TECHNISCHE UNIVERSITÄT MÜNCHEN

Lehrstuhl für Wirtschaftsinformatik (I 17)

Univ.-Prof. Dr. Helmut Krcmar

Incentives for an IT-based health intervention in a workplace environment

Frederik Kerßenfischer

Vollständiger Abdruck der von der Fakultät für
Wirtschaftswissenschaften der Technischen Universität München
zur Erlangung des akademischen Grades eines
Doktors der Wirtschaftswissenschaften (Dr. rer. pol.)
genehmigten Dissertation.

Vorsitzende: Univ.–Prof. Dr. Isabell M. Welpe

Prüfer der Dissertation:

1. Univ.-Prof. Dr. Helmut Krcmar
2. Univ.-Prof. Jutta Roosen, Ph.D.

Die Dissertation wurde am 10. Juni 2014 bei der Technischen Universität München eingereicht und durch die Fakultät für Wirtschaftswissenschaften am 15. Dezember 2014 angenommen.

Abstract

Background

Health intervention programs are an important part in the modern health care systems. Reducing the impact of diseases and creating a higher awareness of the personal health status will be necessary in a society that is facing a large demographic shift in the next years. However, most of these programs focus on rather simple approaches to supply medically relevant information to prospective/future participants. The prevention of risk factors, such as obesity, smoking, low physical activity, excessive alcohol consumption or stress is the effective way to improve the general health status and helps to prevent more serious complications. The success of health interventions is thereby heavily dependent on the permanent execution of health promoting activities. Only with continuous participation in health promotion, which can be supported by additional incentives, a positive development can be achieved. This is a major shortcoming of health promotion programs.

Problem statement

A problem in the implementation of health promotion measures is the investment of employees' time, which is perceived as a major obstacle to long-term continuation. The shift of health promoting measures in everyday life is therefore accepted only under restrictions such as the threat of acute illness. The programs will be operated only after a previously diagnosed illness or in cases such as obesity and smoking usually only until an improvement of the health status has been reached. For this reason health promotion is a research priority, which is examined in the workplace. The workplace environment contains many factors favoring the success of the measures. This includes a common infrastructure, a daily routine, a payment system and other factors which benefit the integration of a health promotion program. Positive aspects for the integration of new IT supported health programs in the workplace environment are: the large time proportion of the day spent there, the long-term commitment to the employer (which leads to an important constancy in the execution of the health program), the requirement to be "fit" enough to cope with the daily work and daily contact with colleagues which can act both motivating and controlling, and thus contribute to success. The thesis uses three guiding research questions: 1) Which IT focused features can be found in workplace health intervention programs? 2) Which incentive mechanisms should be used for workplace health intervention programs? 3) What can be learned from the application of motivational mechanisms in a workplace health intervention program?

Research design and method

The thesis used the action research method while implementing the IT-based health promotion in a company. Therefore, various qualitative and quantitative data on the topic were used and compared with each other. First, a literature review in combination with a market analyses was accomplished. In combination with the theoretical

background of the literature this lead to expert interviews and to a questionnaire for a specific target group. Following the findings of the qualitative and quantitative results, field experiments were conducted concerning the usability, scenarios for the implementation and motivation of the participants. For the evaluation of the experiments data from direct observations was used, as well as post-experiment questionnaires.

Results

Health promotion programs experience the integration of IT-based solutions. Beside sporting good manufactures, smartphones and gaming consoles are suited to be used in this context. Their implementation however relies on factors such as usability, acceptance, cost-efficiency or a shown long term effect. Furthermore, stakeholders such as executives of a company, value the potential of such measures high for the future and believe their suitability for stress reduction. The aspect of usability is shown within an experiment of gaming consoles that revealed the superior movement based input of the Xbox 360 Kinect and the Wii. Additionally, the scenarios in which colleagues and supervisor perform a health promotion measure together and spontaneous are favored among employees. Lastly it was found, that the motivation to exercise can be increased with changes of the gaming consoles during a field experiment.

Limitations

The limitations of this thesis are the ever existing problem of self-reported answers during the expert interviews and questionnaires. Additionally the short term perspective of the conducted field experiments with a restricted number of participants that could, due to the nature of field experiments, possibly exchange information between each other might influence the observed results. Furthermore, the thesis only provides the picture of a current market selection of devices. As the used technology advances, different observations and results might occur in the future with the application of next generation devices.

Key words

Health promotion, intervention, IT, computer, workplace, occupational, usability, acceptance, interview, questionnaire, experiment

Table of contents

List of figures

List of tables

List of abbreviations

AMOS SE	Allianz Managed Operations & Services Societas Europaea
AOK	Allgemeine Ortskrankenkasse
AR	Action Research
ATUE	Attitude towards using exergames
AW	Attitude towards workplace health promotion
BITUE	Behavioral intention to use exergames
BREQ	Behavioral Regulation in Exercise Questionnaire
cf.	confer, compare
e.g.	exempli gratia, for example
EG	Exergames
GPS	Global Positioning System
Ibid.	ibidem, the same
IT	Information Technology
KW	Knowledge of exergames
OIT	Organismic integration theory
PE	Potential of exergames
PEQUE	Perceived ease of use exergames
PUE	Perceived usefulness exergames
PW	Priority of workplace health promotion
RAI	Relative Autonomy Index
RCT	Randomized controlled trial
SD	Standard deviation

SPSS	Statistical Package for the Social Sciences
SUS	System Usability Scale
SWOT	Strength, Weaknesses, Opportunities and Threats analysis
TAM	Technology Acceptance Model
TTM	Transtheoretical Model of Behavior Change
USB	Universal Serial Bus
WHO	World Health Organization
WHP	Workplace health promotion

1. Introduction

This work examines health interventions within a workplace environment in the context of modern IT-based support systems that can be used to improve these programs and act as an incentive for the participants. In the following chapter the motivation for work is presented and the approach is further described. Additionally, the research contribution of the topic is outlined and an overview of the structure of this work is given.

1.1 Problem statement

The workplace environment in combination with health related topics is a well examined research field[1]. However, the development of implications for health promoting activities in a workplace environment of recently available IT-related developments are a new research field. In the following chapters of this thesis these two areas are linked and the relevance of the research is demonstrated. The health status of employees and the long-term preservation of this status are increasingly issues created by the given demographic trends and structural changes in the labor market[2]. For example the World Health Organization offers recommendations on physical activity due to the fact that the activity leads to a reduction of health risks such as high blood pressure, type 2 diabetes, depression and coronary heart diseases and thereby leads to a higher level of muscular fitness and allows to achieve a healthy weight maintenance[3].

This is closely related to the problem that in general physical activity depreciates over the life course and this leads to an increasing impairment of cognitive performance, which can be countered by health promoting interventions[4]. The prevention report of the GKV-Spitzenverband shows that workplace health promotion has been steadily increased over the recent years[5]. Additionally, the programs can generate savings for the employer and increase the attractiveness of the company for employees with the offering of such measures[6]. However, the evaluations of workplace health promotion

[1] cf. (Robson et al., 2007); cf. (Hulshof, Verbeek, Van Dijk, van der Weide, & Braam, 1999)
[2] cf. (Dixon, 2003); cf. (Isidoro Losada & Mellenthin-Schulze, 2010)
[3] cf. (WHO, 2010)
[4] cf. (Middleton, Barnes, Lui, & Yaffe, 2010)
[5] cf. (Schempp, Zelen, & Strippel, 2012)
[6] cf. (Baicker, Cutler, & Song, 2010); cf. (Kirsten, 2008); cf. (Amundson & Morley, 2002)

show that the acceptance of such programs has numerous problems such as low number of participants or high dropout rates which both deter the effectiveness of the measures[7]. The incentivation is therefore a key feature that needs to be addressed by a health promotion measure in the workplace, as otherwise the target group and the total effect of the measures will be at a minimum to moderate level. A motivation for an employee to take part can be difficult to achieve, as the environment of the workplace differs heavily in the setting from the rehabilitation or private environment in which health promoting activities are normally carried out.

Innovative measures can therefore be a way to promote workplace health promotion and make it more attractive for employees to participate. To support this the motivating effects created through the use of IT based measures must be tailored in such a way that a long-term and broad interest by the employees is created to perform the health promotion, meaning that effects that are created through the innovation must be considered within the application[8]. Likewise, the focus and implementation of the measure must be directly be connected with the health promoting activity of the employee, to counteract the fading interest of the employees has to be kept in mind. However, if the motivation to participate in a measure is created only through the technology, the effect will wear off quickly and will leave only the intrinsically motivated employees with a comparably expensive health promotion measure due to the integration of technology.

Furthermore, the effectiveness needs to be considered, as the implementation in a workplace environment naturally gets in conflicts with the working time of the employee. For that reason, the application in short breaks and with little preparation effort (such as changing clothes or setting up equipment) is needed. Additionally the health effect should already be triggered throughout these short time interventions, whilst positive physical or psychical effects need to be observed.

[7] cf. (Harden, Peersman, Oliver, Mauthner, & Oakley, 1999); cf. (Rudow, 2004)
[8] cf. (Dearing, 2009)

1.2 Solution approach

IT-based support offers a lot of potential to encourage the participation and to further support a positive behavioral change to a healthier lifestyle[9]. The workplace, on the other hand, is an environment which, under normal circumstances, doesn't openly foster or harm the health of employees. However, it is there were people spend a large amount of their daily time. It is therefore a highly relevant setting for new and innovative health promotion programs. Like many developments, the IT-based support for a healthier life first started to be used by people who already live a comparably healthy lifestyle (e.g. doing exercises several times a week and participating in a gym or sports club). Additionally, they are already motivated to perform the measures on a regular basis and to do this over a long term period. Because of this, the available technical solutions are mostly adapted to the needs of a private environment, which doesn't reflect the requirements of a health promotion program in a workplace adequately.

The idea therefore is to evaluate a variety of available IT-based solutions in the market, which are offering good acceptance by the users and could be adapted to a workplace environment. In a second step the requirements of an innovative health promotion program in a workplace should be evaluated. With this an assignment of an IT-based solution to a setting it is possible, alongside the features a solution can offer, to address the participants in an optimal way.

The solution thereby not only has to confront obstacles such as cost-effectiveness, because even for a health promotion activity this is a crucial subject in a business environment, but also the acceptance of the employees, the in general low participation rate and the significance of a "real" health improving effect for the participants.

An ideal scenario would be that an employee is offered a measure in his workplace and he can freely decide if he wants to participate. IT-based measures, in fact, offers however different possibilities for the employee to perform and participate in it. Of great importance for the success and the achievement of a long-term effect is the employee's motivation to actively participate in health promotion. Therefore, the measure must be implemented in such a way, that different incentives are present for the employee and he keeps participating in the health promotion. The incentives thereby

[9] cf. (Uta Knebel, 2011); cf. (Portnoy, Scott-Sheldon, Johnson, & Carey, 2008)

can be of different nature, such as automatic data recording, individual training plans or data sharing to create a workplace wide competition from the IT-based side and are also depending on the design of the measure (e.g. time and duration, activity performed solo or in a team and spatial/technical conditions).

The employee's motivation to participate is influenced by a large variety of factors and different incentives have various effects over a given time period. For example, an employee might start with the measure, because he is interested in the innovative technical features that are offered. On the other hand this effect will wear off once he has experienced the features, but he, for instance, sticks to the health promoting measures because he enjoys to perform it in a team during his short coffee breaks.

This possible combination of short/long-term incentives due to the use of IT-based measures can be a way to ensure a broader and more sustained participation of employees in workplace health promotion programs.

1.3 Research contribution

The goal of the thesis is to make three contributions to the research regarding the incentivation of IT-based health interventions in a workplace environment. It is attempted to keep the areas of contribution as distinct as possible from each other whilst, on the other hand, providing a current overview and development of the topic as a whole (see Table 1).

Table 1: Overview of research contributions to the topic of IT-based health interventions in a workplace environment (Source: Own diagram)

Contributions to research
• Status quo
• Requirements, Acceptance
• Implementation, Evaluation

The first contribution is the assessment of the current status and the development over the last decade of IT-based health promotion programs in a workplace environment. An overview should be provided on how IT is used in the programs and which certain features were and can be added through the use of it.

The second contribution aims at the problem of the participation level in the programs and tries to identify reasons and ways to increase the participation. Therefore the acceptance of IT-based measures is examined and motives from various parties in a workplace environment are analyzed. The identification of fostering parts and barriers for the motivation to participate in IT-based health promotion activities in the workplace is further looked at. A list of requirements that should be taken into account for the implementation of such measures is then derived.

The third contribution for research is the testing of the above described approach to the topic. Therefore, different field experiments are conducted in a large German company to deliver empirical data about IT-based workplace health promotion. The gathering of such data is very work-intensive, as the environment requires careful planning, a clear communication to all interested parties and an error-avoiding execution of the experiments. Due to these challenges the number of scientific publications offering such data remains low.

In the following chapter three research questions will be presented that will provide a guideline for this thesis and help to evaluate the success in the research of the topic at hand.

1.4 Thesis overview

The following chapters of the thesis are organized along a systematic approach to the topic.

Chapter two introduces the methodological framework of the thesis. The focus lies on the description of the chosen research design, and the presentation of the three leading research questions are presented. Moreover, the selected research methods are explained within the subsections, starting with the literature review and then followed by the expert interviews and questionnaires. Finally, the chosen approaches for the

experiments is explained in detail, to provide an overview over the development of the research focus of this thesis.

Chapter three presents an introduction to the terms and topics of health promotion and disease prevention. Afterwards, the systematic review of current literature on IT in workplace health promotion and the associated incentive mechanisms are investigated. The market analyses then completes the overview of the current state of the topic with an analysis of different products that could be used for workplace health promotion. The respective advantages and disadvantages in the found literature and the products are evaluated and summarized afterwards.

Chapter four introduces the second approach to the identification and selection of incentive mechanisms for workplace health promotion. Therefore, expert interviews, and the executive questionnaire and their detailed results are described in the subsections. Both aim to provide insights about possible barriers in the application within a workplace environment as well as about the identification of improvement areas. Recommendations for the implementation of IT-based workplace health promotion are derived and provide further knowledge about the composition of the measure.

Chapter five contains the third research approach with three experiments in the workplace setting. Hence, this section focuses on the practical application and provides information about the usability, different scenarios and the motivation mechanisms. In the subsections the design of the experiments is further described in detail and the results are presented and discussed to improve the insights on IT-based health interventions in a workplace environment.

Chapter six summarizes the contributions of the three approaches to the topic and compares the results with related work. Furthermore, the connection of the results to the leading research questions of this thesis is established and scientific limitations are pinpointed. Additionally, an outlook of the topic is provided and the new approaches are critically reviewed.

Chapter seven features the complete reference list of the thesis. **Chapter eight** contains the appendix with the interview protocols, the questionnaires, data sets and minor statistical results of the conducted experiments of the thesis.

2. Methodological Framework

In this chapter an overview over the methodological framework of the research is presented. This includes the general approach of the research structure in the first section, as well as the methods chosen and conducted for this thesis. At start, a brief overview of the structure is given and consecutively the research design is described along the three guiding research questions. These help to lead the research and present a possibility to harmonize the understanding of the gained results in answering the questions. Lastly, the applied methods are shortly presented to provide common ground of knowledge for the following thesis.

2.1 Structure of research

The research in this thesis follows an Action Research (AR) approach. A definition to AR is given by Reason & Bradbury[10]:

> *"…a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes […]It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people…"*

The combination of practical implications to create new insights in an objective and comprehensible way is what AR provides. Due to this, the method is practiced in diverse research areas such as economics, organizational development, sociology or management[11]. In these areas the AR can be helpful, as it allows for the active participation of the researcher while conducting the research and most commonly contains some form of organizational change within a social group or an institution. The researcher directly interacts with the research objective and gives up the neutral perspective as he becomes a part of the research approach.

Berg describes the AR as[12]:

[10] cf. (Reason & Bradbury, 2001)
[11] cf. (Carr & Kemmis, 2003); cf. (McNiff & Whitehead, 2010); cf. (Levin & Greenwood, 2001)
[12] cf. (Berg, 2004)

> *"Today action research represents a viable, practical strategy for social sciences studies requiring systematic, organized, and reflective investigations. In its present use, action research is one of the few research approaches that embraces principles participation, reflection, empowerment, and emancipation of people and groups interested in improving their social situation or condition."*

As described here, the integration of the participants into the research approach is a common factor as well as the goal to create a positive social change in the researched environment. This plan, to improve and change the current situation, makes AR unique, in a way, as it provides the possibility to leave the role of a strictly observing and analyzing research. It thereby aims to create directly useful insights for the practice and tries to apply them in an improving way.

This means that the research actions are not necessarily based on the insights gained from the available scientific literature, but can also be based on the actual situation in the practice. During this, AR generally follows a process that can be described as: "Planning – Action – Evaluation" or" "Goal setting – Gather information – Evaluate results – Interpret – Apply" or "Plan – Act – Observe – Reflect". Thereby it at first relies on qualitative research methods to gather information that are then the basis for an evaluation and interpretation cycle. For this thesis the process can be depicted as in Figure 1.

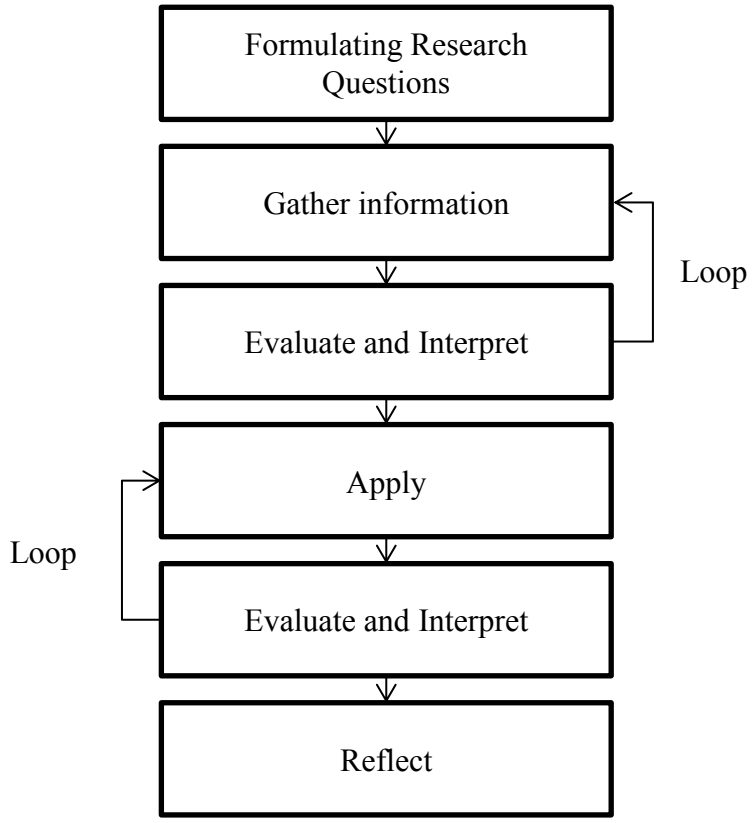

Figure 1: Overview of the research process of the thesis (Source: Own diagram)

Formulating Research Questions: Initially questions are formulated to narrow down the research goal and act on the one hand to identify research problems and on the other hand provide a guiding structure for the following research. Through them it can easily be controlled in the dynamic AR process if a planned action aids to answer a research question or if the expected knowledge gain is out of the planed research scope.

Gather Information: In this phase, the mentioned qualitative research begins to obtain knowledge about the research topic. At first this can be based on available scientific literature that already exists about familiar topics. Furthermore e.g. interviews or focus groups can help to generate relevant insights.

Apply: The implementation of actions is conducted in this phase and involves the participants as well as the examiner. Different ideas and changes in the environment are tested and often lead to a series of iterations in which the induced changes are refined.

Evaluate and interpret: This part of the process is repeated in a loop until sufficient knowledge is obtained to apply it and induce changes in the practice. This process step is then also subject to a loop cycle as different outputs lead to a learning process in which the results are broadened and refined. The improvement of the current situation is regularly selected as an evaluation criterion.

Reflect: Finally the results of the process are reflected back on to the initially stated research questions and answers are drawn from the conducted research. However, even though this step is the final one, the reflection on the gained knowledge is part of the whole process and should also conducted throughout the previous steps.

Following, the described steps of AR are connected with a set of research methods and provide the further research design of the thesis.

2.2 Research design

The design in this research reflects the stepwise proceeding in the approaching the topic of IT-based workplace health intervention. An overview is presented in Figure 2. At first an introduction with the motivation and a research objective is presented. In the following, the theoretical background of the research topic and the current state of the research are encountered with a systematic literature review. Additionally, a market analysis completes the overview of the status quo for this thesis by comparing the latest developments of IT-based health promotion. Moreover, the section ends with the connection of motivation fostering measures in the current market environment. The research question one of the thesis is connected to this procedure.

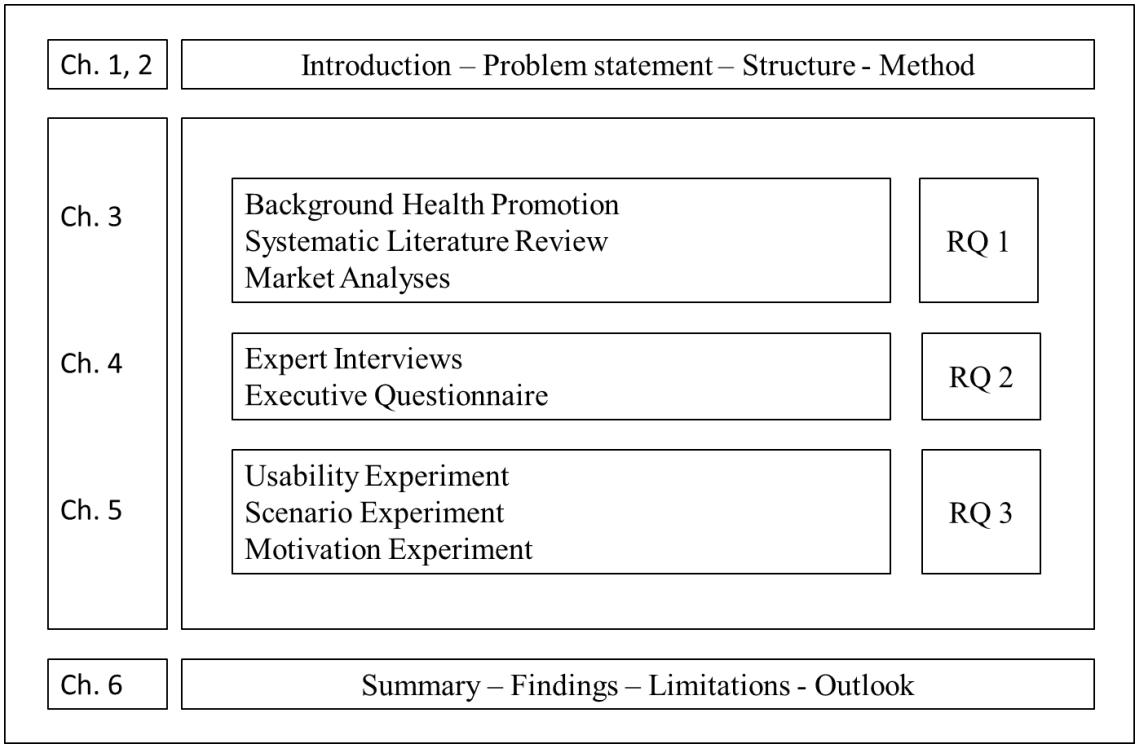

Figure 2: Overview of the research structure of the thesis (Source: Own diagram)

In the next step the requirements for the introduction of a workplace health promotion are evaluated and designs are chosen with the help of expert interviews and an executive questionnaire. Research question two aids in this approach for the applied methods.

The implementation and evaluation is then conducted via three consecutive field experiments, each focusing on a certain aspect required for the evaluation and also providing foundations in the findings for the following experiments. The last research question three tackles the findings achieved by the experiments.

Lastly, the research questions are answered in the summary and the contribution to scientific research, as well as the implications for an implementation in a workplace setting, are presented. Furthermore, the limitations of the research are named and an outlook with further need for research is formulated.

2.2.1 Research question 1

The first research question of this thesis aids in the understanding of the research focus and serves to set a baseline. This aims to provide a general overview of the current

status in identifying the technological development that took place in recent years and is nowadays used in health intervention programs. Furthermore, the increasing relevance of the topic should be tackled with this question in stating its connections to trends e.g. demographic shift and the increasing number of diseases that are becoming prevalent due to physical inactivity and stress factors.

These disease symptoms are growing in the population and are the target of workplace health promotion due to the existing connection of modern working conditions fostering their diffusion, if not being taken into consideration. At the same time, the development of innovative IT-based health interventions can also be observed also in recent years and shows the potential to contain the trend. In different areas the IT is either used to gather data for the participant to allow a self-monitoring, enable the professional counseling based on just-in-time cues during health promoting activities or to even create new forms of interventions with the integration of technical devices such as gaming consoles. The first research question tries to cover these diverse topics and therefore reads as follows:

Which IT focused features can be found in workplace health intervention programs?

2.2.2 Research question 2

In connection to the first question, the second research question builds on the recognition that innovative IT solutions are used in workplace health intervention programs. The implementation in this environment offers a set of challenges that are unique for health promotion and need to be addressed correctly. For example, employees spend a large proportion of their daily time at work, but health promotion programs report only a small share of employees participating and additionally large drop-out rates are observed. To complicate the situation, the target group of endangered subjects often neglects to participate, as they see the measures as unfitting to improve their lifestyle. To tackle this problem the IT-based health promotion programs should be designed and implemented in such a way that they offer motivational support to the participants and further foster their long-term commitment to improve their health status. The successful behavioral guided measure is then a combination of the setting, the used technology, the targeted health issue and the selected target group in a company. To reveal which factors are influencing this problem and what

recommendations should be drawn from a research's perspective, the second research question is formulated as follows:

Which incentive mechanisms should be used for workplace health intervention programs?

2.2.3 Research question 3

After the first two research questions, the third question completes the framework of the thesis in regard to the selected research approach of AR, in implementing the knowledge gained from the questions above. After the thematic overview, the identification of technical developments and questioning of important stakeholders, the results are experimentally tested in a workplace environment. At that the acceptance of the measures and the usability of the technical devices are factors which need to be accounted for in the development of a health promotion measure. The experiments should reveal which behavioral guided measures are accepted by the employees and as well as show which ones prove to be effective in combination with a certain technical solution or device for health promotion purposes. In the end, the improvement of existing health promotion programs in a workplace environment needs to incorporate solutions for the further dissemination of the programs in a company and ensure a long-term commitment by the employees. To this end, the third research question is:

What can be learned from the application of motivational mechanisms in a workplace health intervention program?

2.3 Selected research methods

To answer the research questions different research methods are applied, each suitable to support the approach of the AR method. The methods are chosen to successively approximate the approach to the topic in starting with a broad overview of the current status of the scientific literature and ending with the specific results of a field experiment conducted in the targeted environment. In this way, the results and the knowledge gained from the previous methods aids the following progression of the research.

2.3.1 Review of current literature

To start the research of this thesis, a systematic literature review according to the guidelines of Webster and Watson is conducted[13]. The goal of the review is to present a complete overview of the current literature at a specific point in time regarding the topic of IT-based workplace health promotion. To this end it includes papers and articles of different journals and sometimes research areas, as well as a mixture of methodologies chosen in them. Due to the interdisciplinary topic, various scientific databases are queried, as the literature can be found in the IS, psychology, occupational medicine, economics and social sciences literature.

After achieving the identification of highly relevant sources, the next step is the clear definition of key search terms that are used during the literature search, to maintain a method driven approach in the research, rather than a subjective selection of articles by the researcher. The found articles are then sorted according to a set of criteria and compared with each other. This step allows to clearly identify the key concepts of the research field and provides the abstract view over the research's results. This is important, in order to detach single research results of one article and to set them into a broader context of results that often complement each other and lead to an insightful approach to the topic.

To support the results of the literature review, the data and the discovered connections should then be presented in a comprehensible and suitable way to further highlight the main results of the research for the area so far. In this, the picture of future ways for the research topic can be drawn and current gaps that exist in the literature be identified. For this thesis, the literature review therefore acts as a foundation stone to tackle the topic of IT-based workplace health intervention.

2.3.2 User questionnaires and expert interviews

In the second step, interviews and questionnaires are chosen as a qualitative and quantitative approach in the evaluation, based on a guideline provided in the works of Patton and Fink[14]. The combination of the both approaches allows, on the one hand, to

[13] cf. (Webster & Watson, 2002)
[14] cf. (Patton, 1987); cf. (Fink, 2008)

obtain the insights of experts on the topic, which are of qualitative nature and, on the other hand, to receive quantitative data for further analyzes through the use of fixed questions. In principle, a set of questions helps to understand the key criteria and to set up the evaluation (see Table 2):

Table 2: Overview of questions for qualitative and quantitative research (Source: cf. (Patton, 1987))

Who is the information for and who will use the findings of the evaluation?
What kinds of information are needed?
How is information to be used? For what purposes is evaluation being done?
When is information needed?
What resources are available to conduct the evaluation?

At the start this leads to the choice of qualitative expert interviews to collect data on an issue, reveal past events and allow for an in-depth questioning, if an expert offers helpful insights to further advance the topic. This is only achievable due to the unconstrained input method of an interview. However, the predetermination of introducing questions for interviews can allow for a more comparable analysis, even among qualitative data and help to compare interactions, situations, observed behavior and events as described by the interviewees. In the end, this methods helps to gain an understanding of underlying reasons and motivations to the topic, provide insights about problems of a setting, identifies trends and opinions and to generate ideas and hypotheses for following quantitative research.

The questionnaires are complementary in this approach, as they allow for the generation of quantifiable data from a sample of a group of subjects relevant to the research topic. They then share their views and opinions on a topic in a fixed set of questions and assess presented ideas and scenarios from their perspective. This way more generalizable data can be gathered, correlations between certain factors identified and recommendations formulated, based on the obtained results. The advantages thereby are the relatively large number of people that can be used for data generation at a comparably low cost and the independence of time and place which allows the integration of subjects that would hardly be available for interviews. However, this

comes at the cost of a well-designed questionnaire, which must be used to obtain the data, as it is not possible to alter the questions after the first feedback is received. For the creation of a questionnaire, the steps should be taken as in Figure 3.

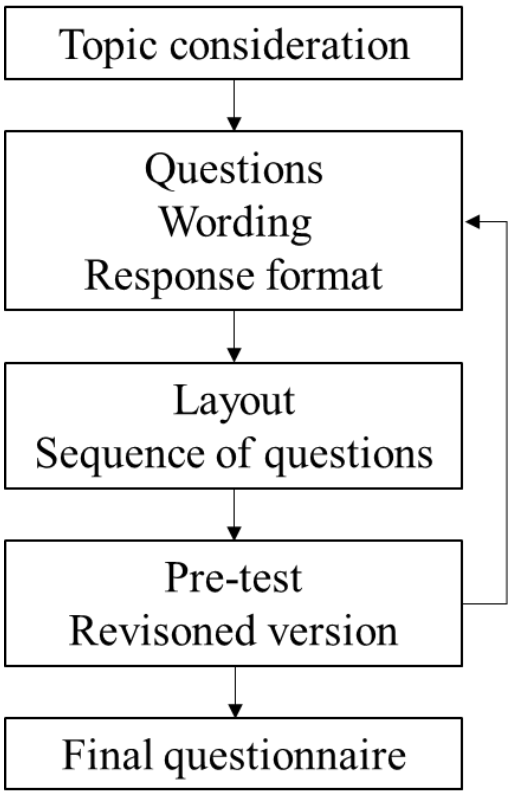

Figure 3: Overview of steps for the design of a questionnaire (Source: Own diagram)

As stated above, it is of high relevance to be clear about which information is required for the research and who the target subjects of the questionnaire are. For that, it is never too early to think about the analysis of the questionnaire results ahead, as it will clearly influence the selection of questions and the chosen layout of the questionnaire. Therefore a pretest can help to identify the flaws coming from questions that don't add value or further insights and confuse subjects in the answering. To avoid these, already standardized questionnaires, questions constructs and items can be used for many research topics.

For this thesis, different questionnaires are used, completely standardized and therefore comparable, as well as newly created questionnaires which rely on a combination of proven question constructs and newly designed questions. These are checked during the

pretest phase with a small sample of respondents to ensure the correct understanding and answering of the questions.

2.3.3 Field experiments

Field experiments are a special kind of experiments that are used in this thesis[15]. They differ from laboratory experiments in that they give up the control over most of the environmental influence factors of the experiment. Lab experiments, on the other hand, fail to deliver relevant results, predictions and evidence for "real world" behavior of the scenario workplace health promotion, as the environment with its variables cannot easily be mapped in a lab environment. Harrison & Field suggest six criteria to determine the context of a field experiment, which are presented in the following Table 3.

Table 3: Overview of criteria to determine the context of a field experiment (Source: cf. (Harrison & List, 2004)

Criteria:
The nature of the subject pool
The nature of the information that the subjects bring to the task
The nature of the commodity
The nature of the task or trading rules applied
The nature of the stakes
The nature of the environment that the subjects operate in

The subject pool in the case of this thesis would be employees of a company. In comparison regular lab experiments are usually conducted at the university, mostly with students who represent an already specialized subject pool. However, this fact alone wouldn't suffice to argue for a field experiment as a chosen method as the subjects could easily be invited to a lab to conduct the experiment once they are recruited. This fact, in combination with further criteria, rules in the favor of field experiments. The environment is, as mentioned, the most important factor, as the actual behavior of the

[15] cf. (Harrison & List, 2004)

participants is heavily influenced by it and should reflect the environment for which this research tries to make a statement.

Additionally, the stakes are also an important factor, as it matters if a participant decides to join a health promotion activity during his working hours which is offered to him at his workplace in the context of an experiment, or if he decides to participate in an experiment and then performs the activity at a fixed time. This is especially important as the experiments in this thesis are connected to the topic of motivation of the employee to participate in health promotion. Therefore, it matters if he decides to join the experiment in a setting that is most closely build to reflect the latter application or in a lab environment, where the motivation to participate interferes with the context of the research.

Due to this, all experiments of this thesis are conducted “in the field” - directly in the environment of a company. To tackle the problems of participant randomization and replicability of the experimental setup, three experiments are conducted separately to obtain three separate data sets for analysis and thereby reduce the risk of a flawed data set with inconclusive data. Additionally, the sample size of each experiment is chosen to be higher than in a comparable lab experiment, to compensate for the larger variability of participants and results in a field experiment.

3. Structured analysis of the research field

Health promotion programs are a common part of the modern health care system with the main focus being to supply medically relevant background information to the participants of such programs. However, the scientific literature and the market participants in this field strive to develop programs that go beyond the information of e.g., employees about e.g. health risk factors such as obesity, smoking, low physical activity, excessive alcohol consumption or stress.

The following chapter presents an overview of the current state of the research field and further identifies the most relevant market developments that can be applied in the context of workplace health promotion. The literature review and the market analysis additionally focus on the aspect of incentive and motivation mechanisms for health promotion programs.

3.1 Health promotion

Health promotion is a concept that serves the purpose of developing health resources and health promoting structures in the daily and working life[16]. The theoretical foundation of this is provided by the so called model of salutogenic of Antonovsky, which presents the formation and maintenance of health conditions as the main focus and thereby legitimizes the application of health promoting measures[17]. The origin of the model can be found in the investigation of why people stay healthy despite a variety of hazardous and harmful factors of their health status and what factors can compensate for such disturbances of one's health[18]. His development of the salutogenic approach constituted a complementary approach to the pathogenesis, which represents the traditional disease oriented medicine approach[19].

According to his understanding of health and illness are not two static, mutually exclusive and alternative states, but poles of a continuum[20]. The health of an individual is thus the product of a "*dynamic interaction between numerous incriminating and*

[16] cf. (Vogeler, 2008)
[17] cf. (Bundeszentrale-für-gesundheitliche-Aufklärung, 1996); cf. (Rigotti & Mohr, 2011); cf. (Kolip, Wydler, & Abel, 2000)
[18] cf. (Hurrelmann, 2010)
[19] cf. (Antonovsky, 1997); cf. (Bundeszentrale-für-gesundheitliche-Aufklärung, 1996)
[20] cf. (Nowak, 2011)

exculpatory, protective and supportive factors"[21]. The combination of resistance factors and the sense of coherence is decisive for the position of a person on the health-disease continuum at a certain time in his life. Therefore, health is the "*result of the current balance between risk and protective factors within and outside the person*"[22], which can be influenced through targeted promotion.

Although the concept of health promotion was introduced in the 1970s by the World Health Organization (WHO), the concept itself has only been established with the Ottawa Charter for health promotion in 1986[23]. Health promotion is therefore a process that serves to "*allow all people a greater degree of self-determination in their livelihoods and their environment and thus enabling them to strengthen their health*"[24].

Health is a complex and normative concept which is characterized and changing through social discussions and group interests[25]. An overview of the various attempts of a definition of health is found in Franke[26]. The best known, and therefore most used, although also the most frequently criticized, definition of health comes from the WHO. In its statement of 1946, health was defined as "*a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*"[27]. Today, health is following the salutogenic and resource oriented principle as a "*long lasting development process, which refers to aspects of the individual act and the subjective well-being and includes physical, psychological and social dimensions*"[28]. Health is then both a prerequisite and a result of interaction between people, behavior and the environment. Within the meaning of health promotion, the concept corresponds to an active life coping skill that can be learned to improve one's health[29].

3.1.1 Health promotion vs. disease prevention

Health promotion and disease prevention are strategies aimed at improving and maintaining the health of a person, but their contents and overall meaning differ, due to

[21] cf. (Hurrelmann, 2010)
[22] cf. ibid.
[23] cf. (WHO, 1986)
[24] cf. ibid.
[25] cf. (Ulich & Wülser, 2010)
[26] cf. (Franke, 2007)
[27] cf. (Ulich & Wülser, 2010)
[28] cf. (Bamberg, Ducki, & Metz, 2011)
[29] cf. (Badura, Walter, & Hehlmann, 2010)

their different frames of reference[30]. As mentioned before, health promotion describes a promotion strategy in the sense of an empowerment approach[31]. In comparison, the focus of disease prevention lies on an avoidance strategy. It describes all approaches that prevent the onset of disease through targeted measures and make its occurrence less likely or delay it[32]. Thereby it relies on modifiable factors such as lifestyle, diet, exercise, or drug abstinence[33]. Depending on the goal and the time of the prevention, three types can be distinguished[34]: The primary prevention describes specific activities prior to a tangible injury. It helps to avoid and prevents initiating a disease. Secondary prevention describes all measures to detect clinically asymptomatic in early disease stages and cure them with a successful early treatment. The tertiary prevention describes the effective treatment of a disease which has become symptomatic and further tries to prevent the worsening and permanent loss of (body-) functions[35].

In the implementation health promotion and disease prevention are both pursuing a behavioral and relationship-based approach. Behavioral (including personal) measures are set directly with the individual or alternatively also in groups. They target both the development and the stabilization of healthy behavior, as well as the prevention and change of behavior harmful to one's health. Relationship related (also condition-related) measures by contrast describe actions relating to the lives of individuals or groups[36].

3.1.2 Workplace health promotion

In the 1980s the WHO developed the setting approach with the aim to "identify with the active participation of the stakeholders to the respective health potentials and risks in the area of life and to stimulate a process of planned organizational change and support"[37]. The setting approach provides a central implementation strategy for health promotion because the everyday workplace, the learning and living conditions have a significant impact on the health of an individual and shape the health values, attitudes

[30] cf. (Hurrelmann, 2010); cf. (Gebert, 2009)
[31] cf. ibid.
[32] cf. (Vogeler, 2008); cf. (Hurrelmann, 2010)
[33] cf. ibid.
[34] cf. (Bamberg et al., 2011)
[35] cf. (Vogeler, 2008)
[36] cf. (Gebert, 2009)
[37] cf. (Spitzenverbände-der-Krankenkassen, 2006)

and behaviors[38]. Settings in this context are social systems such as communities, schools, retirement homes or workplaces that have a strong impact on health and which allow for altering the conditions of health and its influence factors.

Promoting the health of workers and preserving their capabilities up to the retirement age is increasingly of relevance given the demographic trends and changes in the labor market[39]. In the future, the proportion of older workers will increase among the total number of employed persons. Until now, almost 50 million people in Germany are of the working age from 20 to 64 years. Out of these, 20 percent belong to the younger group of 20 to under 30 olds (9.9 million people), 47 percent to the middle group of 30 to under 50 year olds (23.5 million people) and 33 percent to the older group of workers aged 50 to 65 years (16.3 million people). The low birth rate along with an increasing life expectancy leads to an age shift towards the older age groups[40]. In the coming decade, the percentage of people within the middle and older age group will rise to about 40 percent[41].

Since the risk of disease however increases with age and additionally the data of the health insurances' data shows that the frequency and duration of disability is strongly related to the age of a worker, this trend is expected to follow with the consequence of an increase in absenteeism at the workplace. Although older workers are less frequently on sick leave compared to younger workers, with age the duration of working incapacity drastically rises[42]. However, the risk of a disease is not only determined by the age, but also by the disposition of a person (e.g. life history or genetic factors) and especially the exposure to hazardous environmental conditions such as high physical and psychosocial stress[43].

Physical and psychosocial work stress are a result of the ongoing structural changes in the labor market (growth of the service sector, increased international competition, increasing rationalization efforts, always new and faster reorganization measures)

[38] cf. (Steinbach, 2007)
[39] cf. (Isidoro Losada & Mellenthin-Schulze, 2010)
[40] cf. (Bundesministerium-des-Inneren, 2012)
[41] cf. ibid.
[42] cf. (Krämer & Nolting, 2012)
[43] cf. (Siegrist, Dragano, & Wahrendorf, 2009)

increased significantly[44]. Thus the proportion of atypical employment (e.g. temporal workers) increased in the last 20 years by 11.4 percent to 25.1 percent in 2011[45]. At the same time an increase in the flexibility of employment conditions in terms of formal employment contracts, working hours, mobility requirements and independence can be observed at the worksite[46]. Several studies revealed a relationship between job demands and an increased risk of health consequences [47]. Data of the Allgemeinen Ortskrankenkassen (AOK) shows that between 2009 and 2010 an increase in musculoskeletal disorders and mental illnesses among their members can be observed[48]. An overview is presented in Figure 4.

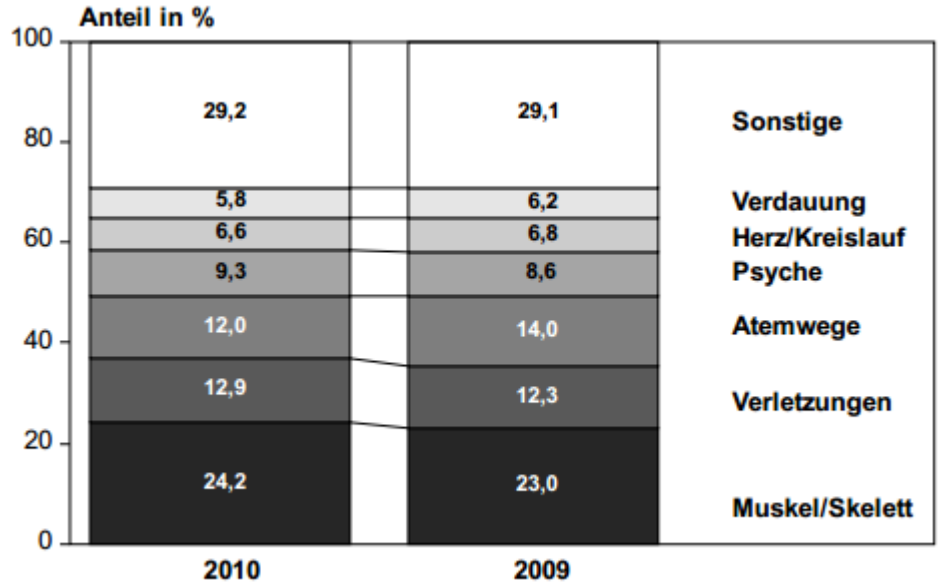

Figure 4: Days of sick leave for different illnesses, comparison of AOK member in 2009/10 (Source: (Wissenschaftliches-Institut-der-AOK, 2011))

In particular the increase in psychiatric disorders deserves attention, because they cause by far the longest absence from work. An overview is presented in Figure 5 in which psychiatric disorders show the highest number of absent days with an average value of 23.4 days.

[44] cf. (Richter & Wegge, 2011)
[45] cf. (Destatis, 2010)
[46] cf. (Rigotti & Mohr, 2011)
[47] cf. (Wroblewski & Leitner, 2005); cf. (Rau, Gebele, Morling, & Rösler, 2010); cf. (Gebele, 2010)
[48] cf. (Wissenschaftliches-Institut-der-AOK, 2011)

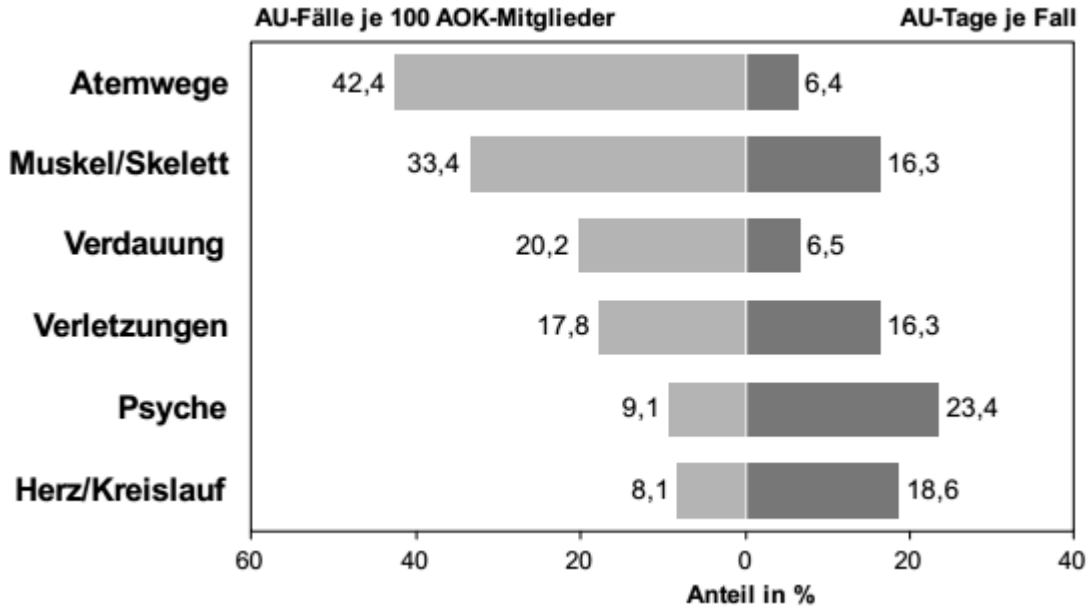

Figure 5: Frequency and duration of different illnesses, AOK members in 2010 (Source: (Wissenschaftliches-Institut-der-AOK, 2011))

Despite these negative influences on health, some conditions in the workplace environment can also be health conserving and even beneficial by providing opportunities for self-development, personality development and well-being[49]. The outlined relationship between work and health shows the meaningfulness of health related interventions in the workplace environment. Moreover Quaas et al. argues that:

> *"Health - particularly mental health - is related to other business success and image related performance factors of the employee such as resilience, availability, motivation and skills of qualification/learning ability/willingness to actively participate in decision making and design processes and creativity. Therefore important economic incentives are set for workplace health promotion for a company that go beyond the reduction of directly predictable accidents and illness costs"*[50].

With the "Luxembourg Declaration on Workplace Health Promotion in the European Union" in 1997, for the first time a uniform understanding of workplace health promotion was established at the European level. Workplace health promotion thereby

[49] cf. (Quaas, Kubitscheck, & Thiele, 1997); cf. (Deplazes & Künzli, 2010)
[50] cf. (Quaas et al., 1997)

includes "*the combined efforts of employers, employees and the society to improve the health and wellbeing at work*"[51]. For a company, workplace health promotion provides a modern corporate strategy to reduce health related burdens through targeted interventions and the possible increase in health promoting resources[52]. It therefore aims not only to influence the behavior of individuals, but to strengthen their personal skills (behavioral measures) and also the employment relationship with their specific health potentials and risks (relative measures).

Working conditions, structures and processes should be designed so that the employees are motivated and enabled to a health promoting life- and working-style[53]. The focus is not the short-term reduction in sick leave days, but the long term and permanent implementation of health promoting corporate structures[54]. The workplace health promotion being voluntary for a company is thereby positioned opposing to the statutory health and safety laws for workplaces, which are mandatory. Due to this fact, the design of the measures is in the sole responsibility of the company's management[55]. The implementation in the company is based on the recommendation of the Luxembourg Declaration by linking resources focusing on improving the work organization and the working conditions, the participation in fostering and promoting active participation of the employees and the empowerment by encouraging the personal development[56].

Moreover, workplace health promotion is a complex field in which a number of institutional and social stakeholders are involved with different and sometimes conflicting interests, roles, influences, action repertoires and forms of organization[57]. Mostly the employers and the management are presented as the most important internal actors and the health insurances as the most important external actor for workplace health promotion. The employer is, by law enforced to "*take the necessary occupational safety measures, taking into account the factors that can influence the health and safety of employees at work. He has to review the necessary measures to ensure effectiveness*

[51] cf.(ENWHP, 1997)
[52] cf. (Bundeszentrale-für-gesundheitliche-Aufklärung, 1996); cf. (Spicker & Schopf, 2011)
[53] cf. (Spicker & Schopf, 2011)
[54] cf. (Westermayer, 1996)
[55] cf. (Faller, 2010)
[56] cf. (ENWHP, 1997)
[57] cf. (U. Lenhardt, 2010)

under changing circumstances. He has to strive for improvement of safety and health of employees"[58].

To this end, employers are required to appoint occupational doctors and workplace safety specialists, who offer them support in all aspects of occupational health and safety[59]. The extent of the employer's activities beyond the legal regulations for the health of his employees depends largely on whether health is an important value for the company and is integrated into the corporate goals[60]. For the implementation of workplace health promotion measures the occupational doctors and safety specialists can take over the responsibility, however, in many cases this task is also taken over by recruiters, workers' council members, or operation maintenance staff. These can act together in cooperation with the safety specialists and further external actors such as the health insurances companies, trade associations or private providers of such measures[61].

With the introduction of the §20 of the fifth social law book, the health insurances were made the most important part of the Health Care Reform Act in 1989, strengthening their organizational and financial support role for prevention activities in the workplace. Since the year 2000, health insurance companies are authorized to "*add measures of health promotion in complement to occupational safety regulations*"[62]. Further the law clarifies:

> "*Health insurance companies provide benefits for health promotion in companies to raise the participation of the insured and the person responsible for the operation of the health situation, including their risks and future potentials and foster the development of proposals for the improvement of health and strengthening of health resources and capabilities to support their implementation*"[63].

For the implementation of this task, the health insurances should cooperate with the responsible accident insurance companies[64]. However, the actual term of the workplace

[58] cf. (Bundesministerium-des-Inneren)
[59] cf. (U. Lenhardt, 2010)
[60] cf. (Franke, 2007)
[61] cf. (Wellmann & Lempert-Horstkotte, 2009)
[62] cf. (Bundesministerium-für-Gesundheit)
[63] cf. ibid.
[64] cf. ibid.

health promotion actions are defined by the GKV-Spitzenverband. The priority areas and criteria for primary prevention and health promotion by health insurance companies were bindingly established for the members with the guideline "Prevention". The purpose was to ensure the quality and effectiveness of workplace health promotion measures by health insurance companies[65].

Furthermore, the workplace health promotion set standard goals regarding targets, priorities and the implementation of measures[66]. The majority of the measures are thereby attributed to voluntary activities of a company[67]. Measures that are deliberately carried out to sustain and improve the health of employees are subsumed by Bamberg under the term: "*health related measures*". This then includes both preventive and health promoting activities[68]. The design of health-related measures is influenced by numerous terms and conditions of the respective setting and requires, depending on the sector, company size, structures within the company and health risk factors, different forms of resources[69]. The resulting variety of health-related actions can be assigned to four different intervention levels: The reduction of stress at the organizational level (relationship-oriented) and at the personal level (behavior-based). When it comes to the development of organizational resources, this is carried out on the relationship-oriented level whilst the behavior-based development is enacted on a personal level[70]. Table 4 provides an overview of the intervention levels with an exemplary measure assignment.

[65] cf. (Slesina, 2001); cf. (U. Lenhardt, 2010)
[66] cf. (Bamberg et al., 2011)
[67] cf. (Baumann, Czarny, Flach, Hetzel, & Mozdzanowski, 2007)
[68] cf. (Bamberg et al., 2011)
[69] cf. ibid.
[70] cf. (Spicker & Schopf, 2011)

Table 4: Intervention levels in workplace health promotion (Source: Own diagram; cf. (Spicker & Schopf, 2011))

	Reduction of stress	**Development of Resources**
Organization **(relationship-oriented)**	• Ergonomic changes • Acquisition of lifting aids • Design of work and break areas • Establishment of smoke-free zones • Pause control • Etc.	• Design of team meetings • Autonomous organization of rosters • Tasks with high decision leeway • Participation opportunities • Maintain jobs for older employees • Etc.
Person **(behavior-base**d)	• Exercise and nutrition program • Skin- and infection control • Smoking cessation • Etc.	• Seminars on stress or conflict management • Leadership training • Party to welcome new employees • Job rotation • Etc.

Recommended for a high quality and sustainable workplace, health promotion is the linking of behavioral and relationship-oriented measures[71]. While the design of workplace health promotion within the companies is not subject to specific regulations, the different health insurances associated four specific fields (in accordance to the §20 fifth social law book) which are additionally funded by them in Germany[72].

- Work-related physical strain

  Measures to prevent and reduce work-related stress are subsumed to the musculoskeletal system which can promote healthy behavior. Examples include group training sessions and consultations with the active involvement of employees or job-related practical guidance.
- Company catering and operations

[71] cf. (Schempp et al., 2012)
[72] cf. (Spitzenverbände-der-Krankenkassen, 2006)

This includes all activities associated with the health promoting meals at work. Examples include information and motivation campaigns or additional offers such as reduced group rates (e.g. for weight loss, diet for certain professionals)

- Psychosocial stress

  This includes measures for developing individual skills for coping with stress at work. An example is the placement of psycho-physiological relaxation techniques or trainings, furthermore the training of assertive behavior and social-communicative skills.

- Drug use

  The prevention of drug use generally refers to a variety of (addictive-) drugs. In the workplace health promotion the prevention of alcohol and nicotine stand in the foreground. As an example, the provision of effective cognitive-behavioral smoking cessation trainings can be named.[73]

3.1.3 Success factors for workplace health promotion

The success of workplace health promotion depends on several factors. As mentioned above, the workplace health promotion depends largely on how important the health of the employees is seen by the management of a company. Successful workplace health promotion requires that it is perceived as an executive function and is integrated into existing management systems[74]. Workplace health promotion "*stands or falls […] with the degree of support from the top hierarchy*"[75]. In particular, the middle and lower management is attributed an important role in the implementation of health promoting measures due to their employee contact. Therefore in the "role of a multiplier a manager is responsible, whether and how the health concept of a company is translated into concrete actions. It is expected to provide adequate financial, human and time resources and to make by their own interest and commitment an active contribution"[76]. The attitudes and behaviors of managers can thereby influence the acceptance of the policies for the workplace health promotion programs in a strong way[77].

[73] cf. ibid. For the four presented funding fields
[74] cf. (Spitzenverbände-der-Krankenkassen, 2006)
[75] cf. (U. Lenhardt, 2010)
[76] cf. (Franke, 2007)
[77] cf. (U. Lenhardt, 2010)

Additionally the Luxembourg Declaration on health promotion identifies the principles of participation, integration, project management and the central holistic approach as other success factors. This is to be seen as a minimum requirement for a high value and comprehensive workplace health promotion concept[78].

The first principle of this declaration calls for the participation of all employees and their representatives, which are affected by the workplace health promotion, in the planning and decision making. The second principle of integration requires the systematic and purposeful consideration of the health promotion in all important decisions in all areas of the company. The third principle of project management states that all policies and programs are systematically targeted to the needs of the employee and are subject to continuous monitoring and evaluation. The fourth principle urges the holistic approach to create a permanent link between behavior and environment-directed measures. With this approach it combines the strategy of risk reduction with the development of protective factors and further positive health potentials[79].

However, in the literature many barriers for workplace health promotion are discussed as well. A major problem arises from the low participation rates and the high dropout rates of these programs[80]. First, the commitment of the employees and also the motivation to participate is often criticized[81]. Since participation of workplace health promotion measures is based on the principle of self-selection, there is a problem to reach the people who would most benefit from the programs. Studies suggest that "*employees who have a high health risk, such as smoking, high blood pressure, cholesterol or an inactive lifestyle are a lot less likely to participate in health promotion programs*"[82].

Another problem of workplace health promotion arises for interventions that are in particular movement related, which most often report dropout rates of up to 50 percent[83]. Rudow in this context suggests using economic incentives to increase the

[78] cf. (Spicker & Schopf, 2011)
[79] cf. (Deplazes & Künzli, 2010); cf. (Bundesverband-der-Betriebskrankenkassen, 2004); cf. (Spitzenverbände-der-Krankenkassen, 2006)
[80] cf. (Rudow, 2004)
[81] cf. (Bechmann, Jäckle, Lück, & Herdegen, 2010)
[82] cf. (Kreis & Bödeker, 2003)
[83] cf. (Stoffel, 2009)

participation rates and to counter early termination of the measure by the participant[84]. Further, a problem which could was identified for workplace health promotion is that the measures do not sufficiently meet the needs of the specific target groups too little and therefore risk their participation. Different audiences of employees need different measures designed specifically to their needs[85]. Invalidity analyzes, risk assessments, medical examinations or interviews with employees in terms of loads and resources can therefore provide the required information on the needs of the different target groups[86]. Lastly, workplace health promotion in general has to fight some problems which should be kept in mind for the following chapters.

- Costs and benefits of workplace health promotion programs may apply at different points within a company[87].
- No clear assignments of effects of different implemented measures that would allow for a comparison[88].
- Possibilities of the workplace setting are not exhaustively used[89].
- The short program duration of many workplace health promotion measures may not induce permanent participation and behavior change by the employees[90].

3.2 Literature review

The literature review aims to identify the state of the research of workplace health promotion programs[91]. Thereby, the structured review investigates the influence of incentive and motivation mechanisms in this context. Especially studies which provided information about the number of participants, the targeted risk factor e.g., obesity or low

[84] cf. (Rudow, 2004)
[85] cf. ibid.
[86] cf. (Spitzenverbände-der-Krankenkassen, 2006)
[87] cf. (Sockoll, Kramer, & Bödeker, 2000)
[88] cf. (Nöhammer, Schusterschitz, & Stummer, 2009)
[89] cf. (Kreis & Bödeker, 2003)
[90] cf. ibid.
[91] cf. (Kerssenfischer & Fritsch, 2012b) all following literature review results were presented on the conference Med-e-Tel 2012 in Luxembourg

physical activity, the program design and the incentive mechanisms used were included. Studies which provided only partly information about the aforementioned topics were excluded in the selection process. These aspects were analyzed whilst considering the theoretical backgrounds, which could lead to important insights for the development of the field experiment of this work and for future research.

3.2.1 Approach

The studies were identified through a structured search[92] in February and March 2011 in the following online bibliographic databases: PubMed, WorldCat, JSTOR and Web of Sciences. Studies from 1995 to 2011 were included into the research to reflect the state of the research field at this moment. Only articles in English language were included to the analyses were due to the use of keywords in this language. Throughout the process, different MeSH-terms[93] or keywords were used. While databases like PubMed allow the use of MeSH-terms, in other cases (like Web of Science) the search is conducted by topic areas. In every database the keywords from the following Table 5 were used.

Table 5: Keywords of the literature review database search (Source: Own diagram)

Keywords:	Health	Incentive	Intervention	Worksite	IT
	Fitness	Motivation	Promotion	Workplace	Online
	Wellness	Encourage-ment	Action	Workspace	Computer

To achieve the best results for every search three keywords were used in combination e.g., “health incentive worksite” or “health promotion workplace”, if the combinations of the keywords proved to be meaningful were used in the database search.

This method brought a wide selection of articles. On the one hand, the set restrictions were narrow enough to exclude a large number of database articles, and on the other hand wide enough to include many relevant studies for the topic at hand. As a

[92] cf. (Webster & Watson, 2002)
[93] cf. (NLM)

prerequisite for being included into the further research and analysis, the search results were screened by taking into account their fulfillment of the following criteria (see Table 6):

Table 6: Overview of the applied criteria for the inclusion into the literature review (Source: Own diagram)

Criteria:
• The article is written about a worksite health promotion study
• The article contains quantitative information about the participation of the health promotion or intervention
• The article provides information about the combination or the study focus of incentives and motivation mechanisms of health promotion/intervention programs
• The article contains information about the study research design
• The article is published and peer reviewed
• The article had to be written in English language to be considered for the following review

The searches in the databases yielded an amount of 14,244 search results for the diverse combinations of the MeSH-terms and keywords. After a review of the titles 204 articles were included. Duplicate search results were eliminated and the focus on quantitative research further decreased the number of considered material, due to the exclusion of qualitative research articles. In the next step, the abstract and/or full-text reviews of the selected articles helped to reduce the number of articles to 23 which were then reviewed with improved criteria concerning the incentive focus in worksite health promotion programs. The overview of the structural sequence of the literature review is depicted in Figure 6, which shows the number of articles and the reasons for their exclusion from the further analysis.

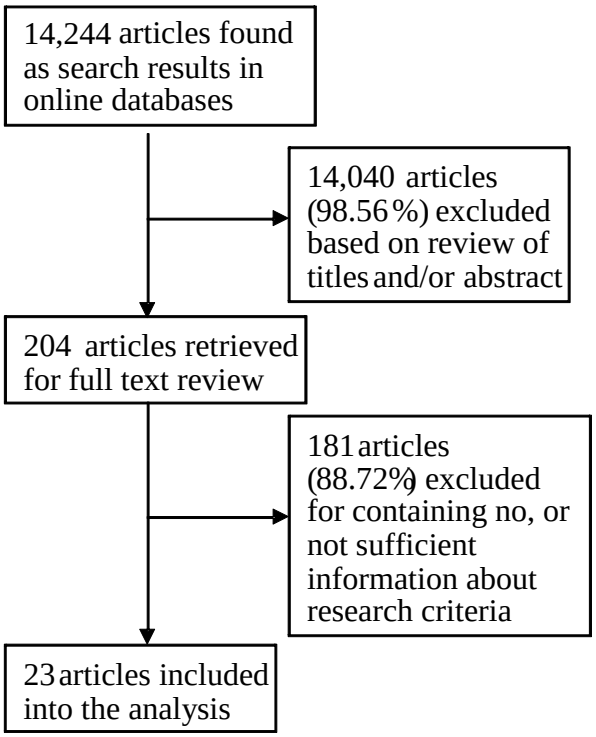

Figure 6: Literature review search results and exclusion process (Source: Own diagram)

3.2.1.1 Data collection

After the structured selection process, the data for the review was extracted from the included articles. In the course of this process, a data form with several determinants reflecting the relevant information concerning the worksite health promotion programs was used. This form included information like year of publication, demographics and number of participants, type of targeted health intervention (e.g., obesity, smoking, physical activity), applied study design, the size of the company in which the program took place and most importantly the type of incentive used in the study. The data was carefully extracted and later a verification of the listed results took place. If certain information in the selected articles was not conclusive, the available information was excluded from the data form and therefore from the final analysis.

After the completion of the data set the studies were divided into clusters for further comparison. Separate clustering was done for the group of incentives and the electronical support mechanisms. As for the incentives the following classification was created: cash rewards, merchandise prizes, peer referral and individual counseling. For the part of the electronical support mechanisms the classification identified five dissimilar tools: websites, email communication, digital questionnaires, programs and technical devices (e.g., step counter or heart rate monitor).

3.2.2 Analysis

204 potentially relevant studies were identified during the research process. Of these, 23 remained after the exclusion process for a detailed analysis. The articles that were included into the literature review were published between 1999 and the year 2011. Most of the studies (87%) were published between the years 2005 and 2011. Figure 7 provides an overview of the distribution of the publication years of the selected articles.

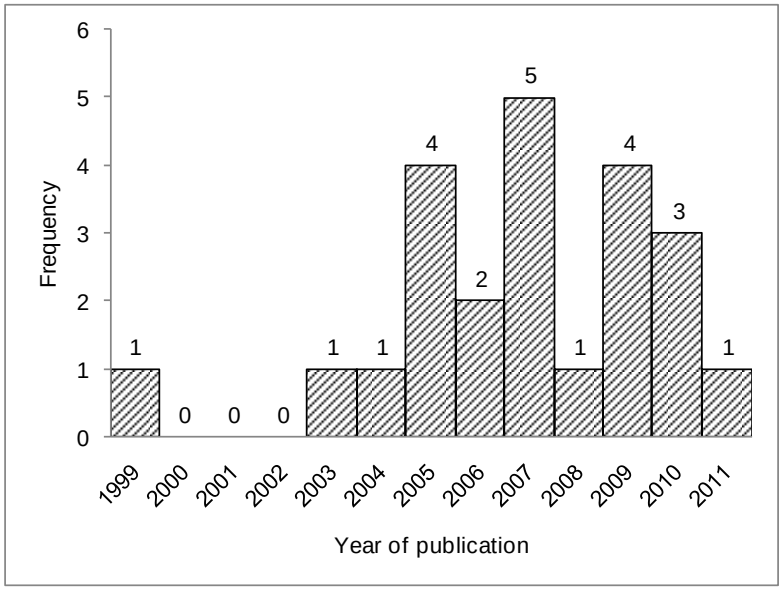

Figure 7: Histogram of article publication years (Source: Own diagram)

In every included study a participation of both genders could be observed (n=23). The age of most study participants was within the range of 30 to 50 years. Over twenty studies (86%) included participants from this age range. An equal distribution among the participants was found for the <30 years and 51 to 70 years. In each case seven

studies (30%) included this group. Only in two cases (9%) participants with the age of over 70 were observed.

Worksite interventions were offered in a variety of health related areas. In fourteen studies (61%) the promotion of physical activity was part of the intervention. Seven studies each (30%) focused on the topic of either smoking or obesity, while in six (26%) the improvement of nutrition was addressed. Another three studies (13%) targeted cancer prevention and two (9%) the further reduction of stress at the workplace. Overall seven studies (30%) featured two or more intervention topics. If multiple topics were addressed, increasing physical activity of the participants was always included as a part of the workplace health promotion program.

The study sizes varied largely in employees participating in the workplace health promotion programs. The smallest worksite intervention included 73 participants, while the maximum was 5,209 employees in a single study. In mean 960 employees were involved in each workplace health promotion program. A presentation of the study participants of the selected articles is given in Figure 8.

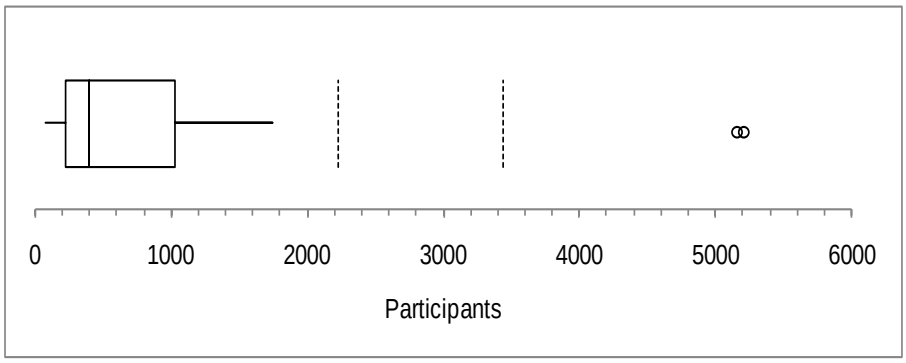

Figure 8: Box plot presentation of the study participant numbers (Source: Own diagram)

The duration of the workplace health promotion programs showed a minimum duration of two weeks and a maximum of three years. The mean duration over all studies was 8.8 month and the median six month. Figure 9 presents an overview of the distribution of the intervention length of the studies.

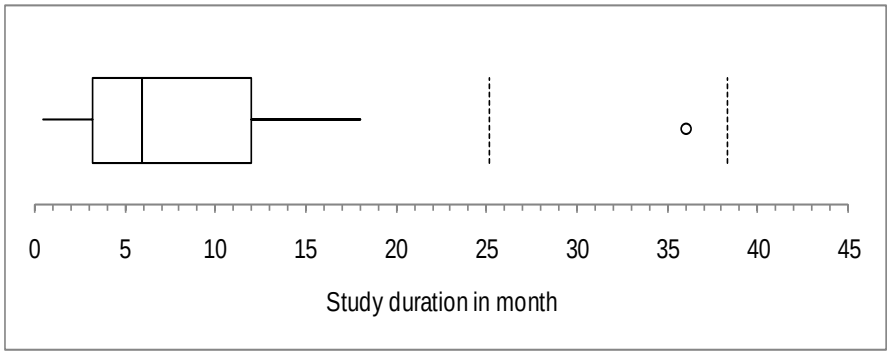

Figure 9: Box plot presentation of the study duration (Source: Own diagram)

Different scientific approaches were found in the evaluation of worksite health promotion programs. The majority of the articles (65%) used a variation of a randomized controlled trial (RCT) as a study method. Seven articles (30%) featured a Pre/Post design for the evaluation of the intervention results and one article (4%) conducted a cohort study. Figure 10 shows the frequency and distribution of the different research approaches that were found in the selected articles of the literature review.

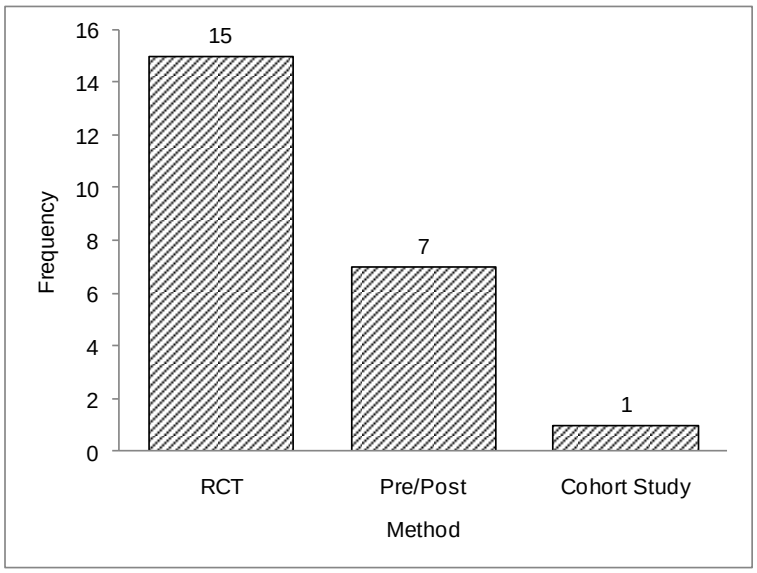

Figure 10: Histogram of scientific research approaches (Source: Own diagram)

For the following analysis, the data of two topics was clustered to allow for an easier identification of future research areas. The first cluster included incentive and

motivation mechanisms used in the workplace health promotion programs. Eight health promotion programs (35%) offered individual tailored counseling for the participants and five experiments (22%) used peer referral as a motivation mechanism. Classic incentives to increase the participation rate were found in five studies (22%) which included various forms of monetary rewards and five studies (22%) offered merchandise prizes. Only four programs (17%) offered more than one mechanisms. The mechanisms which appeared in each of these studies was peer referral.

The second cluster was created for the different electronic support mechanisms that were used in the workplace health promotion programs. Ten programs (43%) included a website for the promotion, coordination and information provision about health related topics. An exemplary study overview can be found in Table 7, which includes the cluster of programs that used a website in the workplace health promotion program. Nine studies (39%) used emails as a recruiting or reminder instrument for the employees. Electronical questionnaires were offered in six interventions (26%) to keep track of the health improvements of the participants. The small number of five studies (22%) featured a computer program that allowed the employees to interactively get involved with the promoted health topic. Only three articles (13%) included information about the use of additional technical devices like step counters or sensors that were used in the process of workplace health promotion.

Table 7: Website study overview (Source: Own diagram)

Study	Design	Participants	Duration	Intervention	Incentive	Support
Swa06	RCT	N=351	3 month	smoking	individual counseling	website, email
Goe09	cohort	N=5209	12 month	obesity	money	website, email, program
Slo05	RCT	N=600	2 weeks	physical activity	individual counseling	website, technical device
Coo07	RCT	N=419	3 month	nutrition, physical activity, obesity, smoking, stress	money	website, email, questionnaire, program
Spi07	RCT	N=526	6 month	physical activity	money	website, email, questionnaire
Cow07	Pre/Post	N=90	4 month	nutrition, physical activity, obesity, smoking, stress	individual counseling	website, email, questionnaire
Pro08	RCT	N=1400	6 month	physical activity, obesity, smoking, stress	individual counseling, peer referral	website
Cou08	Pre/Post	N=104		nutrition	individual counseling	website, questionnaire
Gre07	Pre/Post	N=1167	6 month	physical activity	merchandize prizes	website, email, technical device, questionnaire
Irv11	RCT	N=221	1 month	physical activity		website, email, program

3.2.3 Discussion and Conclusion

The systematic literature review revealed that the most commonly used incentive mechanisms today are custom tailored health counseling and the use of a website for worksite health promotion programs. Among all analyzed studies 22% included these features. Data from Kummvervold[94] suggests that the private use of eHealth solutions will drastically rise in the next years. 77.95% of the population under the age of 25 already uses the internet for health purposes. This score corresponds to the finding that showed the common use of websites in workplace health promotion programs. In

[94] cf. (Kummervold et al., 2008)

contrast, only three articles included the use of technical gear like step counters into the intervention trials. Herein lies the next step to advance the development of workplace health promotion. The participation numbers in the experiments varied, but a total mean for all studies of 960 employees participating supports the fact that health promotion programs are mainly established in large companies, because of the expense of creation and managing the program[95].

As for the participation of male and female employees in the programs, no statistical difference could be found. All interventions included both genders and even though some studies suppose a higher participation of women[96] and others show the skepticism of men for health promotion[97], no preferences of gender could be found in the workplace health promotion programs. Still, individual tailoring of health program content should take different requirements from men and women into account.

As to the publication years of the selected articles in this literature review, the majority of 87% of the articles were published after the year 2005. This is certainly related to the fact that keywords were included like “IT”, “computer” and “online” were included into the search terms. This reflects the introduction of IT based health promotion programs into every day live over the past years[98]. However, the level of technical solutions that are nowadays used in workplace health promotion shows a lack of actuality, as mostly only websites and emails are integrated, to improve the programs.

The reviewed articles demonstrate different program durations for health promotion programs. Some studies have been carried out over a period of just two weeks[99], while others lasted over a year[100]. It is important to differentiate between these studies. The short term experiments mainly focused on the recruitment phase, the health data collection and the initial participation, while the long lasting studies examined the health effects that the interventions had on the employees. For such studies it is of great importance to last at least one year, in order to exclude effects from seasonal illnesses and holiday phases and to allow for the promotion effect to set in. The observed median

[95] cf. (Bull, Gillette, Glasgow, & Estabrooks, 2003)
[96] cf. (Robroek, Van Lenthe, Van Empelen, & Burdorf, 2009)
[97] cf. (Verdonk, Seesing, & de Rijk, 2010)
[98] cf. (Houston, Sands, Jenckes, & Ford, 2004)
[99] cf. (Slootmaker, Paw, Schuit, Seidell, & van Mechelen, 2005)
[100] cf. (Jørgensen, Rasmussen, Ekner, & Søgaard, 2010)

duration of six month is therefore the balanced mixture of the very short term participation experiments and the long lasting health effect studies.

The scientific quality of the reviewed articles heavily depends on the method of RCTs, but also on Pre/Post designs, when the application of health promotion programs seemed too difficult in the workplace setting to correctly control two treatments[101]. These methods are both established procedures that are used in the context of workplace health promotion. For the clear cut identification of study results further researchers have to pay an increased attention to the randomization process, a true blindness of the employees about the treatment allocation and provide sufficient data about the dropped out employees to increase the result quality.

The electronic support mechanisms found in the literature review in different workplace health promotion programs indicate a fair amount of adaption of these methods into everyday working life. However, a significant lack of technology use beside features such as websites and emails was identified. Especially the application of supporting technical devices is under represented within the selected articles. Practical examples like Nike+ however showed the benefit of a well concerted activity product[102]. Because of these blind spots for the topic after the literature review, a further market analysis was necessary. For the case of workplace health promotion programs a large potential can be found in these solutions that can increase employees' interest and motivation of employees to participate in the programs.

A surprising result for the incentive and motivation mechanisms was the widespread use of individual counseling as a method to assure constant employee participation. While one might suggest monetary rewards like participation payments[103] or lotteries for all successful participants[104] to be the most common and most sophisticated rewards to create a strong incentive to sign up for a long lasting health promotion program[105], the findings showed a different picture. The individually tailored health advice and the referral/comparison of achieved health improvements to peers seems to be as effective in increasing motivation and in parts even more desirable to employees as classical

[101] cf. (Green, Cheadle, Pellegrini, & Harris, 2007)
[102] cf. (Ramaswamy, 2008)
[103] cf. (Goetzel et al., 2009)
[104] cf. (Spittaels, De Bourdeaudhuij, Brug, & Vandelanotte, 2007)
[105] cf. (Cahill & Perera, 2008)

incentives e.g., money. In combination with the electronical support mechanisms mentioned before, these motivation drivers should definitely be used in the context of workplace health promotion programs.

The literature review of incentive and motivation mechanisms in workplace health promotion programs showed a dissemination of methods that improved the programs over the past five years. The broad introduction of websites and emails is documented and the first steps for the integration of new technical devices into these programs are taking shape in the scientific literature. The incentives used in the experiments to increase the participation rate profit from the introduction of the IT solutions as they allow a more individualized approach to workplace health promotion. However, classical incentives like money and merchandize prizes will still maintain their role as motivation drivers. For the later experiments the literature review revealed the importance of the combination of incentives to achieve wide employee participation on the one hand and discovered that an estimation of the utility of the selected IT solution's utility is required for workplace health promotion programs on the other hand.

3.3 Market Analysis

Additionally to the review of the scientific literature an analysis about the market development was conducted[106]. The goal was to evaluate the current development status of IT solutions that are suitable for the application in a workplace environment. The development of sport activities supported by modern technology continues to advance and has in recent years expanded from professional sports into the private sector[107]. The next step in this development is to use the potential of these technologies and further related concepts for companies and their employees. First step is the integration into existing sport facilities, thereby increasing the health of employees, as well as the prevention of chronic diseases through physical activity[108]. IT is used to improve the interventions by adding features like data tracking, virtual trainers and most importantly increasing the motivation of the participants[109].

[106] cf. (Kerssenfischer & Fritsch, 2012a) all following results of the market analysis were presented on the conference Sport & Society 2012 in Cambridge, UK
[107] cf. (Ermes, Parkka, Mantyjarvi, & Korhonen, 2008)
[108] cf. Powell 1989 (Powell, Caspersen, Koplan, & Ford, 1989)
[109] cf. (Irvine et al., 2011)

A few years ago the market of digital assistants and the possibilities of computer-based monitored training were very small and mainly used for (high) professional sport. In recent years it has grown significantly and now is also accessible to the common leisure sportsmen[110]. This is firstly due to the fact that more versatile and cheaper equipment is available, because of the ever-advancing technological development, which led to an increased and more widespread use of it among athletes.

On the other hand a change in the minds of recreational athletes has taken place. Were a few years ago only professional athletes were interested in their lap times, speeds and matching heart rates or in a detailed planning and control of their training, it is now also lots of recreational athletes who are interested in such data and their analysis[111]. The gathered data promises the athletes a better shape and improve their training results. For this reason, the development departments of the leading manufacturer of sporting goods industry´s offer products to meet this increased demand. They developed products with training support functions that will be examined more closely.

A common feature of the products is automatic recording of training data during the exercise. Depending on the product type this feature includes the measurement of time, calories burned and heart rate, whereby the latter requires the use of a body sensor. Furthermore step sensors are available to measure the speed, cadence and distance during the training. The recorded data can be loaded via wireless port or USB port into a web portal depending on the model.

Further developments in this area are virtual trainers who use the recorded data to create individualized training plans. Some products include this feature with an acoustic cue in which athletes receive training instructions from a virtual trainer[112]. The portals offer further information and guidance on fitness exercises and a reminder function[113]. The connection of forums and social networks allow exchange of experiences and exercise tips and the ability to form groups and create competitions among the athletes[114]. Depending on the product, different types of sport such as running, cycling or swimming are currently supported for additional data collection. This is emerging into

[110] cf. (Guillen, Arredondo, & Castellano, 2010)
[111] cf. (Wijnalda, Pauws, Vignoli, & Stuckenschmidt, 2005)
[112] cf. (Saponas, Lester, Hartung, Agarwal, & Kohno, 2007)
[113] cf. (Cousineau, Houle, Bromberg, Fernandez, & Kling, 2008)
[114] cf. (J.O. Prochaska et al., 2008)

the trend of "quantified self" in which different states or performances of one's daily life are recorded by (wearable-) sensors[115].

Another way of using the training supporting technologies is to use applications on smartphones. Depending on the solution this offers the functions mentioned above with the advantage of supporting even more sport types by e.g. the usage of the GPS module of the phone.

Not only the sporting goods manufacturer, but also the electronic entertainment industry (game console manufactures) recorded an increase in movement supporting products[116]. This created a new branch of sport activity games with the focus on physical activity. This is characterized by the following functions: All products have in common that the control is based on body movements. The function although is differently implemented. For some products, the controller will be held in the hand during the exercises while other manufactures abandon the controller. In these cases the control is performed exclusively by body movements which are registered by a set of sensors and a set of intelligent cameras.

For these products various electronic sport games like boxing or tennis exists, which rudimentary mimic the body movements of these sports. A virtual trainer commonly is implemented into these games and individualized training plans can be created, as well as the automatic data recording.

Therefore, different products were analyzed regarding their potential influence to motivate employees to use them in the context of workplace health promotion programs[117]. The motivation or incentivation through the use of IT is identified as a promising development for workplace health promotion programs which often suffer from low participation rates among the employees[118].

3.3.1 Approach

In the following section the current state of market solutions that foster the connection of sports and healthy activities under the use of modern IT solutions are presented and

[115] cf. (Swan, 2009)
[116] cf. (Lanningham-Foster et al., 2009); cf. (Pasch, Bianchi-Berthouze, van Dijk, & Nijholt, 2009)
[117] cf. (Greben, 2011)
[118] cf. (Groeneveld, Proper, Van Der Beek, Hildebrandt, & Van Mechelen, 2009)

described. First, the devices of four sporting goods manufactures are presented and compared via their features. Secondly, the current gaming consoles which offer movement based controller input are examined at and lastly the development in the area of smartphone apps is considered in the market analysis. A short description of each product should reflect the individual characteristics of the products and allow for a comparison among their competitors. In Figure 11 different GPS watches are exemplary depicted from manufactures like e.g. Garmin, Polar and Nike. The functionality and additional features of these sport watches are described in the following.

Figure 11: GPS watches from sporting good manufactures (Source: cf. (Joggen-online, 2012)

3.3.1.1 miCoach

The first product which should be shortly described is "miCoach" from Adidas[119]. Users can choose between four individual training zones. The zones are characterized by a different color association and start in the blue zone which stands for active recovery training and basic training. In the following green zone of the product the endurance can be trained and most calories are burned when exercising in this zone. The third zone is the yellow zone which requires intense activity by the user and should lead to extended capabilities in terms of the athletes pulse or speed. The final red zone stands for

[119] cf. (Adidas, 2013)

maximum physical intensity and should therefore be performed only short and rarely. The zone system should enable the user to choose his training level and reflect on his activity level.

This feature is enables through the data collection which is recorded directly during the training and can be presented to the user either visually or acoustically in which zone he is exercising. Additionally a web portal is offered were the data can be synchronized and uploaded and individual training plans can be created according to the individual preferences of the user. To further support the training, specific fitness exercises are offered with instructions on the portal and can afterwards be compared with the recorded data. Recorded data are e.g. time and spend calories[120]. This way the "miCoach" allows two ways of data evaluation for the user, during the training, as well as after the training. Different versions are offered of the "miCoach" system, including different sets of sensor such as GPS, heart rate monitor and step counter. Each version allows the sharing of the individual training results via Facebook and Twitter.

3.3.1.2 Nike+

The second product in the category of sporting good manufactures is the product "Nike+"[121]. Similar to the "miCoach" from Adidas the "Nike+" product provides the user with the feature of acoustic cues during the training in the form of short data updates or instructions. Similarly the data can be uploaded on a web portal after the training and be analyzed there after the training. Due to the initial focus of the Nike+ product on the running sport individual training plans were offered only for this sport. Therefore a large set of plans could be offered for the users specific to their individual training goals.

In the last years Nike further developed the Nike+ concept to sports like basketball and most recently to personalized training via a combination with the Xbox 360 Kinect, which should be described later on. From the start Nike tried to foster the community aspect of their product and implemented features that allowed the sharing of individual training results among the user's friends and the Nike+ community via the portal and

[120] As an estimation through the intensity of the physical activity by the miCoach system
[121] cf. (Nike, 2013)

social media e.g. Facebook and Twitter. A firstly unique feature, established through the early cooperation with Apple, was the integration of song playlists which could be shared among the users and listen to during their exercises to motivate them. A similar cooperation was created later by Nike with Polar to allow the use heart rate sensors with their product in extension to the step counter and the GPS functionality through the Nike+ smartphone app. Additionally a watch is offered by Nike that can be used via a touch screen and contains all features and data recording capabilities.

3.3.1.3 Polar

Thirdly, the product of Polar is described that focuses on the measurement of training data and is commonly known for their expert status on heart rate measurement[122]. The products generally center on watches which are suited for running and fitness activities, but also extend up to equipment which is used by professional athletes during their training and contests. The sensors are in general focused on the heart rate monitor accompanied by the possibility to add a GPS tracking device.

A feature which differentiates Polar products from other companies in this field is the professional software of the products that are supported via a web portal. In contradiction to the other portals it allows a much wider variety of data analysis than the competitors and supports the user with data analysis features that are normally applied only in the field of sport medicine and by professional athletes. Thereby the software not only support sports like running, but a large variety of sports that profit from the measuring of the heart rate such as cycling, hiking and general fitness activity.

The website of Polar also offers the features of individualized training plans and suggestions for exercises and the social feedback system with the integration of social media channels. Furthermore the possibility is integrated to create competitions in the online community to set a specific training goal and compare the user's results with other athletes.

[122] cf. (Polar, 2013)

3.3.1.4 Garmin

The last product which should be described in this segment are the devices of Garmin[123]. As Polar before the company mainly offer watches to support the user in their sporting activity. Their focus lays in contrast to Polar not on the measurement of the heart rate, but on the integration of GPS sensors for which the company is most commonly known. The products therefore support mostly activities such as hiking, cycling but also golf. A heart rate monitor can be added as well as a step counter, but are not as well integrated as in the products of the competitors.

A web portal is offered under the name Garmin Connect which allows the creation of training plans and analyses of training data afterwards. The function of sharing the results among his Facebook friends is integrated as well as the function to export route profiles that can then be offered to other users for their exercises. The community aspect however is not as well integrated by Garmin for their products as found in the products of the competitors, e.g. the feature of competitions among the users of the system is not available.

An overview on the four described products is found in

Table 8 in which the different features are compared to each other in categories. An estimation on how well a certain feature is integrated in the product is given by the indication of positive or negative signs.

[123] cf. (Garmin, 2013)

Table 8: Overview of the market analysis of sport good manufactures (Source: cf. (Greben, 2011))

Producer / Functions	**Adidas**	**Nike**	**Polar**	**Garmin**
Info „on the fly“	++ (visually and acoustically)	+		
Training schedules online	+ (reminding Emails)	+(Reminder in watch function)	+	+
Several sports	+ (Bike and Fitness)	- (Only running)	++ (Running, Bike, Canoe, etc.)	++ (e.g. Golf)
Fitness exercises	+	-(Only running)	+	
Data measuring	+(Time, speed, calories, distance)	+(Time, speed, distance)	++(Variety of professional data measuring possible)	+ (Time, calories, etc.)
Heart rate	+ (Pacer) - (Zone / Mobile)	+ (With sensor from Polar) - (without sensor)	++	++
Step sensor	+	+ (solely with Nike products)		+ (GPS)
Audio features	++(Several professional athletes as spokesmen)	++(Power-Song, song lists of other athletes)		
Community & forums	++(Training groups, data comparisons)	++(Competitions, Data comparisons to other athletes)	+	O(Limited)
Social Media	++Facebook, Twitter, groups, followers)	++(If commented on Facebook: cheering during workout)	+ (Workout schedules)	+ (Export of goals and export to Facebook possible)
Costs	120 € (Pacer), 93 € (Zone)	30 € (Step sensor), 199 € (Watch)	Large differences	Large differences

Next, the current gaming consoles are presented, which include the feature of movement based controller input. This technical innovation was first introduced by Nintendo and rapidly adapted by the competitors Sony and Microsoft. Each device is shortly described and the unique features of the products are explained. Figure shows the three devices with their controller from the Wii on the left, the Playstation 3 in the middle and the Xbox 360 on the right side. The Xbox 360 is missing however the Kinect sensor bar in Figure 12.

Figure 12: Current gaming console and input controller (Source: cf.(freegamesystems, 2013))

3.3.1.5 Playstation 3

The PlayStation 3 is a gaming console invented by Sony computer entertainment. First presented in 2005, the launch in Germany followed in 2007. It is a console of the seventh generation that involves the devices released by Microsoft, Sony and Nintendo since 2005. The seventh generation includes all devices where motion based input is possible. The Xbox 360 was the first gaming console on the market, the PlayStation 3 followed one year later just a few days before Nintendo introduced its Wii[124]. In addition to its function as a video gaming platform, it is possible to display DVDs, Blu-ray disks and CDs.

A wireless controller (PlayStation Move) was introduced to the market in 2010. It is a sensitive-mobile controller, whose motion gets detected by the PlayStation Eye, which

[124] cf. (Tamborini & Skalski, 2006)

is an EyeToy camera. It transfers the movement onto the screen through compiling it into a virtual character[125]. This extension makes the PlayStation 3 a console suitable for exergaming since the gamer has to move the controller to play the game. Up to four controllers can be used at once, depending on the game. For some games a second controller per game is needed which is called Move navigation controller[126]. Since the Move controller only detects the movement of the arm, the second controller allows the payer to run (e.g. tennis). In 2011 Sony started to launch add-ons to the Move such as tennis rackets, steering wheels and guns to convey a more realistic games experience to the users.

3.3.1.6 Wii

The Wii is a video game console released by Nintendo. In 2006, they were the first who launched Exergames successfully. A sensor bar below the screen recognizes the movement of a wireless controller (Wii remote), which is in the players' hand. Via Wii remote the hand movements of the player are transferred via a sensor bar on the screen. The transfer is carried out via an infrared camera that detects the position and orientation of the Wii Remote relative to the screen. The character will implement the movements of the player simultaneously. An acceleration sensor in the Wii Remote registers changes in direction, speed, acceleration and incorporates this information into the game. This allows a precise control of the character.

In addition to the Wii Remote, for some games, a second controller, known as the Nunchuck, is required. This smaller controller connects to the Wii Remote and allows more options in the control of the game[127]. The Wii offers a wide range of Exergames in different game genres in addition to classic action and adventure games, it offers a variety of sports, health and fitness games. Besides individual training plans and calendar functions, there is the possibility to use this console like a genuine physical activity with the aim of a deliberate, planned and regular improvement of physical

[125] cf. (Sony, 2012b)
[126] cf. (Sony, 2012a)
[127] cf. (Nintendo, 2012b)

fitness. The spectrum of health-related games for the Wii game console has multiplied in recent years[128].

3.3.1.7 Xbox 360 Kinect

The Kinect is a hardware extension for the Xbox 360 Kinect video game console manufactured by Microsoft, released on the market in 2010. 60 days after its release 8 million devices were sold which makes it the "fastest selling consumer electronics device"[129]. The principle of the Kinect is based - as opposed to the Playstation 3 and Wii - on a controller-free input, which is a unique characteristic. Gestures and voice enable the unrestricted movement throughout the game.

The control consists of a complex system of depth sensors, microphones and a 3D RGB color camera that delivers images in the three basic colors. The sensor remembers 48 points on the body of up to two players in real-time simultaneously, such as jumping, ducking or dodging. Also for the Kinect, a variety of games of different genres, such as action or adventure games, role-playing games or sports games, are offered. In 2011 it won the MacRobert Award for engineering innovations for its new technology innovation[130].

Table 9 shows a comparison of the three presented gaming consoles. Different categories are compared among the devices and an estimation is provided on the quality of the integrated feature with an indication of positive and neutral signs.

[128] cf. (Nintendo, 2012a)
[129] cf. (Guiness-World-Records, 2011)
[130] cf. (Microsoft, 2012)

Table 9: Overview of the market analysis of gaming consoles (Source: cf. (Greben, 2011))

Producer / Functions	Wii	Playstation 3	Xbox 360 Kinect
Graphics	O	+	+
High scores	+	+	+
Multiplayer	++	++ (online possible)	++ (online possible)
Trainer	++	++	++
Training schedules	+	++	++
Calories	+	+ (Nutrition advice)	+
Competitions	O (Single-player otherwise multiplayer modus)	+	++
Handling	+	+	++ (without controllers)
Costs (amazon.de as of November 2011)	85 € (Wii Fit Plus), board included	299 € (without games)	339 € (One game included)

In supplement to the sport devices and the gaming consoles a third area of IT driven health promoting solution was examined. Since the introduction of the Apple iPhone in 2007 the dissemination of smartphones and thereby apps for the devices is rapidly increasing and one of the most well adapted technical innovations in recent years with over one billion sold devices[131]. An overview of the development of the smartphone sales number is provided in Figure 13 which shows the rapidly growing distribution of devices world-wide. Due to this, the total number of available apps for these devices can´t be called. As the devices provide such a large user base and by that a possible large impact in the application for health promoting activities a selection of apps should be looked at. These apps can only be exemplary for many other available apps and include the most used apps in the sport, health and activity area.

[131] cf. (Gartner, 2012)

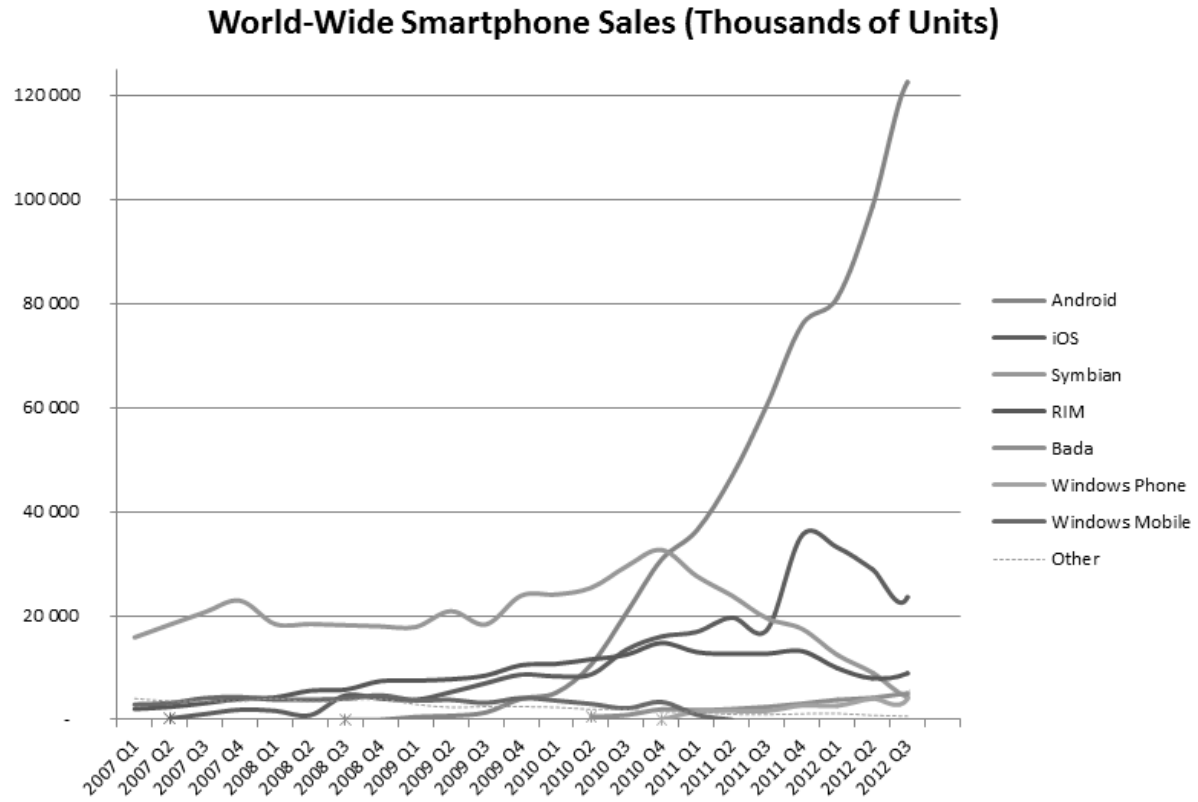

Figure 13: World-Wide Smartphone Sales 2007-2012 (Source: cf.(Gartner, 2012) / cf. (Wikipedia, 2013))

3.3.1.8 runtastic

The first app that should be mentioned is runtastic[132] which as it is one of the most downloaded health and fitness app for smartphones. In general the app provides many features that were made also available by the sporting good manufactures devices. First, is the GPS tracking of the activity which allows a recording of training time, distance, estimated spend calories, speed and absolved height differences. Secondly, the app offers a map with the training route as well as an overview of finished training sessions and planned training sessions. The integration of music during the activity is integrated and so called "power songs" for further motivation during the activity.

The social component is integrated in the app via a live tracking function which allows friends to actively follow were the user is performing their training and is following their route. In addition to this a solution is implemented that allows others to cheer the

[132] cf. (runtastic, 2013)

user via acoustic recordings that are played to the user when performing his training in real time. Beside that a competition modus is integrated as well in which the user is motivated through acoustic cues in comparison to his previous or his competitor's performance, telling him that he is slower or faster than his virtual competitors. The possibility to share training results via Facebook, Twitter and the web portal of the app are integrated as well to complete the state of the art social media package.

Additional comfort features that are offered are weight tracking, a work-out modus, an indoor modus, pulse measuring, pulse zone training and predictions of the time sunrise and sun dawn.

3.3.1.9 RunKeeper

The second app is RunKeeper[133] which is with over 13 million downloads also a very successful health and sport app for the smartphone. In comparison it integrates all described features of runtastic and further tries to integrate additional sports such as hiking, skiing or cycling. The app contains as well of all the data tracking functionality and social components like stats sharing, friend cheers and the training plans, routing that are described in the app above.

A special feature of the RunKeeper app however is that it allows the connection of other apps and input devices to offer additional use cases. The developed HealthGraphAPI[134] thereby allows to further integrate data from other daily activities such as e.g. nutrition or sleeping. This development of everyday life data tracking is enabled through the possibility to connect the data of multiple sensors that record the user's activities throughout the day. The development that is shaping out of these possibilities is described by Wolf as the so called "Quantified self"[135]. While apps enable the recording, data storage and analysis of this data, this development is not clearly focused on health promotional aspects and will therefore not be further examined in this work.

Due to the same hardware, which is always the smartphone the most commonly used apps are highly comparable to each other through the identical features that are offered

[133] cf. (RunKeeper, 2013)
[134] cf. ibid.
[135] cf. (Wolf, Carmichael, & Kelly, 2010)

by the app. Even the graphical interface is in most cases hardly distinguishable from direct competitor apps. A comparison of the app interface of the both described apps is depicted in Figure 14 that shows how close the apps are in their presentation to the user.

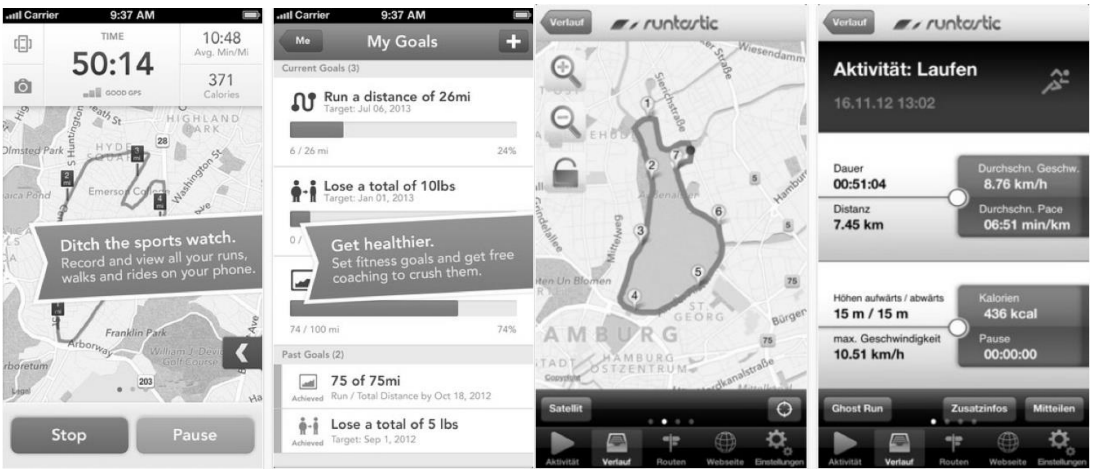

Figure 14: App Interface Comparison RunKeeper to runtastic (Source: cf.(RunKeeper, 2013) /cf.(runtastic, 2013))

The approach of the market analysis revealed the current technical development of hardware and software for health promoting activities in different areas such as sporting good manufactures, gaming consoles and smartphone apps. For each product group the most relevant representatives of the respective market were presented and their individual features were described and compared to each other. In the following the different features of the products were analyzed and compared to for their possible motivating aspect for the user.

3.3.2 Analysis

Table 10 offers an overview of the features which provide a motivating effect for athletes. On the left side the aggregated features are listed from the market review. On the left side the motivating aspect is listed and an estimation of the effect length is

given. For the further discussion the durability of the motivation is crucial, because workplace health interventions need a long term commitment of the employees to pay off for the company[136].

Table 10: Overview motivating aspects (Source: Own diagram)

Feature	**Motivating aspect**
Automatic data recording	Reduction in documentation efforts (s-t-)
Analysis of training data	Visualize the effects of training and the progress (l-t)
Individualized training plans	Meets the individual training needs of athletes, varied training (l-t)
Direct feedback system	Perform exercises correctly, cheers (s-t)
Integration social networks	Exchange with like-minded people, mutual motivation/support (l-t)
Competitions	Mutual encouragement (s-t)

The feature automatic data recording may reduce the effort for documentation so the athlete can focus on the training. This motivational aspect is attributed to a rather small effect[137]. The analysis of the training data enables to visualize the effect of the training and the progress of a longer period of time. This aspect is attributed to a high and long-term effect[138].

The feature to create individualized training plans may motivate the athletes by satisfying the individual needs and create varied training units. This aspect is also attributed to a high and long-term motivational effect[139].

The direct feedback system motivates the athlete during the training for proper performance of the exercises and in periods of falling power, for example at the end of

[136] cf. (Yen, Schultz, Schaefer, Bloomberg, & Edington, 2010);
[137] cf. (Ojala & Saarela, 2010); cf. (Årsand, Tatara, Østengen, & Hartvigsen, 2010)
[138] cf. (Holzinger, Dorner, Födinger, Valdez, & Ziefle, 2010); cf. (Kennedy et al., 2012)
[139] cf. (Ba & Wang, 2013); cf. (Daniel, Casati, Silveira, Verga, & Nalin, 2011)

the training, to continue the exercise. This aspect is attributed to a high but short-term effect[140].

The integration of social networks creates the condition for the exchange with like-minded people and allows mutual motivation and support in terms of the training. This motivational aspect is attributed to a long-term effect[141].

The feature competition provides the potential to compare the abilities and performance with other athletes. The competition sets a goal for the athletes and motivates the participants to high performance. It is attributed to a rather high but short-term motivational effect[142].

In order to underline the relevance of the presented IT enabled motivation aspects it is useful to highlight the interconnection to the workplace health promotion thematic and the results of the previous literature review.

3.4 Evaluation of the major findings

To understand the importance of the development of hardware and software products for health promoting activities and their application for workplace health promotion purposes one has to view this before the background of the upcoming demographic change. In recent years, both the average life expectancy and the proportion of older people in the total population of Germany have increased significantly[143]. Due to the demographic development a shortage of young employees is expected in near future[144]. In 2030 the working age population, e.g. between 20-65 years old, decrease to 7.5 million people, while the age group of the over 65 year olds will rise to 22.3 million people during this period[145].

This moves the preservation and extension of the working capacity of employees increasingly into focus. Workplace health promotion programs play therefore an increasingly important role. Preventable health risks such as smoking, high blood

[140] cf. (Soler et al., 2010); (Ederer, 2010); cf. (Gegenfurtner, 2011)
[141] cf. (Valente, 2010); cf. (Jung, Song, & Vorderer, 2012)
[142] cf. (Ntoumanis, Taylor, & Thøgersen-Ntoumani, 2012); cf. (MacKinnon et al., 2010)
[143] cf. (Statistisches-Bundesamt, 2012)
[144] cf. (Michaels, Handfield-Jones, & Axelrod, 2001)
[145] cf. (Bundes, 2011)

pressure, obesity or unbalanced diet are responsible for most of the healthcare costs, because they lead to serious chronic diseases e.g. diabetes mellitus type 2, various type of cancer or cardiovascular diseases[146].

Since a disproportionate part of the daily time is spent at work, precisely in this environment lays a large opportunity to improve our health status. Workplace interventions such as e.g. healthy food in canteens, gyms in the workplace or smoking bans help to reduce the risks for chronic diseases.

Many of these activities are already offered by employers, but they rarely find great encouragement by the employees. A literature review of the past on this topic revealed that on average only 34 percent of employees participate in worksite health promotion programs offered to them[147]. These numbers get even worse if it is taken into account, that dropout rates of 49 percent were observed in workplace health promotion programs[148]. Thus, while a worker spends on average 52 percent of his wake time in a company[149] the time period which he is interested to invest in his health status is much shorter. So although the use of health promotion programs is recognized, many fail in the successful implementation in everyday business life.

The literature review and the market analyses examined how the described motivational aspects in IT supported health promotion programs can be used in companies as a part of workplace health promotion to encourage employees to increase e.g. physical activity and/or reduce stress.

Harden et. al. pointed out, that "*effective workplace health promotion partly depends on the interest and willingness of employers to support such programs and of employees to participate*"[150]. The integration of IT-supported sports products in existing workplace health promotion may be the key to increase the acceptance of employees. The finding that the peer group effect plays an important role in maintaining physical activity will be

[146] cf. (Kumar & Nigmatullin, 2010)
[147] cf. (Robroek et al., 2009)
[148] cf. (Plath, Köhler, Krause, & Pfaff, 2008)
[149] cf. (OECD, 2012)
[150] cf. (Harden et al., 1999)

examined closer in a workplace environment. Especially the work environment has the potential to provide sustained peer group support[151].

Successful workplace health promotion programs showed the effectiveness of the involvement of peer groups[152]. This effect could be enhanced by the integration of an internal social network. The analysis has revealed that the use of a platform or forum plays a major role in maintaining the motivation of people. In the company context this would imply the provision of a special platform on the subject of workplace health promotion (to encourage the exchange among employees) or at least integrate it as a special topic into existing platforms.

Another important aspect that was identified is the automatic data gathering process and the associated generation of training reports. On the one hand, the automatic generation of data provides the advantage that no other forms or papers need to be filled out. This reduces the administrative burden for participants and eases the usability. At the same time it prevents the misuse and modification of the data. On the other hand it provides the option of generating reports of training which allows an analysis of the training. This is probably the most important aspect for company, because in order to maintain an activity it is necessary to recognize progress and a positive development induced by a health promotion activity[153].

However, this is an aspect that is not being primarily pursued. The analysis of training data can also be used to clearly demonstrate the effectiveness of an intervention and to reduce the dropout rates of participants by visualizing the effect that was created through the intervention. Studies show that the motivation to continue the training and achieve the goals - raises the closer persons get to their set goals[154].

Additionally usable for companies is the finding of holding competition as an incentive to maintain requested behavior of employees. Competition supported by IT-based solutions could be used to arouse the interest of the employees for health promotion programs or increase the participation of existing measures. However, the instrument of competition will be rated only as a short-term incentive, long-term effects cannot be

[151] cf. (Smedslund, Fisher, Boles, & Lichtenstein, 2004)
[152] cf. (Oberlinner et al., 2007)
[153] cf. (Marlatt & Donovan, 2005)
[154] cf. (Schunk & Swartz, 1993)

achieved with it[155]. A long-term effect may be achieved by the use of peer groups and the provision of training results.

From these findings follows the selection of a promising application in the context of a workplace before the background of health promoting activities. The examined gaming consoles offer a good chance to be used for these purposes, while providing many of the above described aspect which could foster the application and acceptance of the users for such measures.

On the other hand the market overview revealed that the sporting good manufacture devices are possibly too expensive to use them in a companywide health promotion program due to the individual device costs which would be needed for every participating employee. Furthermore this would set wrong incentives to the employees who could participate in a measure just to receive a new sports device and stop participating afterwards. This would leave the measure with the already healthy and motivated employees who are not the ideal target group for a health promoting measure.

For the chase of the smartphone apps the picture is comparable, however different in the argumentation for the workplace setting. While the device wouldn't be provided in this chase by the company and just the software of a measure in form of an app would be distributed among the employees, the implications from that don´t suit the found aspects for long-term motivation. Because of the already large variety of fitness and health apps in the market the adaptation of this concept for the workplace seems not very promising. The product itself is heavily focused on the individual training aspect which contradicts the finding of peer pressure as a possible good measure to create a long term motivation effect. However, social sharing mechanisms are incorporated in these apps it is unlikely that the concept could be adapted from the private friend environment to the more public workplace environment.

Due to this selection, the gaming consoles could provide a potentially fitting device for a workplace health promotion measure. Before this background one has to understand the topic of digital games which were predominantly associated with a negative influence on health[156]. It is commonly posited that digital games are an inactive leisure

[155] cf. (Grossberg, 1987); cf. (Lam, Yim, Law, & Cheung, 2004)
[156] cf. (Wiemeyer, 2009)

activity that further favors movement poverty and obesity[157]. Nevertheless, approaches exist that point out the fact that media support in health services entails a lot of improvement potential to the suggestion and further supports behavioral changes to the participants of such measures[158]. IT-based health promotion in the form of multimedia applications however have been established for several years in the general area of health promotion[159]. Mostly they thereby relate to the offers of primary prevention such as IT-based sport programs[160]. However, in the health sector more digital games are used, for example in the support of treatment processes[161]. As the main reason for the use of digital games in health promoting measures, primarily the motivating effect that is created by the games is mentioned[162].

Basically games draw from the fact that they take place on a voluntary basis and are intrinsically motivated by the users[163]. Gaming is classified as a "*particularly familiar and important type of consumption experience*"[164] and therefore belongs to the class of intrinsically motivated behavior. For that it plays an important role that the joy is in the game itself and is independent of external incentives. They further require only a certain level of physical activity and differ significantly from other activities by sketching an imaginary world for the user[165]. Based on these characteristics games are especially suitable to support unpleasant treatment processes (e.g. painful processes, such as chemotherapy or monotonous such as regular exercise) to provide an instrument for the modification of user behavior[166].

Digital games with a clear health reference, like the health electronic games denote a growing market segment with interconnections to other game areas, such as casual games, serious games (digital games with informational and educational elements and exergames (activity-enhancing digital games)[167].

[157] cf. (Yang, Smith, & Graham, 2008)
[158] cf. (Portnoy et al., 2008)
[159] cf. (Lintonen, Konu, & Seedhouse, 2008); cf. (Magnussen, Zafar, & Poulsen, 2013)
[160] cf. (U. Knebel, Leimeister, Esch, Pressler, & Krcmar, 2009)
[161] cf. (Kato, 2010)
[162] cf. ibid.
[163] cf. (Holbrook, Chestnut, Oliva, & Greenleaf, 1984)
[164] cf. ibid.
[165] cf. (Kato, 2010)
[166] cf. ibid.
[167] cf. (Donner, Goldstein, & Loughran, 2008)

Health electronic games make use of the advantages of the easy to use and interactive nature of electronic games to improve health literacy, strengthening the behavioral changes and promote vocational training. Therefore, different categories of health electronic games can be found in the market[168]. An overview is provided in Table 11.

Table 11: Overview of categories of health electronic games (Source: Own diagram; cf. (Donner et al., 2008))

Category:	**Measure:**
Brain fitness	Cognitive fitness, Brain jogging
Disease management	Diabetes, asthma
Exergames	Fitness, Coaching, Health promotion
Healthy diet	Weight management
Professional training lessons	Training of physical intense situations

3.4.1 Taxonomy of exergames

In the following the category of exergames will be described in further detail and will be the focus of the further work since it promises the possibility to be a well-fitting measure for workplace health promotion. The aspects reach from the compensation of the sedentary work environment to the potential to change daily routines of the users.

The term exergames or exergaming is a combination of the words exercise and game or gaming[169]. Further terms such as physical activity motivating games, games for health or active video games are used interchangeably in the scientific literature in the past years[170]. In principle the term exergames describes any kind of video game or multimedia application that requires the physical movement of the user for the purpose of control.

The concept of motion based input however is too imprecise to characterize the principle of exergames. Referring to Oh, the term exergames subsumes all digital games

[168] cf. (Donner et al., 2008)
[169] cf. (Staiano & Calvert, 2011b)
[170] cf. (Wiemeyer, 2009); cf. (Biddiss & Irwin, 2010); cf. (Graves, Ridgers, Williams, Stratton, & Atkinson, 2010)

where the control is based on the principle of the physical movement of the player, which goes beyond the level of inactivity[171]. Exergames are thereby different from traditional digital games such as computer or console games by the intensity of physical movement that needs to be applied in order to play the games effectively.

While traditional digital games train the manual dexterity and / or fine motor skills of the user (e.g. by moving and clicking the computer mouse), exergames in contrast require a lot of different muscle groups, thus are more comparable to the practice of sport activities and therefore a condition of exhaustion can be established during the gaming process[172]. Many of the currently available exergames include strength, balance, or flexibility from the user that is embedded in the context of sport games like tennis, boxing or aerobics. The user simulates the typical sport movements realistically, so that his virtual character executes the movements in the game[173]. Due to this activity, athletic movements are embedded in a playful context and the user becomes motivated to exercise due to moves that are combined with challenges in the game which are "necessary for the game to continue"[174].Depending on the nature of the game and the intensity of the execution of the movement an increase of the heart rate and energy consumption over the basal metabolic rate is achieved by the user of exergames[175]. To this end, to play exergames in contrast to conventional digital games the player needs to move his body and stimulate his energy expenditure in this process. With this action the boundary blurs between exergames and health promotion and sport activities that lead to a deliberate planned and regular improvement of physical fitness[176]. Overall exergames can be considered "*as a link between physical activity and innovative technology*"[177] and more specifically it is any kind of physical activity which occurs during the interaction while playing a computer of console game.

The intensity of the movement however is largely dependent on the device and the control system on which exergaming is performed. Here commercial exergames are distinguished from the category of serious games. Serious games are "*games or game-*

[171] cf. (Oh & Yang, 2010)
[172] cf. (Staiano & Calvert, 2011b)
[173] cf. (Staiano & Calvert, 2011a)
[174] cf. (Gorgu, O'Hare, & O'Grady, 2009)
[175] cf. (Staiano & Calvert, 2011b)
[176] cf. (Oh & Yang, 2010)
[177] cf. (Schneider, 2008)

like applications that are developed with technology and design in the entertainment software industry, and are not primarily for entertainment"[178]. By integrating informational and educational elements in the game context they are operating, in contrast to the commercial games, by playing through an acquisition of knowledge and intended behavior[179].

In the scientific literature, numerous case studies, as well as randomized controlled trials exist which have investigated the effect of exergames on different target groups such as children, young adults, older people and overweight individuals[180]. Most frequently studied were the motivating effect, the impact on the physical activity and the cognitive function.

However, the reported effects of exergames vary throughout the studies (especially on the physical activity and cognitive performance) with the used exergame system, the various types of exergames, the target groups, the skills and movement techniques of the users and the frequency, duration and intensity of use[181]. Because of these observations, the results of the studies make a general statement about to potential of exergames for health promotion purposes only to a certain point[182]. Korean researches concluded that "*acute cognitive benefits, such as temporary improvements in concentration, can results from as few as ten minutes of exercise with exergaming consoles*"[183]. The stated problem concerns that most employees do not take breaks during their work to do some exercise. In a second survey they analyzed that: "*Casual exergames can motivate people to exercise in short bursts multiple times per day*"[184].

To the researches the positive effects of exergaming seems obvious. Of course there are treatments such as fitness centers or physiotherapies whose outcome related to health aspects is greater in the effect, but they would require the employee to engage further into such an activity. Therefore, exergaming and its effects are becoming a generally

[178] cf. (Marr, 2010)
[179] cf. (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012); cf. (Marr, 2010); cf. (Wiemeyer, 2009)
[180] cf. (Mullins, Tessmer, McCarroll, & Peppel, 2012); cf. (Y. J. Chang, Chen, & Huang, 2011); cf. (Graves et al., 2010)
[181] cf. (Sallis, 2011); cf. (Mullins et al., 2012)
[182] cf. (Graves et al., 2010)
[183] cf. (Gao & Mandryk, 2012)
[184] cf. ibid.

approved approach to achieve positive results concerning motivation, health effects and team spirit among the users.

In the next step this topic should be further evaluated in the context of a workplace environment. The perspective and thoughts of the users should be integrated into the research to provide a more holistic approach. The integration of exergames as a measure of workplace health promotion requires the careful selection and adaption for the specific needs of the user in this environment.

4. Investigation of incentive mechanisms

The literature review and market overview revealed the current scientific state of the subject of workplace health promotion and the current state of the used technical systems. As described, technical innovations in this sector can be an incentive to perform a measure in the private environment because of their novelty, in the company environment, however, further incentives are necessary for a successful application.

Following it is therefore examined more precisely what factors do exist that can create additional incentives to motivate employees to further use health promoting activities in the workplace. For that, actively working incentives play a role, as well as the identification of circumstances that affect the application of the measures in a negative way. To identify these incentives for the later experimental introduction, interviews were conducted among experts in the company environment. Furthermore, an online questionnaire was created which was answered by the executives of the Allianz IT. With this approach several viewpoints of potential later users and related positions are taken into account.

4.1 Expert interviews

Developments and requirements for the use of exergames in workplace health promotion programs from company side are rarely found in the literature. The expert interviews served the goal to integrate the requirements from the practical/operational point of view and draw a clearer picture of relevant subjects for the integration of exergames. For this, interviews with different role holders within the company were conducted to aggregate the requirements from a management, as well as from employee, perspective [185].

4.1.1 Approach

From September 2011 till April 2012 a series of semi-structured interviews[186] with experts from different departments and business areas was conducted regarding the introduction of exergames into the setting of the Allianz Managed Operations &

[185] cf. (F. Kerssenfischer, S. Simonsen, T. Fritsch, & H. Krcmar, 2013), all following results from the expert interviews were presented at the conference eTELEMED 2013 in Nice
[186] cf. (Bucholz et al., 1994), cf. (Longhurst, 2003)

Services SE (AMOS SE) in Munich. Several approaches were chosen for the recruitment process for the expert interviews.

First, a list of important stakeholders was created to obtain the knowledge of well-known experts within the company. This list contained C-level management, executives, members of the workers council, company doctors and employees. Experts were recruited in meetings on topics like e.g., occupational health and safety. During these meetings recommendations on further experts, which could help to broaden the view on the topic of exergames, were solicited from the participants.

Secondly, additional interviewees were recruited through the network of contacts already established within the company. During the selection process of interview candidates a strong focus was ensuring that a variety of views were contained and being represented. Due to this selection, candidates from different departments and different levels of hierarchy within the company where selected.

4.1.1.1 Recruitment

A total of 23 experts were recruited, which were either responsible for the selection and decision process regarding occupational health topics, or added knowledgeable insights about criteria for the introduction of exergames within their organization. To obtain unaltered information and therefore the best possible data – anonymity was ensured to all participants for all statements made during the interview process. Table 12 provides an overview of the different stakeholders and their roles in the company.

Table 12: Roles of interviewed experts (Source: Own diagram)

Role	Frequency
C-Level	2
Executives	5
Workers Council	4
Doctors	2
Academic Researcher	4
Employees	6
Total	23

Different general backgrounds of the experts were observed. While 35 percent had management experience, 26 percent offered a medical or health related background and the remaining 39 percent provided user perspective and experience. The roles were defined regarding the job position in the company and the main activity area of the interviewees. Thus, e.g., members of the workers council can be employees, but in the context of the interviews they answered in their role of workers council members.

In addition to the 23 experts, the responsible facility manager was questioned concerning issues of location, accessibility and safety. The selection of 23 participants as the sample-size allowed the fitting balance between time- and resource-intensive interviews and data gathering versus the marginal return of additional insights from further participants. During the interview phase the answers from different experts were quite homogenous regarding the discussed topic, suggesting that an overall sufficient number of important/relevant criteria were received.

4.1.1.2 Interviews

All interviews were conducted with a semi-standardized interview protocol[187]. This method allows for the creation of comparable responses from the participants, while enabling the interviewer to flexibly ask further questions about relevant areas which are revealed during the interview. The average time of an interview was about 60 minutes, while the fastest was 25 minutes and the longest over 100 minutes. The interviews typically were conducted in-person, each beginning with the question about a short background description of the interviewee's responsibilities followed by a short set of open-ended questions.

[187] cf. (Flick, 2009)

Afterwards the participants were asked to specifically name strength, weaknesses, opportunities and threats for the implementation of exergames into a workplace environment. The experts filled the categories with their recommendations and provided additional feedback for them. At the end of each interview the experts were asked about the single most important criterion for the successful implementation and application of exergames in a workplace environment in their opinion. This allowed for the creation of a prioritized ranking of influence factors for the analyses.

Following the completion of each interview, the recorded answers to the discussed questions were documented in a data spreadsheet for further analysis. This approach enabled the synthesis of the most commonly named criteria for each area by selecting the most frequently named answers in the interview process. Furthermore, aspects which were mentioned by just one or two participants, but which seemed to be an important addition to the identification process of influence factors, were included.

4.1.2 Analysis

The examination of the interview documentation indicated a qualitative difference between the experts' answers. Some experts provided more elaborated insights than others and showed a deeper understanding of the topic exergames. In the interviews all experts mentioned at least one factor for each of the questioned areas, such as strength, weaknesses, opportunities and threats. A commonly made statement by one of the experts for example was:

"…The idea of a gaming console for a team room sounds very interesting, […] it´s an innovative approach to be active and surely fit our company […] On the other hand there must be some rules to use it, otherwise people will play all the time or find other ways to abuse it […] and there will be others who don´t like this kind of activity, because they feel it´s inappropriate for them…"[188]

This answer was coded for the SWOT overview in the following way: strength-innovative, weakness-clear rules, threat-acceptance. In this example the expert opinion was missing a clear statement for the opportunities of the introduction of exergames into

[188] Example of statements made during an interview. The paraphrased interviews can be found in the appendix of this work under 8.1 Interview Protocol.

the workplace environment. Another participant responded to the same questions during the interview in the following way:

"…I think this is a good way to improve the working breaks, I mean these consoles are cheap compared to what else we spend day-by-day for other stuff […] why not use them to get a little more varied gaming opportunities…"[189]

In these sentences the expert mentioned the cost-efficiency of exergames, which was therefore coded as an opportunity for the introduction. However, the experts showed a tendency to mostly put arguments for one or two of the designated areas forward: strength/opportunity, weakness/opportunity, strength/threat and weakness/threat. This was mostly attributed to the fact that once the conversations were taking a direction of pro or contra for exergames, the experts stuck to their opinion and gathered further arguments to support these viewpoints. E.g., strength/opportunity and respectively weakness/threat arguments were mentioned in the interviews.

Table 13: Overview of the expert interview results (Source: Own diagram)

	Strengths	**Weaknesses**
Opportunities	• Innovative • Ease of use • Cost-efficiency	• (Health)Effects • Place/ time • Clear rules
Threats	• Time efficient • Target group • Employee satisfaction	• Missing long-term development / experience • Acceptance • Target group

After the interviews, the statements of the experts were coded comparable to the two examples above and were recorded and counted in a spread sheet. Out of these aggregated interview result an overview of the most important factors was created in Table 13. The overview depictures for each SWOT area the three most commonly mentioned factors for the implementation process. While the innovative approach was clearly seen as the most important strength/opportunity (15 mentions), the unclear resulting (health-) effects were the frequently mentioned weakness/opportunity (10 mentions). For the possible strength/threats the time efficiency received the largest

[189] see above

reference with 11 mentionings and the missing or unclear long-term development of the topic exergames (8 mentions) was especially seen as a weakness/threat.

Table 14: Overview of the most important criteria by stakeholder (Source: Own diagram)

Role	Criteria
C-Level	Cost-effectiveness
Executives	Employee satisfaction
Workers Council	Clear rules, anonymity
Doctors	Ease of use
Academic Researcher	Communication / information transparency towards everybody
Employees	Ease of use, innovative

In addition to the general influence factors, the different criteria were also analyzed by the stakeholder groups. In Table 14 an overview of the experts' diverse roles and their mainly mentioned success factor for the implementation of exergames in a workplace environment is presented. C-level management named cost-effectiveness as the most important factor for the application of exergames in the workplace environment. Executives regarded the effect on employee satisfaction as critical. Members of the workers council stated that clear rules and anonymity for users must be ensured for the introduction. The ease of use aspect was the general concern of the interviewed doctors, while the academic researchers mentioned the necessity of communication and information transparency towards participants. Finally, the ease of use and the innovative character of exergames were the most important criteria for employees. However, the numbers of interviewees in the different groups was very low, preventing further meaningful statistical evaluation of the gathered data. At the same time it adds transparency to the general and background interests of the participating experts.

The role of exergames in a workplace environment and the use for health promotion purposes is influenced by a wide amount of factors. The advantages of exergames are the innovative character of gaming consoles, the ease of use compared to general health promotion activities and the cost efficiency of the solution. In contrast, the long term development of exergames is, at present, unclear. Similar assessments were made for the acceptance and the target group fit of exergames in a workplace environment and they therefore pose a potential risk to the programs' success. The missing evidence in the application of exergames for health promotion purposes is a barrier that must be

overcome to establish it as an alternative way for companies to address the topic of employee health.

Nevertheless, the respondents feel that exergames can help to improve health promotion, if the factors are correctly addressed. Particularly the implementation process needs to be defined and analyzed, since exergames have scarcely been able to show their potential because of the difficulty to show the long-term development of health effects. Therefore recommendations were deducted from the expert answers to address the main problems that are linked to exergames for health promotion purposes in a company environment.

Recommendations: The expert interviews revealed information on possible incentives and background thoughts about the topic exergames. Below, a set of recommendations is formulated which reflect the critical factors for the implementation of exergames.

- *The gaming console chosen for exergaming must be easy to use*

  The simplicity of exergames is crucial. In the application scenario e.g., lunch break, informal meetings, etc. no time consuming ramp ups and further configuration and preparation can be allowed to start with the measure.

- *There must be a clear set of rules for the allowed use of exergames in a workplace environment*

  Because of the novelty of the topic, clear rules help the employees to adapt to exergames. This might, however, be specifically the case for the German environment in which a set of rules is expected to exist[190].

- *The introduction of exergames needs to be properly announced to every employee in the company*

  The communication to every employee is of utmost importance to ensure the success and the long term utilization in the company. In contrast, a silently

[190] cf. (Marschollek et al., 2009); cf. (Armour, Deakin, Lele, & Siems, 2009)

introduced new measure will find a small group of users, but will fail to yield a widespread impact on the health status of the employees.

- *There must be a clear cost-benefit evaluation for the introduction of exergames*

  To further promote and evaluate the measure, a clear statement is required regarding the cost-benefit topic. Especially the benefits within a company environment need to improve in order to make reliable forecasts.

- *The exergames solution needs to be adapted to a specific target group within the company*

  In a way counter-intuitive to the implications of the third recommendation, the selection and adaption of the exergames measure to a specific target group is an important recommendation. The selection of e.g. obese and inactive people is a great leverage to create a positive health effect through the introduction of exergames.

4.1.2.1 Conclusion

The reported 12 factors in four categories (see summarized in Table 13) and five recommendations were drawn from 23 semi-structured interviews with experts from AMOS SE. The findings suggest that exergames have the potential to develop into a new form of health promotion in a workplace environment. Due to their innovative character, the generally easy-to-use devices and the comparable cost-efficiency of exergames, they have the potential to blend in and to further evolve the health status of employees.

The experts identified several important factors which influence the implementation of exergames into a workplace environment. They pointed out which are the strengths and weaknesses for the use in a company and named the largest barriers. To resolve these, five points were recommended which have to be considered in an implementation process. However, in terms of a successful implementation, collaboration between the

different stakeholders in the workplace environment, is as often, the key. Therefore it is recommended to fostering it in any possible way. Finally, experts agreed that health promotion is an important factor for a company that is not emphasized enough. To further evaluate the actual use of exergames, field experiments with different sets of gaming consoles determine the suitability of the measure and document the success of a carefully adjusted incentives and motivation mechanisms for the participants.

4.2 Executive questionnaires

Especially executives of the lower and middle management play an important role for the successful introduction of workplace health promotion due to their ability to provide financial, personal and temporal resources to create engagement through their own interest in the topic[191]. Therefore an online questionnaire was conducted to gather further insights about the viewpoint of executives on the topics of exergames and workplace health promotion. To this end the potential and acceptance of such a new measure was evaluated and correlations between the influencing variables were calculated.

4.2.1 Approach

In this part the general approach of the selected research method is described. A study design of and ex-post-facto arrangement was chosen, which allows for the collection of dependent and independent variables[192]. To gather the data, an online questionnaire was created and hosted with "SoSci Survey"[193]. This was largely due to practical benefits: low costs, independence of place and time for the participants to fill out the questionnaire and automatic data recording for the following analysis.

The participants for the questionnaire were directly derived from a business section of Allianz in the area of Munich and consisted of 65 executives who are responsible for over 2000 employees. This group was chosen, because they define business related strategies and goals and influence the organization both through their leadership, as well

[191] cf. (Franke, 2007); cf. (M. Lenhardt, Lecanto, Ricketts, Morgan, & Karnock, 2011)
[192] cf. (Schnell, Hill, & Esser, 2011)
[193] cf. (SoSci-Survey, 2012)

as their personal preferences[194]. Each potential participant was invited via an email which contained the individual link to the questionnaire accompanied by a short neutrally formulated information text to encourage the participation. The link individualization was not used to identify the participants in the analysis afterwards, but to ensure that only the invited managers could access and answers the online questionnaire. After two weeks the online questionnaire was closed and all feedback was gathered and automatically extracted from the online questionnaires[195] for the further statistical analysis in SPSS.

The first step in the creation of the questionnaire was a literature search of validated questionnaires regarding the topics acceptance, potential, workplace health promotion and exergames. Although a large number of questionnaires for acceptance could be found, no test instrument existed which could be used in the specific context of workplace health promotion. Therefore a questionnaire containing a selection of constructs is used in this research approach. For that, the existing questionnaires that partially reflect the topics from above were analyzed and examined.

For the aspect of exergames' effect in health promotion, the literature provides information about the effects on users. Out of these two items describe the effect of motivation of exergames for physical activity of users. Two items concerning the cognitive effects of exergames and another two the attitude towards exergames' integration into the workplace environment. As a result, a scale of six items is created to reflect the potential of exergames as a measure of workplace health promotion.

Due to the lack of research on the acceptance of measures in workplace health promotion, further studies were analyzed during the preparation of the questionnaire. Thereby the research area was that on the acceptance of technical innovations, because of the similarity to the topic exergames. It was assumed that the scales and questionnaire items can be adapted for the assessment of the acceptance of exergames, due to the fact that exergames are a technical innovation. In this research area, Davis' model of "Technology Acceptance" (TAM) is the most spread theory to explain and predict technology acceptance[196]. The model itself is based on the model of attitude and

[194] cf. (Franke, 2007)
[195] cf. (SoSci-Survey, 2012)
[196] cf. (F.D. Davis, Bagozzi, & Warshaw, 1989)

prediction of social behavior by Ajzen and Fishbein[197]. In recent years newer models like the "Unified theory of acceptance and use of technology" (UTAUT) by Venkatesh have been evaluated, but no improvement regarding the used constructs could be found due to the incorporation of TAM into UTAUT along with seven other models[198].

In Davis' acceptance model the acceptance (the actual use) is influenced by the attitude towards the acceptance. This means, that a positive use (case) affects the usage intention. A positive use intention then ultimately leads to an effective use. For this case, the attitude towards using is significantly influenced by two determinants: The perceived ease of use and the perceived utility of the object, whereby the ease of use also affects the utility. Perceived usefulness is the degree to which a person believes that using a technology improves their performance in their work and the perceived ease of use is "the degree to which a person believes that using a technology is effort free"[199]. Accordingly, a causal chain is assumed that is constructed as follows: the higher the usefulness and usability of an examined object are perceived, the more positive is the attitude towards using it and the more likely a person is willing to use the examined object. This connection is depicted in Figure 15.

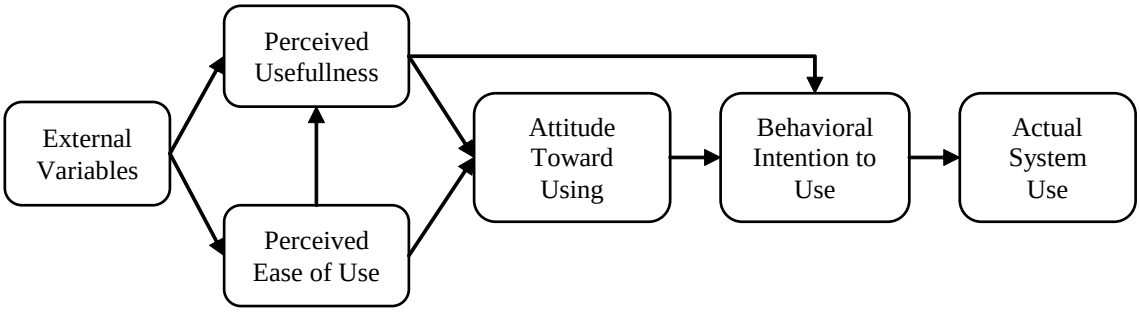

Figure 15: Technology Acceptance Model (Source: Own diagram cf. (F.D. Davis et al., 1989))

The TAM is considered the most influential model examining the acceptance of technology and has been adopted in various areas e.g., in occupational and health

[197] cf. (Ajzen & Fishbein, 1980)
[198] cf. (Venkatesh, Morris, Davis, & Davis, 2003), cf. (Koivisto, 2009), cf. (S. H. Chang, Chou, & Yang, 2010)
[199] cf. (Högg, Schmid, & Stanoevska-Slabeva)

research[200], due to its simple structure. For this reason, the TAM is chosen as the starting point for the questionnaire design, including the items for acceptance and its influence factors.

The acceptance of exergames as a measure of workplace health promotion is determined in accordance with the TAM by applying the scale of behavioral intention to use. Although the TAM measures the actual system use, this wasn't examined in case of the questionnaire, as it would require the measure to be implemented, observable and as well quantifiable for the analysis. This part follows in the experimental section of this work. The behavioral intention to use as an indicator of the acceptance is operationalized with three items that were adapted from the test instrument of Kornmeier[201].

The factors influencing the acceptance of exergames as a measure of workplace health promotion are also determined in accordance with the TAM. Analogous to the above described model by Davis the causal chain is used in the questionnaire. Here, the perceived ease of use and usefulness are operationalized by six items adapted from Davis' test instrument[202]. The attitude towards using exergames is operationalized by three items, based on the scale of "Attitude Towards the Object" which were formulated by Brunner[203].

However, it is assumed that the acceptance of exergames cannot be sufficiently explained trough the TAM model. Because the scientific literature lacks studies concerning this topic, additional predictors are used in the questionnaire. The first predictor is the attitude towards workplace health promotion. It is assumed that the attitude towards workplace health promotion is influencing the priority which is given to the topic and therefore the resources spend on it. The attitude towards workplace health promotion thus has a direct impact on the attitude towards exergames and indirectly on the behavioral intention of use. To determine the attitude towards workplace health promotion, different questionnaires on the topic workplace health

[200] cf. (Koivisto, 2009), cf. (S. H. Chang et al., 2010; Koivisto, 2009)
[201] cf. (Kornmeier, 2009)
[202] cf. (F.D. Davis et al., 1989)
[203] cf. (Bruner, Hensel, & James, 2005)

promotion were analyzed and the scale of Graf & Grote was adapted for the final questionnaire[204].

The second predictor is the priority of workplace health promotion. This is inquired in the questionnaire in order to obtain an estimate of the value of workplace health promotion from the participants' perspective. Just like the attitude towards workplace health promotion, this predictor indirectly has an influence on the behavioral intention to use.

The third predictor is the knowledge about exergames. It is assumed that both the assessment of exergames usefulness as well as the attitude towards them is determined by the knowledge and thus indirectly influence the behavioral intention to use them. In the literature there are numerous test instruments that elevate the knowledge of a research object. For this questionnaire the scale "knowledge of the product class" by Bruner was used[205]. This measures the degree of knowledge which a person believes to hold about a product or product class. The four items of the scale were supplemented with an additional item that elevates the experience of the participants with the research object of this work.

The fourth predictor is the potential of exergames. Again, the assumption is made that the perception of the potential of a measure affects the behavioral intention to use. The scale that was used here is already explained in the beginning of this chapter.

Figure 16 provides an overview of the influence factors for the acceptance of exergames in the context of workplace health promotion that were used in the questionnaire.

[204] cf. (Graf & Grote, 2003)
[205] cf. (Bruner et al., 2005)

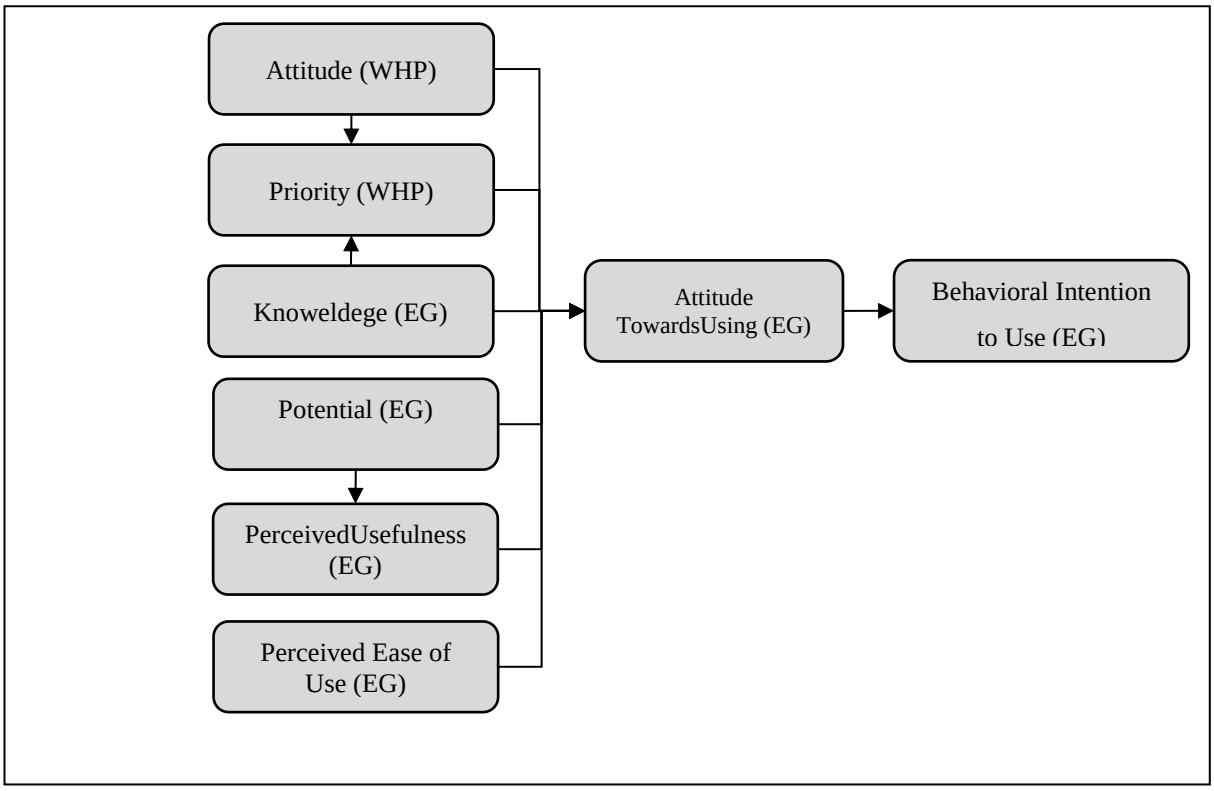

Figure 16: Influence factors for the acceptance of exergames (Source: Own diagram)

Out of this following hypotheses were derived about the relationship between the influence factors and the behavioral intention to use criterion.

- H1: The more positive towards workplace health promotion, the better is the attitude towards using exergames

- H2: The higher the priority of workplace health promotion, the better is the attitude towards using exergames

- H3: The greater the knowledge about exergames, the better is the attitude towards using exergames

- H4: The greater the potential of exergames, the better is the attitude towards using exergames

- H5: The higher the perceived usefulness of exergames, the better is the attitude towards using exergames

- H6: The higher the perceived ease of use of exergames, the better is the attitude towards using exergames

- H7: The better the attitude towards using exergames is, the higher is the behavioral intention to use exergames

All items of the questionnaire were answered on a seven-point Likert scale. Thereby, only the extremes of the scale values were labeled and were additionally represented by a bar graph to clearly state the value. For the scale "priority workplace health promotion" the caption of the scale values from 1 = lowest priority to 7 = highest priority. The remaining scales are all labeled from 1 = strongly agree to 7 = strongly disagree. The complete questionnaire can be found in the appendix.

The questionnaire began with a neutrally formulated introduction passage that was addressed to the participants of the questionnaire. Information about the purpose of the questionnaire, the expected processing time and the assurance of anonymity for all statements made in the questionnaire were provided. In addition the two core concepts workplace health promotion and exergames were briefly explained. The questionnaire is divided into three sections and includes 40 items. The items categories are presented in Table 15.

Table 15: Structure of the executive questionnaire (Source: Own diagram)

Scale	**Number of items**
Workplace health promotion	
Priority of workplace health promotion	1 item
Attitude towards workplace health promotion	7 items
Exergames	
Knowledge about exergames	5 items
Usefulness of exergames	6 items
Ease of use of exergames	6 items
Potential of exergames	6 items
Attitude towards using exergames	3 items
Behavioral intention to use exergames	3 items
Demographic information	3 items

The first section includes questions on workplace health promotion. This includes the item "priority of workplace" health promotion (1 item) and the scale "attitude towards workplace health promotion" (7 items).

In the second section the scales on exergames can be found. The subscales here are "knowledge about exergames" (5 items), “usefulness of exergames” (6 items), "ease of use of exergames" (6 items), the “potential of exergames” (6 items), the “attitude towards using exergames” (3 items) and finally the “behavioral intention to use exergames” (6 items).

The third section identifies the participants’ demographics. In three items, the age, the gender and the number of supervised persons were asked for. The complete questionnaire can be found in the appendix.

4.2.1.1 Pretest of the executive questionnaire

The questionnaire was tested in May 2012 in a pretest with 21 employees of the Allianz IT. The subjects were between 19 and 34 years old with an average age of 27 years. The aim of the pretest was to test the questionnaire on verbal comprehension, content consistency and the correct functionality of the online questionnaire. The pretest was not conducted in the small target group of executives due to the small size of this group. The inclusion of them into the pretest would have distorted the results of the final questionnaire and reduced the willingness to participate in the questionnaire.

The pretest's participants received an email which granted access to the online questionnaire. Due to the results of the pretest the welcome message and the wording of some individual items were modified and redundant items were removed from the questionnaire.

4.2.2 Analysis

In the following section, the questionnaire's results are presented. Starting with the main descriptive results of the data analyses, followed by the correlation analyses, which highlights the relations between the queried factors.

The statistical evaluation and analysis of the data was conducted with the software SPSS version 17 for Microsoft Windows. For this purpose, the automatically extracted data from the online questionnaire was transferred into SPSS and coded according to the scale levels.

4.2.2.1 Univariate analysis

In the first step the descriptive analysis of the collected data was accomplished. For this purpose the frequencies, the measure of central tendency and measures of dispersion were calculated for the scales[206]. The scales' items were aggregated using the arithmetic mean as one scale value, therefore, for the further statistical analysis an interval level scale can be assumed.

[206] cf. (Eckey, Kosfeld, & Türck, 2005)

In a second step, the online questionnaire's scales were examined for normal distributions. In this process, the normal distribution can be determined by both graphical, as well as statistical methods[207]. The graphical analysis is achieved by using histograms that form a scale on the abscissa and the ordinate represents the absolute frequency. An overlay of a normal distribution is then combined with the histogram to reveal deviations. However, the graphical evaluation is problematic, especially in small samples. For this reason, the Shapiro-Wilk test was chosen to securely statistically test for normal distributions. The Shapiro-Wilk test is considered to be the test method with the highest reliability and quality and is particularly suitable for small samples of less than 50 participants[208]. The methods hereby checks if the residuals are normally distributed. The hypotheses for this purpose are:

H0: The residuals are normally distributed.

H1: The residuals follow a different distribution.

If the calculated significance value falls below the threshold of .05, the null hypothesis is rejected and the assumption of a normal distribution cannot be confirmed. If, however, the threshold is exceeded, the null hypothesis and thus the assumption of a normal distribution can be confirmed.

In a next step, the quality of the scales' criteria was calculated. With the help of reliability checks, the degree of accuracy of the online questionnaire was determined. This information was provided by measuring Cronbach´s alpha, which is used to quantify the strength of the internal consistency. The value of Cronbach´s alpha can take on a value between zero and one, where a higher value is generally considered better. A Cronbach´s alpha of 0.4 is found to be acceptable, if there are two or three indicators. With more than three indicators, a Cronbach´s alpha above 0.7 is considered acceptable and above 0.8 as well[209].

Beside the reliability a further test of the validity was conducted. The validity indicates whether a test actually measures what it claims to measure. Basically three main types

[207] cf. (Schmidt, 2010)
[208] cf. (Schmidt, 2010), cf. (Fromm, 2011)
[209] cf. (Peterson, 1994)

of validity can be distinguished: content validity, criterion validity and construct validity.

Content validity, also called face validity, is present, if the content of the test items reflects the measured constructs exhaustively in the most important aspects. This cannot be recorded numerically, but only be judged subjectively, thus representing more of a target state than a test criterion.

Criterion validity is the result, if a test measures a latent characteristic or construct corresponding to the measurement of a manifested characteristic or construct. It is therefore defined as the correlation between the test values and the criterion values of a sample. Construct validity is derived from the measured constructs and the created hypotheses which can be confirmed by the test values[210].

The validity is quantified by the correlation coefficient with the exception of the content validity. There the correlations must be greater than zero and close to one. Validities between 0.4 and 0.6 are considered to be moderate and coefficients greater than 0.6 to be high[211].

In the analysis of the online questionnaire the convergence validity and discriminate validity as components of the construct validity were tested through an exploratory factor analysis. If in this factor analysis the indicators form a single factor, this is an indication of validity. Hereby, the factor has to explain at least 50 percent of the associated indicators' variance and the respective factors' quantity has to be at least 0.4 per indicator. If the indicators form more than one factor, a splitting of the indicators into several constructs is necessary[212].

[210] cf. (Bortz & Döring, 2006)
[211] cf. ibid.
[212] cf. (Bortz & Döring, 2006), cf. (Zinnbauer & Eberl, 2004)

4.2.2.2 Bivariate analysis

In a further step, the correlation analysis was applied and the correlations between the scales were examined. The correlation analysis is a bivariate analysis method which examines stochastic relationships between two equivalent variables of a sample[213]. With the help of the correlation coefficient it was possible to determine the strength and direction of the linear relationship between the selected variables[214]. The coefficient can either be positive or negative and is the direction sign of the correlation and the absolute value of its strength[215]. An overview is presented in Table 16.

Table 16: Overview of correlation interpretation (Source: (Eckey et al., 2005))

$-1 \leq r < -0.8$	strong negative correlation
$-0.8 \leq r < -0.3$	middle negative correlation
$-0.3 \leq r < -0.1$	weak negative correlation
$-0.1 \leq r \leq 0.1$	no connection
$0.1 < r \leq 0.3$	weak positive correlation
$0.3 < r \leq 0.8$	middle positive correlation
$0.8 < r \leq 1$	strong positive correlation

However, the calculated correlation values cannot provide information about the causal relations for the interpretation of the results. A spurious correlation may occur if the observed variables are influenced by an unknown third variable[216].

Depending on the scale level of the variables, three correlation coefficients are distinguished: Pearson, Kendall´s tau and Spearman´s rho[217]. While the use of Pearson´s correlation coefficient is only suitable for interval scaled variables and normal distributions, the correlation coefficients Kendall´s tau and Spearman´s rho can also be used if these conditions do not apply[218]. To calculate the coefficient for each variable, a

[213] cf. (Sachs, 2003)
[214] cf. (Ziegler & Bühner, 2009)
[215] cf. (Brosius, 2008)
[216] cf. (Schulze, 2007)
[217] cf. (Bortz & Döring, 2006)
[218] cf. (Brosius, 2008)

hierarchy of the values was created and the calculation was performed on the basis of the rank values[219]. For the analysis of the online questionnaire the correlation coefficient Spearman´s rho was selected.

The correlations' significance level then describes the error probability of the postulated correlation hypotheses, which can either be verified or falsified. The null hypothesis thereby expresses, that no correlation exists between the examined variables. At a significance level of .01 this would mean that the correlation of the observed variables occurs in less than one percent of all observed cases.

[219] cf. ibid.

4.2.2.3 Results of the online questionnaire

In the course of the online questionnaire, 65 Allianz IT executives were invited to the answer the questionnaire concerning the acceptance and potential of exergames in workplace health promotion. In total 40 executives followed the invitation and completed the questionnaire. This constitutes a response rate of 61.5 percent.

Table 17 gives an overview over the demographic distribution among the questionnaire's participants. The average age over all was 46.95 years with the youngest participant being 34 and the oldest 58 years. A clear majority (87.5%) of the participants was male and just 12.5 percent female. 2.5 percent did not specify their gender. Furthermore, the number of employee responsibility per manager was recorded with an average of 63.23 employees per manager. Even though anonymity was assured, 57.5 percent of the participants provided no information about the number of persons they supervise. Therefore, no further interconnection between the number of supervised employees and the other answers stated by the executives in the questionnaires can be found in the analysis.

Table 17: Demographic results from the online questionnaire (Source: Own diagram)

Variable		**Frequency** n=40	**Percent** %
Gender			
	male	35	87.5
	female	4	10.0
	no information	1	2.5
	total	40	100.0
Age in years			
	< 30 years	0	0.0
	31 – 40	4	10.0
	41 - 50	25	62.5
	51 – 60	11	27.5
	> 61 years	0	0.0
	total	40	100.0
Number of supervised personel	1 – 50 persons	12	30.0
	51 - 100	3	7.5
	> 100 persons	2	5.0
	no information	23	57.5
	total	40	100.0

The potential of exergames was operationalized by six items. Figure 17 illustrates the obtained data's frequency distribution of the. The items which show the potential of exergames were mostly rated in the right scale range of agree (from somewhat to strongly agree).

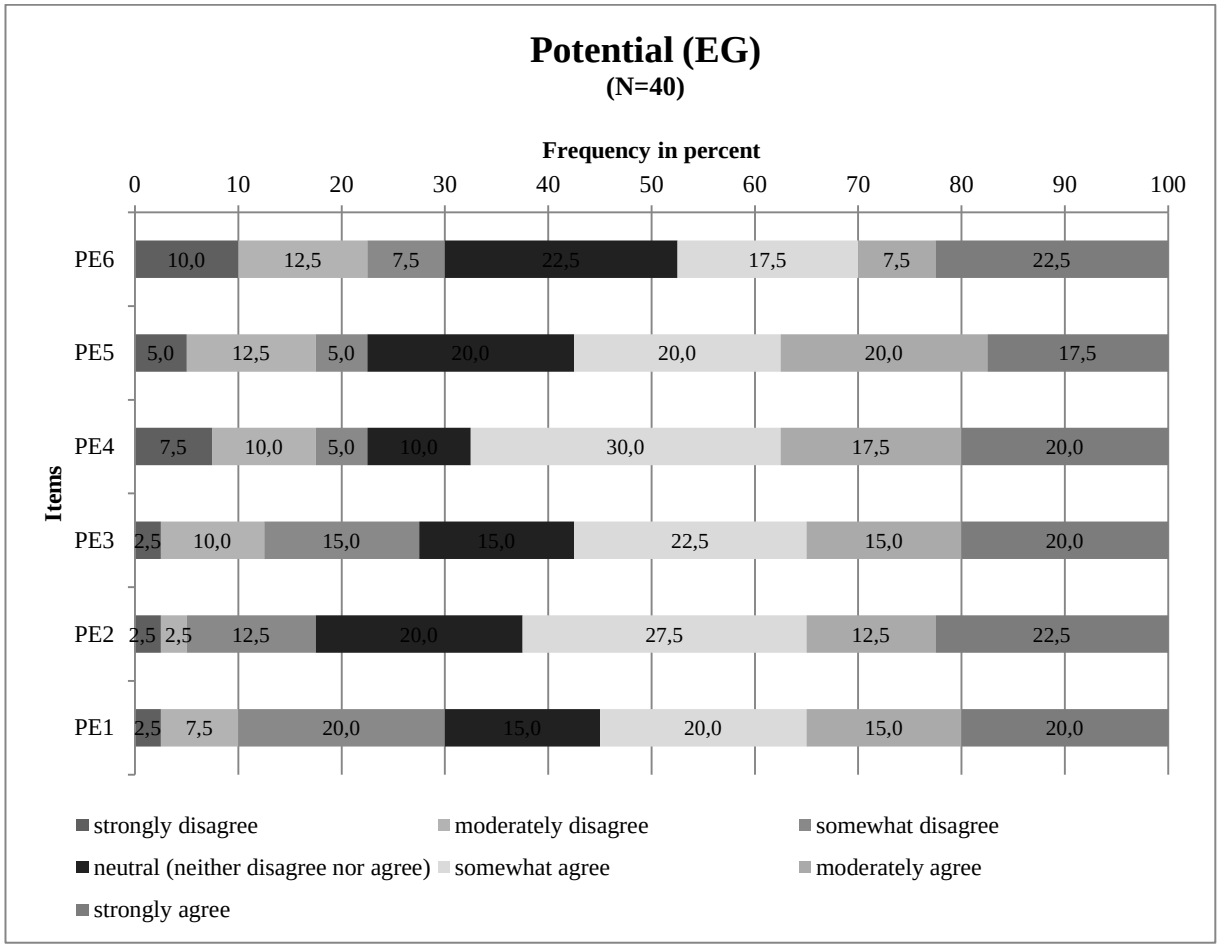

Figure 17: Frequency distribution of the scale "Potential (EG)" (Source: Own diagram)

Note:
PE1: Exergames haben das Potential, Mitarbeiter zu mehr Bewegung am Arbeitsplatz zu motivieren.
PE2: Exergames haben das Potential, Stress abzubauen.
PE3: Exergames haben das Potential, das körperliche Wohlbefinden zu erhöhen.
PE4: Exergames haben das Potential, auch Mitarbeiter zu mehr Bewegung zu motivieren, die bisher nicht von den bestehenden bewegungsfördernden Angeboten erreicht wurden.
PE5: Exergames haben das Potential, als Bestandteil der betrieblichen Gesundheitsförderung aufgenommen zu werden.
PE6: Exergames haben das Potential in unserem Unternehmen angeboten zu werden.

The items'mean values ranging from 4.38 to 4.95 (median = 4.00 to 5.00, SD = 1.55 to 1.98) on the seven-point Likert scale (response format: from 1 = strongly disagree to 7 = strongly agree) suggest that the statements were, on average, mostly approved (cf. Table

32 in the appendix). The scale's aggregated values result in an average value of 4.69 and a standard deviation of 1.51.

The priority of promoting health was assessed using one item. Figure 18 provides the illustration of the generally positive responses on the priority of workplace health promotion.

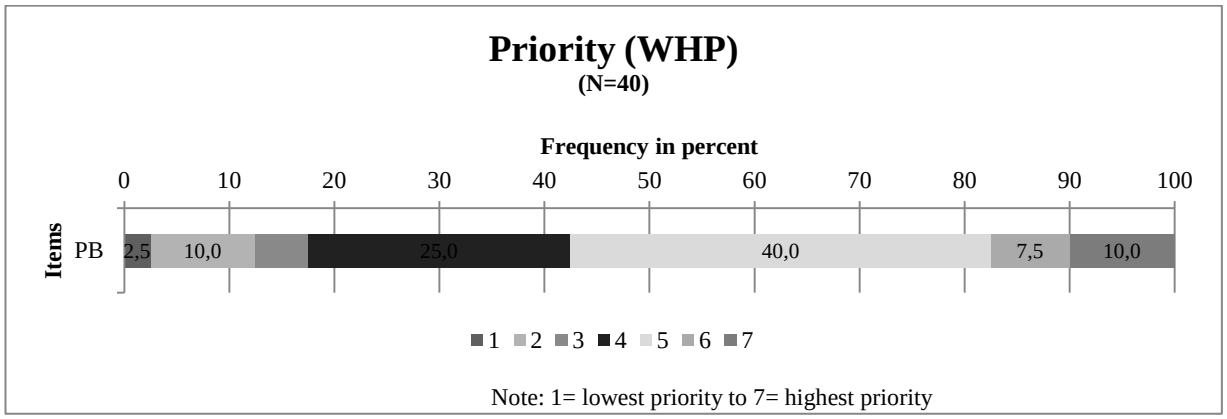

Figure 18: Frequency distribution of the scale "Priority (WHP)" (Source: Own diagram)

Note:
PB: Welche Priorität hat BGF für Sie?

The average value of the item is 4.53 (median = 5.0, SD = 1.43) on the seven-point Likert scale (response format: 1 = lowest to 7 = highest)[220].

[220] cf. Table 32 in the appendix

The attitude of executives towards workplace health promotion was operationalized by seven items. Figure 19 illustrates that the respondents have clearly rated the items' testimonies positive in the scale area of agree (somewhat agree to strongly agree).

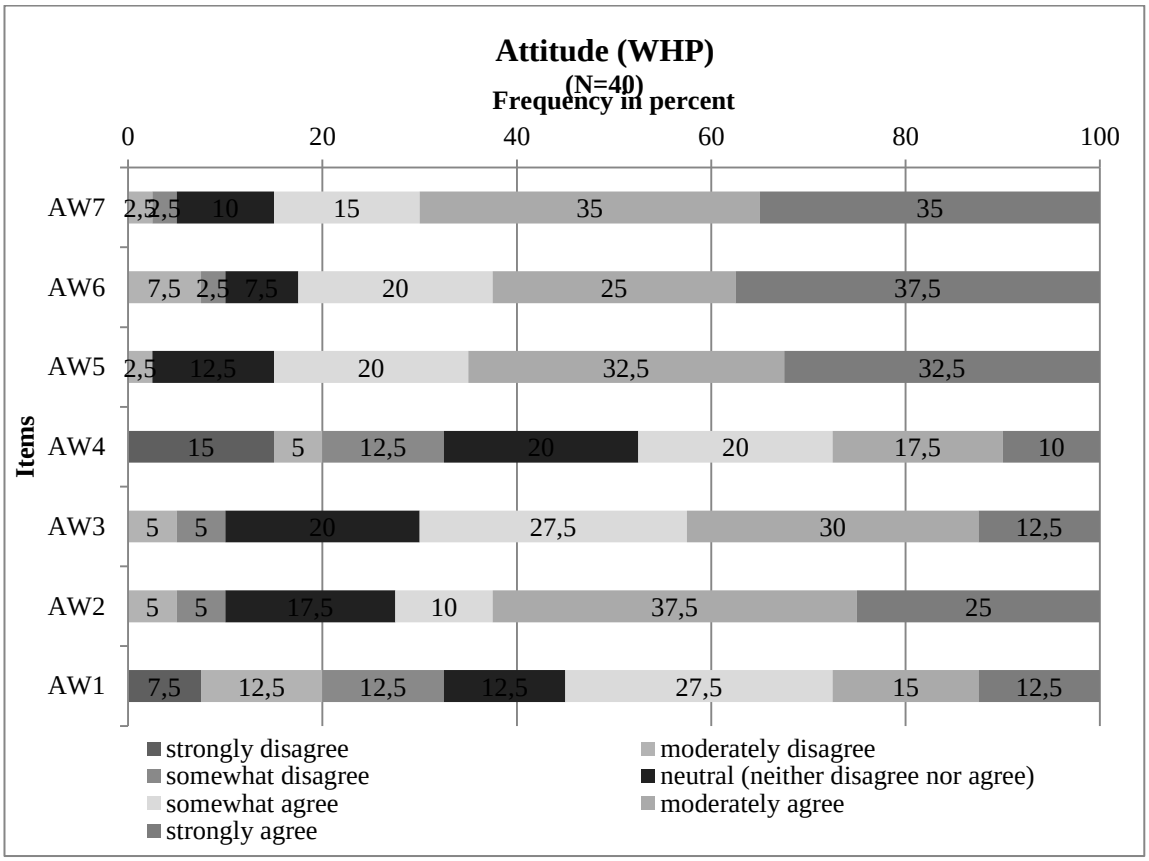

Figure 19: Frequency distribution of the scale "Attitude (WHP)" (Source: Own diagram)

Note:

AW1: BGF ist für mich persönlich wichtig.

AW2: BGF ist eine Investition, die sich rechnet.

AW3: BGF bewirkt gesundheitsförderliche Verhaltensweisen.

AW4: Gesundheitsförderung ist Privatsache.EB5: BGF ist vorteilhaft für das Unternehmen.

AW6: BGF ist eine Modeerscheinung.

AW7: BGF ist nützlich.

The mean values of the items are within the range of 4.18 to 5.83 (median = 4.00 to 6.00, SD = 1.19 to 1.88) on the seven point Likert scale from 1 = strongly disagree to 7 = strongly agree[221]. The aggregated items of the scale result in an average of 5.19 and a standard deviation of 1.2 for the scale.

[221] cf. Table 32 in the appendix

The knowledge of exergames was operationalized by five items. Figure 20 shows that nearly three quarters of all respondents answered with disagree (strongly disagree to somewhat disagree) to the statements of the online questionnaire.

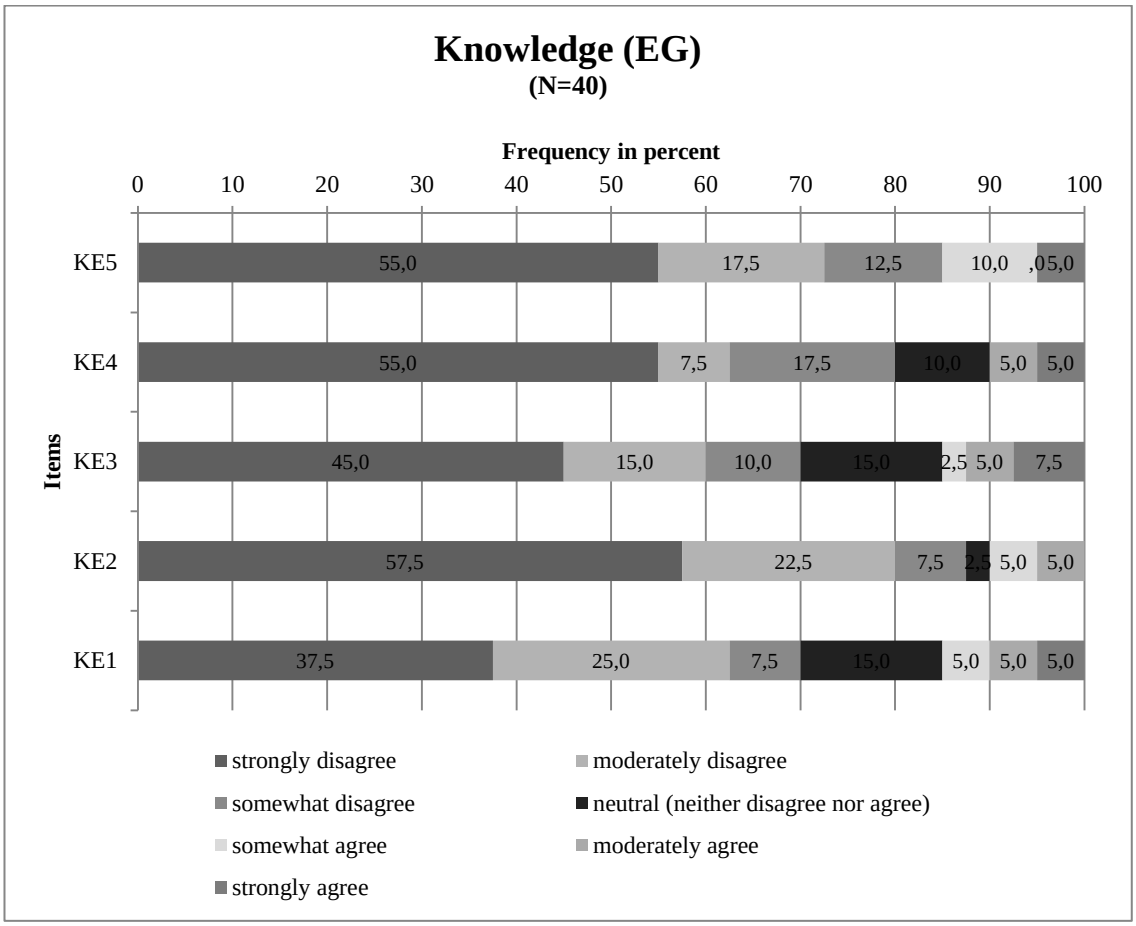

Figure 20: Frequency distribution of the scale "Knowledge (EG)" (Source: Own diagram)

Note:

KE1:Ich weiß sehr viel über Exergames.

KE2:Ich würde mich mit meinem Wissen als Experte in Sachen Exergames bezeichnen.

KE3:Ich weiß mehr über Exergames als mein Bekanntenkreis.

KE4:Ich schenke Informationen über Exergames in der Regel große Aufmerksamkeit.

KE5:Ich habe viel Erfahrung im Umgang mit Exergames.

The mean values of the items are within the range of 1.95 to 2.60 (median = 1.00 to 2.00, SD = 1.58 to 1.95) on the seven point Likert scale from 1 = strongly disagree to 7 = strongly agree[222]. When the items are aggregated on a scale, the result is an average of 2.31 and a standard deviation of 1.62.

[222] cf. Table 32 in the appendix

The perceived usefulness of exergames was operationalized by six items. Figure 21 illustrates the frequency distribution of the collected data. It can be seen that for this scale no clear statement can be made about the type of the items, as the items were answered uniformly along the response scales.

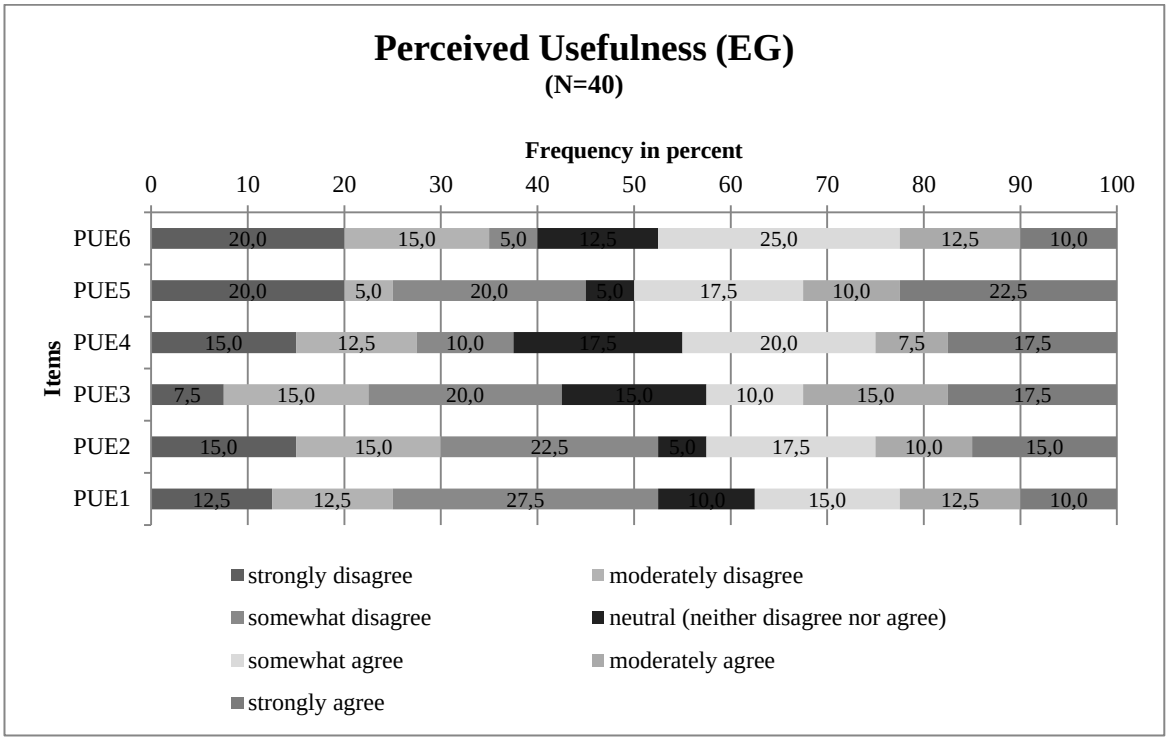

Figure 21: Frequency distribution of the scale "Perceived Usefulness (EG)" (Source: Own diagram)

Note:

PUE1:Exergames sind ein nützliches Instrument, um Mitarbeiter zu mehr Bewegung am Arbeitsplatz zu motivieren.

PUE 2:Ich würde Exergames nützlich finden.

PUE 3:Exergames sind genauso nützlich wie andere Maßnahmen der bestehenden Gesundheitsförderungsprogramme.

PUE 4:Exergames ermöglichen es mir, mehr Bewegung am Arbeitsplatz auszuüben, als dies sonst möglich wäre.

PUE 5:Exergames ermöglichen es mir, in meinen Pausen abzuschalten.

PUE 6:Allgemein gesehen sind Exergames von hohem Nutzen.

The mean value of the items is within the range from 3.80 to 4.20 (median = 3.00 to 4.50, SD = 1.87 to 2.21) on the seven point Likert scale from 1 = strongly disagree to 7 = strongly agree[223]. The aggregated value of the scale results in an average of 3.99 and a standard deviation of 1.75.

[223] cf. Table 32 in the appendix

The perceived ease of use of exergames was also based on six items. Figure 22 shows that the items were mainly responded to positively on the scale range agree (somewhat agree to strongly agree).

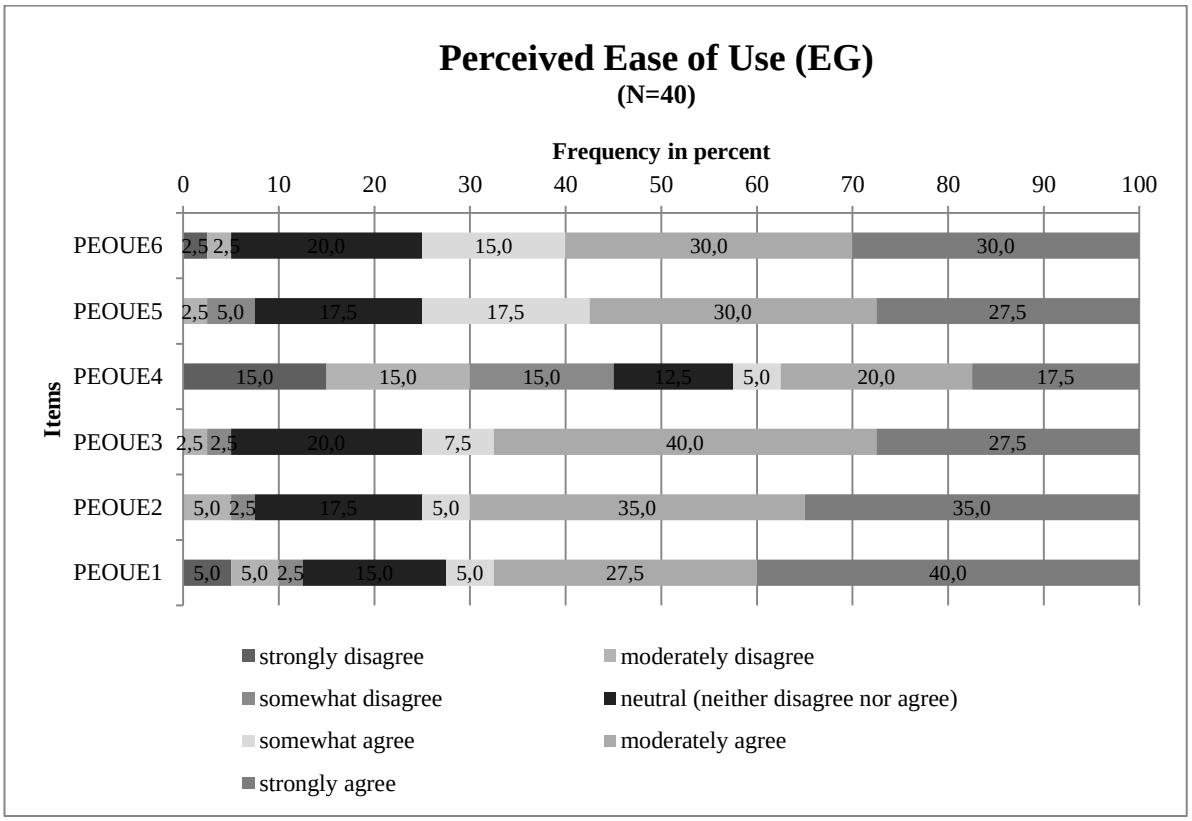

Figure 22: Frequency distribution of the scale "Perceived Ease of Use (EG)" (Source: Own diagram)

Note:

PEOUE1: Das Bedienen der Konsole würde mir leicht fallen.

PEOUE 2: Ich finde, die Konsole wäre einfach zu benutzen.

PEOUE 3: Ich könnte mir vorstellen, dass die meisten Leute sehr schnell lernen würden mit der Konsole umzugehen.

PEOUE 4: Ich denke, ich würde die Konsole gerne häufiger benutzen.

PEOUE 5: Die Interaktion mit der Konsole würde klar und verständlich sein.

PEOUE 6: Die Bedienung der Konsole würde nicht viel geistige Anstrengung erfordern

The mean values of the items range from 4.08 to 5.68 (median = 4.00 to 6.00, SD = 1.30 to 2.15) on the seven point Likert scale from 1 = strongly disagree to 7 = strongly agree[224]. The aggregated items of the scale result in an average value of 5.32 and a standard deviation of 1.35.

[224] cf. Table 32 in the appendix

The attitude towards using exergames was operationalized by three items. Figure 23 illustrates that two of the three items (ATUE1, ATUE3) are approximately evenly distributed along the response scale. The third item (ATUE2) was largely answered within the response scale of agree.

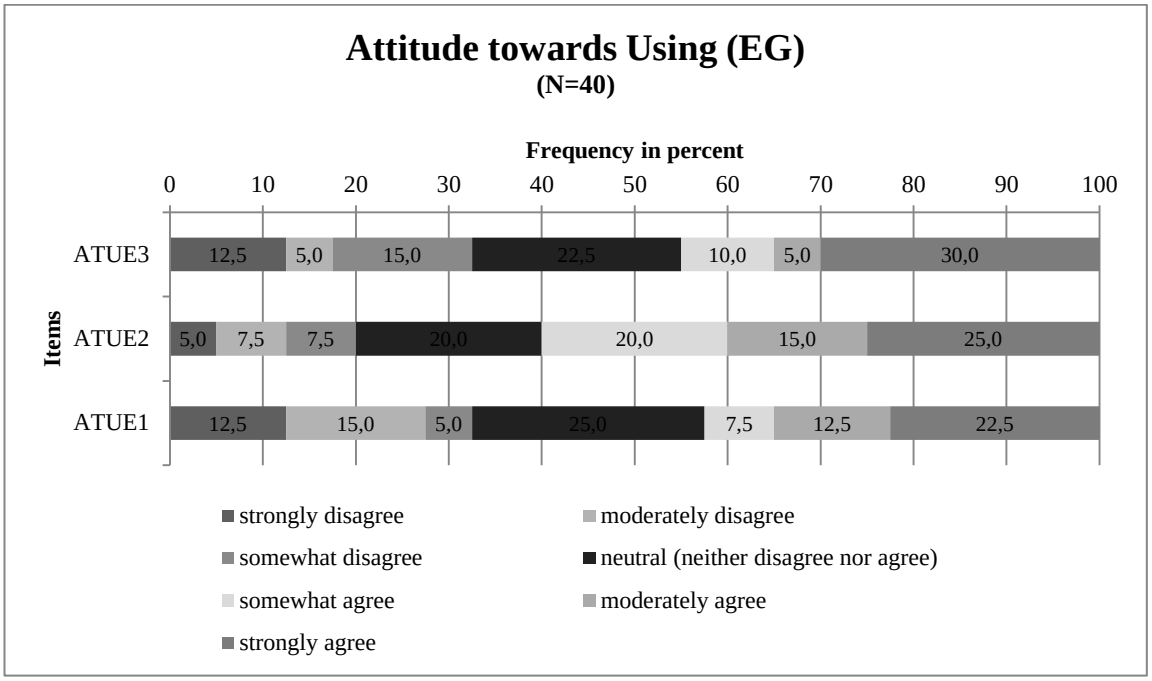

Figure 23: Frequency distribution of the scale "Attitude towards Using (EG)" (Source: Own diagram)

Note:
ATUE1:Die Nutzung von Exergames im Rahmen betrieblicher Gesundheitsförderung halte ich für eine gute Idee.
ATUE2:Der Einsatz von Exergames macht die betriebliche Gesundheitsförderung interessanter.
ATUE3:Mir würde der Einsatz von Exergames im Rahmen betrieblicher Gesundheitsförderung gefallen.

The mean values of the items lie within the range from 4.28 to 4.88 (median = 4.00 to 5.00, SD = 1.79 to 2.10) on the seven point Likert scale from 1 = strongly disagree to 7 = strongly agree[225]. The aggregated items of the scale result in an average of 4.54 and a standard deviation of 2.01.

[225] cf. Table 32 in the appendix

The acceptance of exergames was determined by three items which operationalized the behavioral intention to use exergames. Figure 24 provides an overview of the collected data's frequency distribution. This shows that the respondents mainly answered negatively (strongly disagree to somewhat disagree) to the testimonies of this scale.

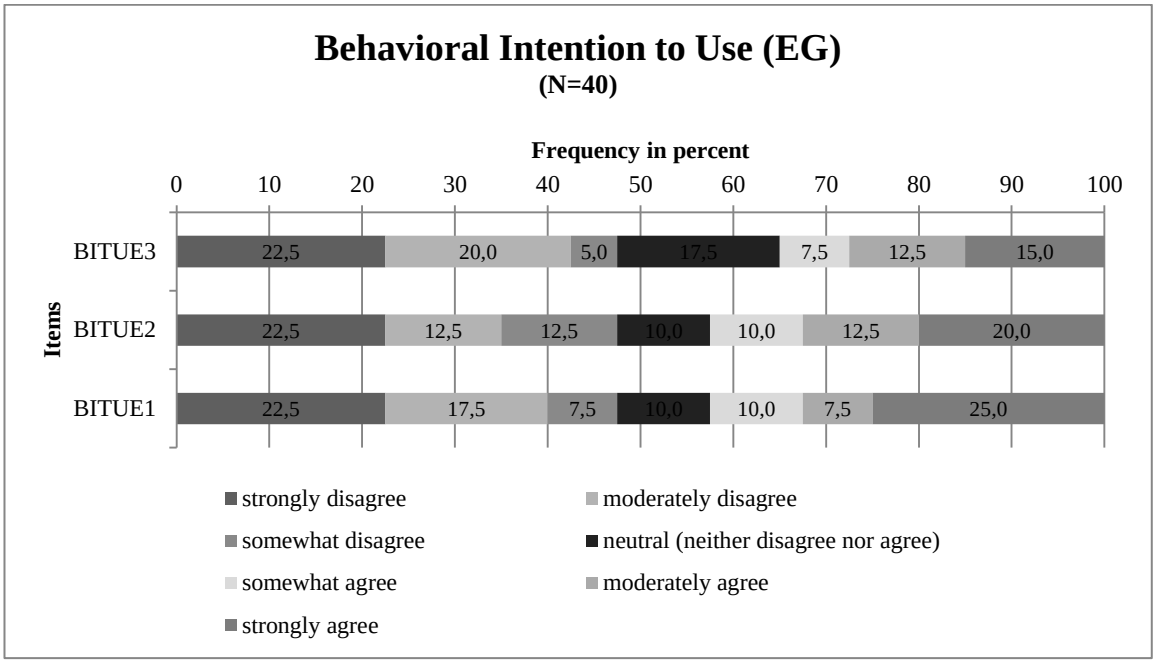

Figure 24: Frequency distribution of the scale "Behavioral Intention to use (EG)" (Source: Own diagram)

Note:
BITUE1:Ich würde Exergames im Rahmen betrieblicher Gesundheitsförderung nutzen, wenn sie angeboten werden würden.
BITUE2:Ich würde Exergames im Rahmen betrieblicher Gesundheitsförderung nutzen, wenn ich den Zugang dazu hätte.
BITUE3:Ich würde Exergames regelmäßig nutzen, wenn sie in unserem Unternehmen angeboten werden würden

The mean values of the items are in the range from 3.65 to 3.9 (median = 4.00, SD = 2.19 to 2.36) on the seven point Likert scale[226]. The aggregated items of this scale result in an average of 3.82 and a standard deviation of 2.26.

[226] cf. Table 32 in the appendix

In Figure 25 the average values of the scales are depicted within ascending order by their calculated values. The figures show the average values as well as the error bars represent the standard deviations. From the figure it appears like the scale for ease of use of exergaming has the highest scale value. Knowledge of exergames, in contrast, received the minimum score with a scale value of 2.31. Particularly interesting are the characteristics of potential of and intention to use exergames. The potential to use exergames with a scale value of 4.69 is rated considerably higher than the intention to use exergames scale value with 3.82. The standard deviation of both scales, however, shows that they scatter significantly around the mean value.

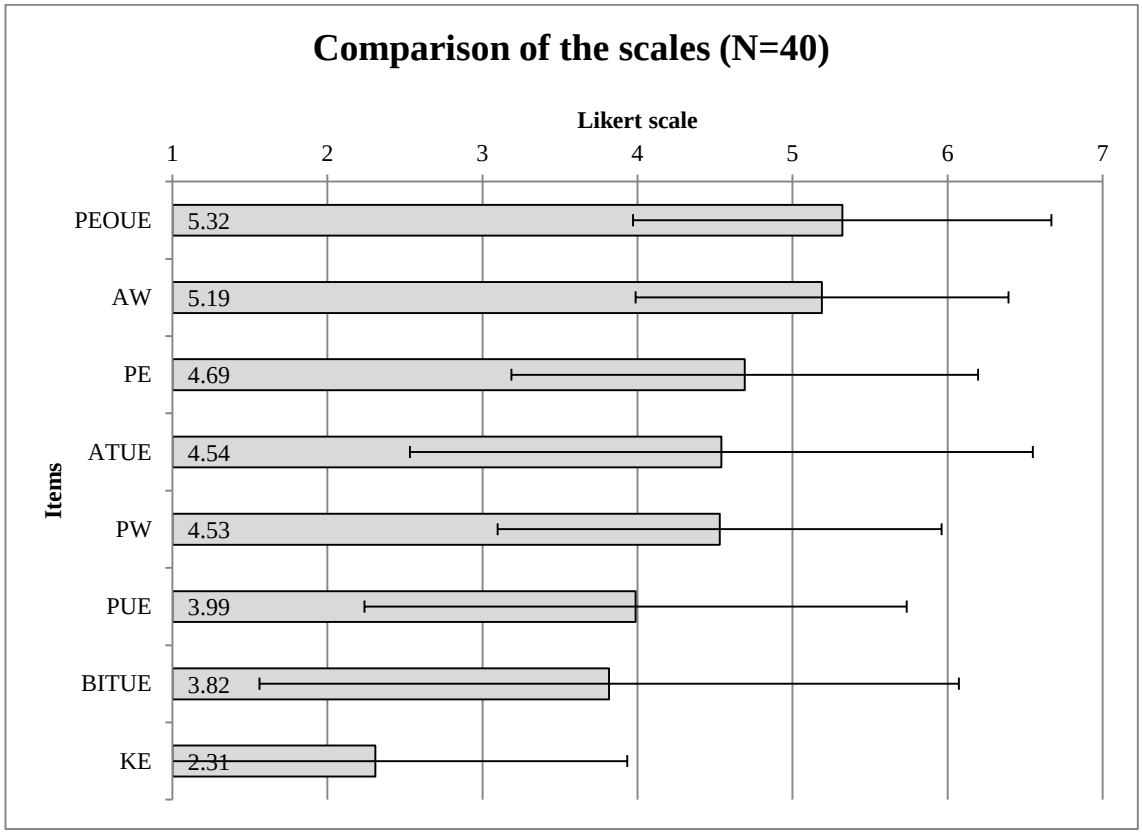

Figure 25: Comparison of the scales (Source: Own diagram)

Note:

AW = Attitude towards workplace health promotion

PW = Priority of workplace health promotion

KE = Knowledge of exergames

PE = Potential of exergames

PUE = Perceived usefulness exergames

PEOUE = Perceived ease of use exergames

ATUE = Attitude towards using exergames

BITUE = Behavioral intention to use exergames

4.2.2.4 Reliability

The scales' internal consistency of the questionnaire was determined by Cronbach´s alpha. The reliability lay between .889 and .990[227] and can therefore be referred to as highly reliable[228].

4.2.2.5 Validity

The validity of the stated factors was tested with the exploratory factor analysis. As shown in the appendix one factor per scale is extracted with an eigenvalue over 1 (Kaiser-Guttman criterion). This for example, means that the factor attitude towards workplace health promotion is operationalized by seven items and explains 63.91% of the variance of these items.

Overall the extracted factors explain between 63.91 percent and 98.15 percent of the total variance of the scales and can therefore be described as valid.

4.2.2.6 Correlation analysis

To determine the online questionnaire's correct correlation coefficients of the variables of the test instrument were checked for normal distributions with the help of histograms and the Shapiro-Wilk-test. Table 18 shows that among all variables of exergames, except age and potential, a p-value below .05 was observed. Thus, the null hypothesis is rejected and the assumption of a normal distribution cannot be confirmed. This result is consistent with the findings from the histograms as well.

Only the variables age and potential of exergames showed a p-value greater than .05, suggesting that the null hypothesis can be confirmed and a normal distribution can be assumed for these two variables. However, their histograms leave some doubt as to the variables' normal distribution (cf. Figure 40: Normal distribution histogram age online questionnaire (Source: Own diagram)Figure 40 and Figure 41 in the appendix).

[227] cf. Table 327 in the appendix
[228] cf. (Bortz & Döring, 2006)

With the help of the Shapiro-Wilk test and the histograms it was found that all of the variables are not normally distributed. Thus, for the correlation analysis the Spearman´s rho correlation coefficient was applied.

Table 18: Results of the Shapiro-Wilk test from the online questionnaire (Source: Own diagram)

Shapiro-Wilk test		
	value	significance
Age	.963	.232
Gender	.350	.000
PW	.902	.003
AW	.895	.002
KE	.694	.000
PUE	.940	.039
ATUE	.913	.005
PEQUE	.904	.003
BITUE	.867	.000
PE	.947	.066

In Table 19 the inter-correlations of the scales are presented. Especially interesting, in combination with the aforementioned hypotheses are the correlations of the attitude towards using exergames and the behavioral intention to use exergames.

For the scale the behavioral intention to use exergames and the scales “attitude towards workplace health promotion”, “perceived usefulness of exergames” and “potential of exergames” R-values of .469 (p> .01), .617 (p> .01) and .766 (p>.01) were observed. Resulting, significant moderate positive correlations were determined.

The scale “attitude towards using exergames” and the scale “behavioral intention to use exergames” showed R-values of .803 (p> .01) and .856 (p>. 01) implying significant positive strong correlations.

At the same time, the scale "attitude towards using exergames" and the scales "attitude towards workplace health promotion", "knowledge of exergames" and "perceived ease of use of exergames" reported a R-value of .312 (p> .05), .427 (p>0.1) and .720(p> 0.1) which indicate significant moderate positive correlations.

Between the scale "attitude towards using exergames" and the scales of "perceived usefulness of exergames", the "potential of exergames" and the "behavioral intention to use exergames" R-values of .905 (p>0.1), .837 (p>.01) and .803 (p>.01) were observed and thus showed significant strong positive correlations.

Table 19: Results of Correlations of the online questionnaire (Source: Own diagram)

		Age	Sex	PW	AW	KE	PUE	PEOUE	PE	ATUE	BITUE
ATUE	Corr. Coef.	-.145	.088	.065	**.312***	**.427****	**.905****	**.720****	**.837****	1.000	
	Sig. (2-tailed)	.373	.594	.691	.050	.006	.000	.000	.000	.	
	N	40	39	40	40	40	40	40	40	40	
BITUE	Corr. Coef.	-.064	.149	.198	**.469****	.307	**.803****	**.617****	**.766****	**.856****	1
	Sig. (2-tailed)	.694	.365	.221	.002	.054	.000	.000	.000	.000	.
	N	40	39	40	40	40	40	40	40	40	40

AW = Attitude towards workplace health promotion PUE = Perceived usefulness exergames

PW = Priority of workplace health promotion PEOUE = Perceived ease of use exergames

KE = Knowledge of exergames ATUE = Attitude towards using exergames

PE = Potential of exergames BITUE = Behavioral intention to use exergames

4.3 Evaluation of the major findings

The following section answers the questions about the potential and acceptance of exergames as a measure of workplace health promotion from the perspective of Allianz IT executives.

Although the knowledge of the respondents about exergames is very limited (cf. Figure 20), the potential of this measure is recognized and was rated mostly highly. Between the knowledge of exergames and the estimated potential of exergames a correlation R-value of .322 ($p > .05$) was observed, which is a significant positive, albeit weak statistical correlation (cf. Table 19). This means that with increasing knowledge of exergames, the potential of exergames will be rated higher.

Interestingly, executives who stated they have little knowledge about exergames later reported a high potential for this measure. This contradiction may be explained by the fact that other factors influence the formation of opinions about the potential of exergames. The questioned executives were generally people of male gender and worked in the professional field of IT. This suggests that the respondents have a technological awareness and are thus more open towards technological products. Based on the acquired data, this assumption could not be proven empirically. To verify this assumption an additional questionnaire or survey would have been needed.

For the majority of the questioned executives exergames have the potential to be included as a part of workplace health promotion. However, the potential to offer exergames in their company is judged critically. Although the majority of the respondents (47.5 percent) could imagine the implementation, 30 percent were of contrary opinion. Further, 22.5 percent are neither for nor against exergames in the context of workplace health promotion. This shows the strong influence of the previously described knowledge on the perception of the potential.

Exergames greatest potential from the executive perspective lies in the motivating effect to foster physical activity at the workplace. Half of the respondents believe that employees can be motivated through exergames to be active at the workplace. Especially employees who couldn´t be reached by motion promoting offers are expected to be motivated to exercise more by this innovative measure. This may be due to the

fact that exergames can be assigned to the low-threshold measures. Since neither a special nor prior experience or a certain level of physical fitness is required, the entry barrier to participate in exergaming is low. Accordingly, exergames can be a useful complement to existing motion promoting offers and widen the scope of the measures in workplace health promotion.

A very clear statement was made by the executives about the potential of exergames as a tool for stress reduction. 62.5 percent of respondents believe that exergames are very capable of relieving employees' stress at the workplace. Only 2.5 percent disagree with this opinion. The high level of support may be due to the fact that the psychological stress increases in the daily work along with the workload[229]. Especially affected by this burden are executives[230]. Moderating and balancing activities, such as exergames, that are integrated into the daily work can thereby help to maintain the employees' performance. The positive relationship between exercise activity and stress reduction has been proven empirically[231]. Within the working day routine it is however difficult to achieve enough exercise to generate this effect. Exergames could therefore be a mean, to be used in short breaks to stimulate the cardiovascular system and generate this effect. Furthermore it was stated by over 50 percent of the respondents that exergames have the potential to enhance and increase the physical well-being of participants.

Overall, the potential of exergames as a measure of workplace health promotion is seen positively from the executives' perspective. The executives can imagine that exergames can be included as part of workplace health promotion and even offered in their company. In their view the measures involve a motivating effect and are a good complement to the offered physical activities due to this effect. The executives are convinced that exergames have a positive effect on the physical wellbeing and can further help to reduce the stress level of employees at the workplace.

The following section clarifies the question whether exergames would be accepted as a measure of workplace health promotion by the executives of the Allianz IT. As mentioned before for the online questionnaire the behavioral intention to use exergames is equal to an estimated acceptance of exergames due to the issue that real behavior

[229] cf. (Koolhaas et al., 2011), cf. (Franke, 2007)
[230] cf. (Franke, 2007)
[231] cf. (Hassmén, Koivula, & Uutela, 2000)

cannot be reported and observed via a questionnaire. With an average scale value of 3.82 on the seven point Likert scale, the exergames' acceptance as a measure of workplace health promotion can be called mediocre. The successful implementation of the measure appears unlikely considering this outcome.

This result is interesting because the executives have assessed the potential of exergames with a scale value of 4.69. Furthermore, the attitude towards using exergames with a scale value of 4.54 was high and can therefore be ascribed a positive tendency. This then, however, begged the question, how the value of the acceptance can be explained. To clarify this, a correlation analysis was carried out to reveal the statistical correlations of the aforementioned suspected influence factors on the acceptance of exergames.

4.3.1 Hypothesis testing

The first hypothesis suggested a positive relationship between the attitude of executives towards workplace health promotion and the attitude towards exergames as a measure of workplace health promotion.

- H1: The greater the attitude towards workplace health promotion, the better is the attitude towards using exergames

This hypothesis was confirmed. Between the two variables a R-value of .312 ($p > .05$) was observed, which indicates a significant, albeit weak positive association at a significance level of five percent. This result can be interpreted in such a way that the executives' attitude towards exergames in workplace health promotion is improving with their positive attitude towards workplace health promotion.

However, since correlation analyses do not represent a method which allows for the detection of cause-effect relationships, it cannot be statistically proven that the attitude towards workplace health promotion is an explanatory variable for the attitude towards exergames as a measure of workplace health promotion. It would also be possible that the attitude towards exergames determines the attitude towards workplace health promotion and that thereby both variables affect each other or that a third or further variable causally affects both variables. To uncover potential causal analysis point's, a

multivariate analysis needed to be conducted. This also applied to the interpretation of the following hypotheses:

The second hypothesis suggested a correlation between the priority given by the executives to the topic and the attitude towards using exergames as a measure of workplace health promotion.

- H2: The higher the priority of workplace health promotion, the better is the attitude towards using exergames

This hypothesis was rejected. Between the two considered variables no statistically significant correlation could be found. This result can be interpreted such as that the executives' attitude towards using exergames is unrelated to what priority is assigned to the management of workplace health promotion.

The third hypothesis suggested a correlation between the knowledge of executives about exergames and the attitude towards using exergames as a measure of workplace health promotion.

- H3: The greater the knowledge about exergames, the better is the attitude towards using exergames

This hypothesis was confirmed. Between the two considered variables a R-value of .427 (p> .01) was observed, which indicates a significant moderate connection at a probability error of one percent. This result signifies that the attitude towards using exergames improves with the executives' knowledge about exergames.

The fourth hypothesis suggested a positive relationship between the expected potential of exergames as a measure of workplace health promotion and the attitude towards using exergames.

- H4: The greater the potential of exergames, the better is the attitude towards using exergames

This hypothesis was confirmed. Between the two variables under consideration a R-value of .837 (p> .01) was measured. This shows a significant positive strong correlation at an error probability of only one percent. Therefore it can be concluded

that the attitude towards using exergames as a measure of workplace health promotion rises with the potential which is attributed to exergames by the executives.

The fifth hypothesis suggested a positive relationship between the perceived usefulness of exergames and the attitude towards using exergames as a measure of workplace health promotion.

- H5: The higher the perceived usefulness of exergames, the better is the attitude towards using exergames

This hypothesis was confirmed. Between the two variables a R-value of .905 (p> .01) was calculated. Hence, a strong significant positive correlation could be confirmed with an error probability of only one percent. This result proves that the attitude towards using exergames improves along with the perceived usefulness of exergames by the executives.

The sixth hypothesis suggested a positive relationship between the expected ease of use of exergames and the attitude towards using exergames as a measure of workplace health promotion.

- H6: The higher the perceived ease of use of exergames, the better is the attitude towards using exergames

This hypothesis was confirmed. Between the two considered variables a R-value of .720 (p> .01) was found. This shows a strong significant positive correlation between the variables at an error probability of only one percent. Therefore, it can be assumed that the attitude towards using exergames as a measure of workplace health promotion is improving with the perceived ease of use of exergames by the executives.

The seventh hypothesis suggested a positive association between the attitude towards using exergames and the behavioral intention to use exergames as a measure of workplace health promotion.

- H7: The better the attitude towards using exergames is, the higher is the behavioral intention to use exergames

This hypothesis was confirmed. Between the two considered variables a R-value of .856 (p> .01) was calculated, which implies a strong significant positive correlation at an error probability of only one percent. Thereby, the executives' acceptance for exergames as a measure of workplace health promotion is greater, the more positive their attitude towards using exergames is.

The online questionnaire of the Allianz IT executives has led to the conclusion that the respondents find a high potential for exergames as a measure of workplace health promotion, for example to motivate inactive groups of employees to be physically active. However, at the time of the questionnaire the measure's acceptance could not be described as sufficient for an implementation. As the knowledge on exergames was identified as a possible determinant for the measure's acceptance it seems useful to inform both the executives as well as the employees about the effects of exergames to ensure the better acceptance of the measure in the future. In conclusion, it was decided to conduct field experiments among the employees in order to take their needs into account for the design of an exergames measure.

5. Experimental testing in a workplace environment

In this chapter the implementation of exergames in a workplace environment as a possible part of health promotion is experimentally tested. For this end, three experiments were conducted, each providing further insights into different topics in the successful incentivation of regular exergame use. The experiments took place at different locations of the Allianz insurance in Munich, with runtimes up to six weeks.

5.1 Field experiments

The implementation of experiments in the context of a company can be very complex due to many external influence factors on the experiment such as e.g. employees' holiday phases, fixed regular working hours, disease phases of flu among the employees in spring and autumn and similar factors which can lead to an inhomogeneous participation throughout the experiments. Other organizational difficulties arose from the setting, which can´t be, in any case, completely freed from external influence factors on the experimental results. Because of this, it was decided to evaluate the topic at hand in three separate field experiments, each focusing on one especially relevant aspect for the successful implementation of exergames. By this, the complexity of the experiments was reduced and possible error or falsifying sources in the experiments could be managed more carefully. It was thereby possible to apply different field experimental designs which allowed e.g. for the generation of experimental data on the aspect of usability of the exergames consoles[232].

5.1.1 Usability experiment

For the implementation of exergames in the workplace environment the, at this point of time, most relevant gaming consoles which were identified through the market analyses were chosen for the first experiment and further testing. A brief presentation on all three devices can be found in chapter three, which provides an overview over the development and individual characteristics of the devices. Following, the recent consoles' development is presented, as well as the game selected for the experiment. Afterwards the chosen test instrument and the experimental design is presented.

[232] cf. (Station, 1926) for the concept of Latin Square arrangement and replicable experimental data.

5.1.1.1 Approach

For the experiment the three most popular exergaming consoles were chosen. Especially the Nintendo Wii and the Xbox 360 Kinect are often used in comparable studies[233]. In Figure 26 the market development from the years 2008 till 2011 is depicted. Only recently the three devices reached a comparable market share. As one can see the respective number of sold Wii´s is declining over the years since the competitors adapted the concept of movement based input (which is required for exergaming) for their console systems.

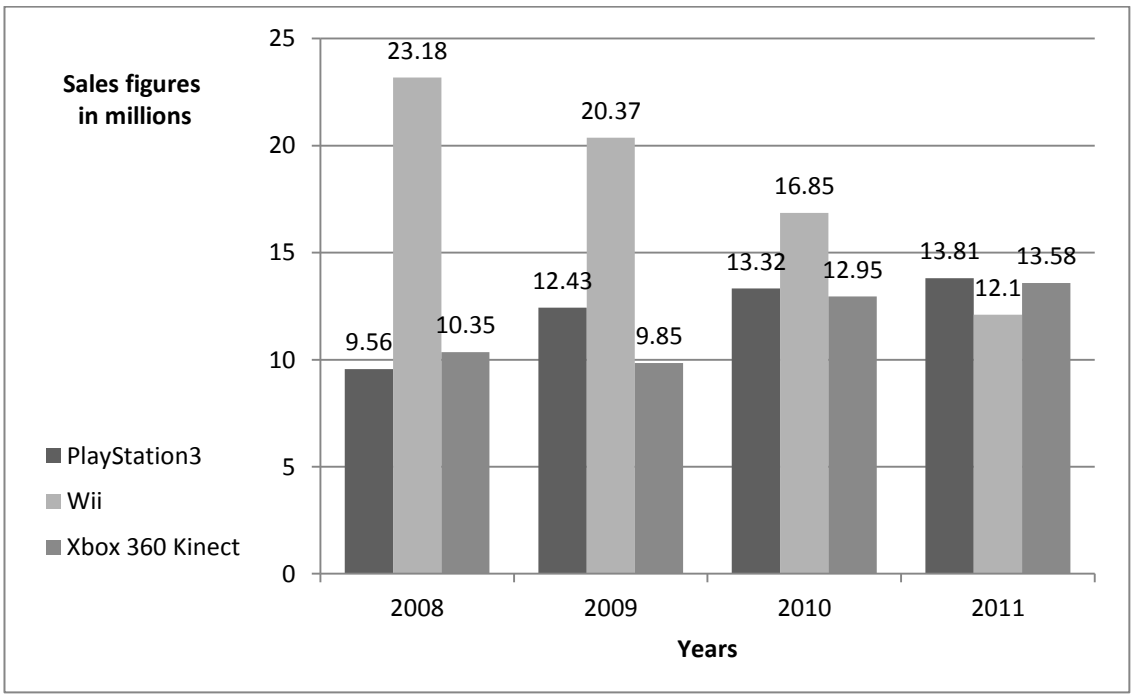

Figure 26: Sales figures of exergaming consoles (Source: Own diagram, cf. (STATISTA, 2013))

[233] cf. (Chamberlin & Gallagher, 2008)

Figure 27 shows the gaming consoles used for the experiment with the Wii, Xbox 360 Kinect and Playstation 3 together with the respective console version of the tennis game Topspin. On the right side the additionally required Playstation Move camera is included.

Figure 27: Picture of the used gaming consoles Wii, Xbox 360 Kinect and Playstation 3 (Source: Own diagram)

5.1.1.2 Usability test instrument

The first experiment that took place was an experiment on the usability of the afore presented three main gaming consoles, which were identified as the most relevant technical systems for the use in an exergaming measure.

For the experiment the System Usability Scale (SUS) questionnaire was chosen. The SUS is a questionnaire developed and introduced by John Brook in 1986. Since then, the ten-item questionnaire "has been assumed to be unidimensional"[234]. This was not intended by Brook originally, but a factor analysis of two SUS data sets showed that it

[234] cf. (Lewis & Sauro, 2009)

covers two factors: the usability with eight items and the learning ability with two items (item four and ten). In this case, a Cronbach´s alpha of 0.91 indicated that the internal consistency of this was excellent[235]. The SUS is answered on a Likert scale, this means it is a procedure to measure the personal appraisal by rating the items on a scale which normally contains 5 or 7 points[236].

During the evaluation of the SUS scores, only one overall number will be generated. Individual scores are therefore not meaningful and should not be used in the interpretation of the results[237]. To compute the score, one has to apply different calculations depending on the item.

For the items in Table 20, the calculated score is the submitted score minus one. On a scale from one to five the possible result lies between zero and four.

Table 20: List of the odd items of the SUS questionnaire (Source: Own diagram)

Item	Statement
1	I think that I would like to use this product frequently
3	I thought the product was easy to use
5	I found the various functions in this product well integrated
7	I would imagine that most people would learn to use this product very quickly
9	I felt very confident using the product

[235] cf. (Bangor, Kortum, & Miller, 2008)
[236] cf. (Brooke, 1996)
[237] cf. ibid.

For the items in Table 21 the contribution is five minus the scale[238]. As for the other items, the score will be between zero and four.

Table 21: List of the even items of the SUS questionnaire (Source: Own diagram)

Item	Statement
2	I found the product unnecessarily complex
4	I think that I would need the support of a technical person to be able to use this product
6	I thought there was too much inconsistency in this product
8	I found the product awkward to use
10	I need to learn a lot of things before I could get going with this product

The sum of the "new" scores will then be multiplied by 2.5 and, resulting, one will obtain the overall SUS scale. The SUS can therefore score between zero and hundred. Interesting and fitting at the same time, evidence was provided by Tully and Stenson[239] that the SUS is particularly suitable for the experimental testing with only few participants. They compared five different usability tests by conducting a study with 123 participants who rated the usability of two websites. In a second round they created a Monte Carlo simulation to see which questionnaire would provide the "correct" answer with the smallest sample size. In this case "correct" means a significant t-test, consistent with a test conducted using the total sample size. The SUS and the Computer System Usability Questionnaire met this goal with only 14 participants. The Computer System Usability Questionnaire aggregates information about how good someone completes his task. As this information is not relevant for exergaming the SUS was chosen for the experiment to collect the user opinion on the usability of the gaming consoles.

Additionally, it must be mentioned that the questionnaire which was used in this experiment, was adjusted with respect to the non-native English speaking participants in the experiment: It was found that non-native speaker did not understand the word "cumbersome" used in item eight ("I found the system to be very cumbersome to

[238] cf. ibid.
[239] cf. (Tullis & Stetson, 2004)

use")[240]. Finstad proved that, for the results, it does not make a difference whether one uses "cumbersome" or "awkward", but "awkward" is more known within this group. Since only non-native speakers were expected to participate the word "awkward" was used in item 8.

Furthermore Bangor et al. confirmed this finding. In addition they proved that replacing "system" with "product" does not influence the result neither in a positive nor in a negative way[241]. As the Playstation 3, Wii and Xbox 360 Kinect are products, this alternation was implemented for all items of the experiments' applied questionnaire as well.

5.1.1.3 Experimental design

The experiment took place at an Allianz office location in Unterföhring in which a conference room was set up with three projectors. To give an overview, the most common gaming consoles were bought and the functionality and graphical user interfaces were presented to the participants. As presented afore the Playstation 3, Wii and the Xbox 360 Kinect were the most successful providers in this market at the time of the experiment. To gain comparable results, at least one sports game needed to be playable on all three devices by the experiment's participants. Therefore, the most circulated one was chosen with a tennis game[242], to ensure a comprehensibly easy entry for the participants, as the rules of the game are commonly known. To ensure the most comparable results for the tennis game between the different gaming consoles and to therefore reduce the influence factor of diverse user experience through different games, the game Topspin was chosen. It is a tennis game which is available on all three platforms and delivers the same game content, so that the participants could concentrate on the different usability issues of the gaming consoles. In addition, after the participants played a tennis match, some other sports were offered such as athletics, bowling, boxing, football and volleyball, in order to give the participants a broader impression of the gaming consoles' usability features through different movements that need to be performed in the games.

[240] cf. (Finstad, 2006)
[241] cf. (Bangor et al., 2008)
[242] cf. (STATISTA, 2013)

To play tennis on the Wii, every player needed one controller. The player had to choose which character he wanted to play and whether he is left- or right handed. Afterwards the game started.

At the Playstation 3, one needed two controllers per person to get the game started. One was for moving the racket and the other one to make the virtual tennis player run in the direction he is supposed to.

The Xbox 360 Kinect from Microsoft worked without any controller. The participants only needed their hands to navigate the tennis player and to play the ball, with their movement being recognized by the Kinect cameras.

Within two days, 21 employees from the Allianz IT department participated in the experiment. The participants were invited to the experiment via email and separate appointments were made in advance to exclude possible influence effects on the reported usability of the devices through observation of other participants. Except for three participants, everyone played in the requested and suggested team of two persons. This allowed a realistic gaming experience and further created the multiplayer situation which could have an influence on the perceived usability.

Following the concept of Latin squares, also known as rotation experiment, the partakers tried one console after another[243]. The experiment design of Latin squares arranges factors in n*n arrays with n symbols, which is shown in Table 22[244].

One examiner, who explained the task and helped in case there were any questions during the experiment, was present. Every participant started with a console that he did not know at that time. After playing for 15 minutes on the first device A_1 [245] he had to fill out the SUS questionnaire for this device and then move on to the next gaming console A_2, continuing with the same procedure. Here it was important that the participant responded to the SUS right after finishing gaming as this avoided the assessment of the gaming consoles to be relativized[246].

[243] cf. (McCall, 1926)
[244] cf. (Vogel & Zendler, 2009)
[245] in the following identified as 1st device, 2nd device and 3th device
[246] cf. (Bangor et al., 2008)

Table 22: Experimental design following the concept of Latin squares (Source: cf. (Vogel & Zendler, 2009))

A_1	**PlayStation 3**	**Wii**	**Xbox 360 Kinect**
A_2	**Wii**	**Xbox 360 Kinect**	**PlayStation 3**
A_3	**Xbox 360 Kinect**	**PlayStation 3**	**Wii**

Every participant was obligated to try tennis for at least seven minutes. In case he didn't or wanted to try other functions, he was allowed to do so during the remaining 8 minutes. As mentioned above, this allowed the participants to get a better impression of the three gaming consoles' usability. By letting each participant start with a console he did not know at that time, it was possible to reduce the bias which could be created through a familiar gaming console as the first test device. This experimental design allowed for each gaming console to be tested equally as the first deviceby seven participants and thereby ensured a comparability of the results in the analysis through identical testing numbers.

5.1.1.4 Analysis

In this part, the results of the first experiment are presented and analyzed. As described above, all participants had to go through the same procedure of testing the three gaming consoles. No one terminated the testing before finishing.

Table 23 shows the demographic distribution among the participants of the usability experiment. In total, 21 employees participated, 14 (66.7 percent) of these were male and 7 (33.3 percent) female. Ten participants; respectively 47.6 percent of partakers in

the experiment were under 30 years old. 38.1 percent were between 31 to 40 years and 14.3 percent were between 41 to 50 years. No participant was older than 50 years.

Table 23: Demographic distribution of the usability experiment participants (Source: Own diagram)

Variable	**Frequency** n=21	**Percent** %
Gender		
male	14	66.7
female	7	33.3
no information	0	0.0
total	21	100.0
Age in years		
< 30 years	10	47.6
31 – 40	8	38.1
41 - 50	3	14.3
51 – 60	0	0.0
> 61 years	0	0.0
total	21	100.0

In Figure 28 the mean results to the questions of the SUS test are presented. In this overview it becomes obvious that the Playstation 3 was rated lower in every single question and that there were only slight deviations between the Wii and the Xbox 360 Kinect. The participants always rated these two gaming consoles within an interval of one score point.

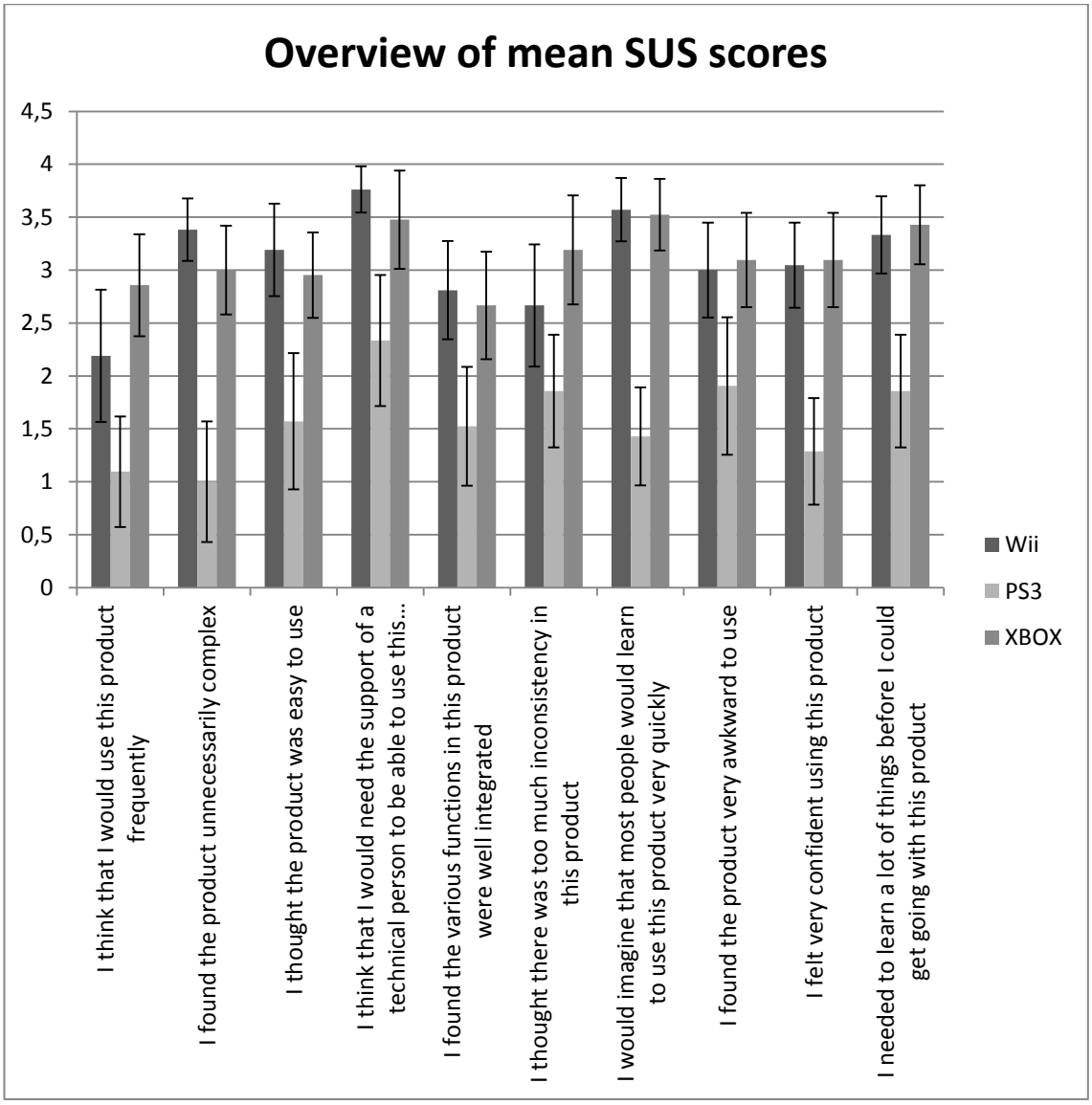

Figure 28: Overview of mean SUS scores of the usability experiment (Source: Own diagram)

The results in Figure 29 show that the Playstation 3 received a very low score, no matter if it was the first, second or third device the participant played with. If the participants started the series with the Playstation 3, they only rated it with 31.70 points. Remarkably though the participants who tried it second scored it 45.71 points, almost 14 points higher. When it was tested as the last device, it received 41.43 points on average. Overall, the lowest score for the Playstation3 was 10 points and the highest 80 points[247].

[247] for the results of the experiment please compare Table 34and Table 36 in the appendix

The Wii scored much higher than the Playstation 3 and almost as good as the Xbox 360 Kinect during the experiment. When tested as first device, it reached a SUS score of 74.29 points. Those participants who started with the Playstation 3 and then turned to the Wii ranked it even higher at 79.29 points. The participants who tried it at the end after testing the Xbox 360 Kinect and the Playstation 3 rated it slightly lower with 78.57 points. Overall the lowest score was 57.50 points and the highest 97.50 points[248].

The Xbox 360 Kinect satisfied participants' expectations best in regard to the usability. It scored 80.71 points as the first device, 70.71 points as the second device and 83.21 points as the third device. In average it was rated only about 1 SUS score point better than the Wii during the experiment. The lowest score was 50 points and the highest the perfect score of 100 points[249].

Figure 29 provides an overview of the results of the usability experiment. The SUS scores are listed for the three devices depending on their test position in the experiment. Additionally, the average overall SUS score is depicted.

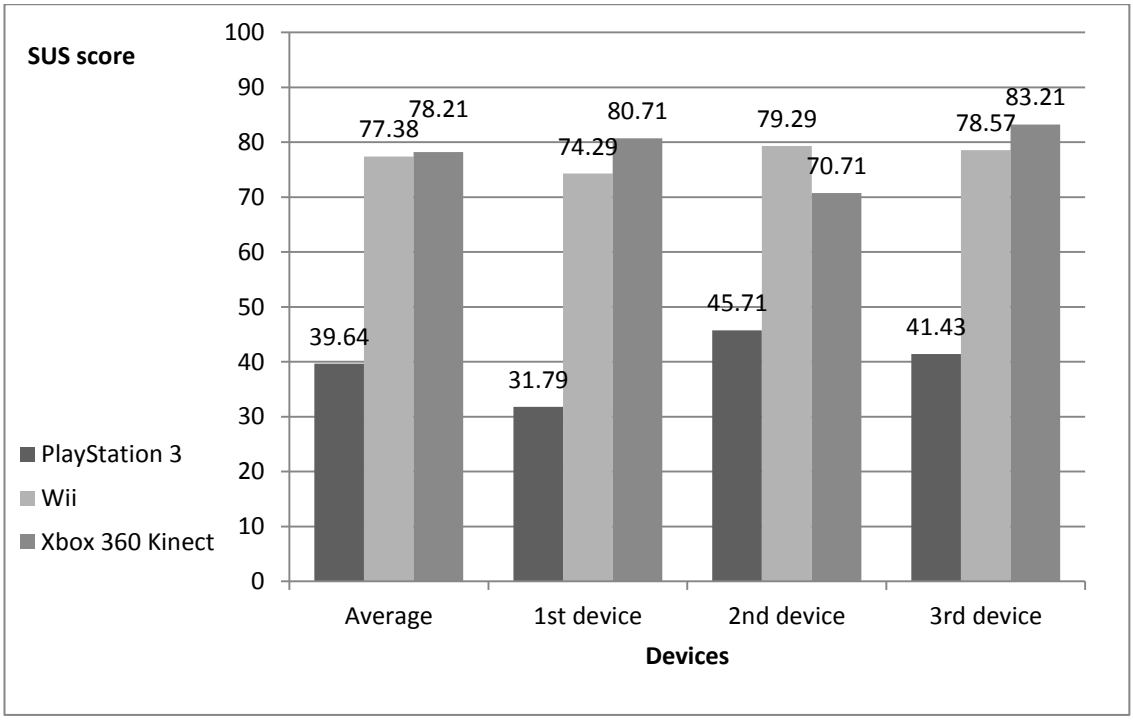

Figure 29: SUS scores of the experiment (Source: Own diagram)

[248] for the results of the experiment please compare Table 34 and Table 35 in the appendix
[249] for the results of the experiment please compare Table 34 and Table 37 in the appendix

The first experiment revealed a clear tendency on the usability aspect of the gaming consoles in favor of the Wii and the Xbox 360 Kinect. This out ruling of the Playstation 3 for the exergames application in a workplace environment was an important step, as the previously conducted expert interviews and online executives' questionnaire strongly suggested the "ease of use" criterion as a major influence on the successful implementation of gaming consoles as a measure of workplace health promotion. It was therefore shown that the Playstation 3 was not found suitable by the employees to be used as a device for exergaming. This is mainly attributed to the fact that the Playstation 3 is too complex in the menu guidance as well as in the technical implementation of the movement control, for which too many controller and buttons must be used by the player to play the games correctly. This was concluded from comments that the participants stated during the use of the device in the experiment and were documented by the examiner.

However, the device might offer other aspects that were not revealed during the usability experiment that are especially conducive for the use as an exergaming console. Because the participants had only 15 minutes per device to give their impressions, these might change if they received a longer timeframe and could get used to the complex handling of the Playstation 3. After this the games might offer a more challenging environment for the users, due to greater complexity, and provide a long term motivation to play them through better content.

To answer this question and to confirm the statement that the Playstation 3 is not fitted to be used as a device for exergaming in a workplace environment the device was included into the scenario experiment despite the low usability scores of the first experiment. Because the second experiment offers the possibility to use the different devices over a longer period of time, the conclusions drawn from the first experiment could be adjusted to reflect the correct suitability of the Playstation3 for a long term use for exergaming.

5.1.2 Scenario experiment

In this experiment different scenarios for the application of exergames in a workplace environment should be evaluated. Therefore, it was important to examine the employees' opinion on exergaming in the context of the workplace environment and to allow them to use the different gaming consoles over a longer timeframe to form their impressions on the measure.

5.1.2.1 Approach

Following, the research approach selected for the conducted scenario experiment is described. It included an experimental implementation of exergames into the workplace setting to evaluate the devices and possible scenarios for their use developed by employees. The results were directly observed by the examiner, as well as reported by the participants in a paper based questionnaire, which was handed out after the experiment.

The experiment took place at the location of the Allianz IT on 20 days during October 5th to November 9th 2012 in Unterföhring. The consoles were accessible from 9 am to 6 pm from Monday to Friday. These were employees' main working hours and allowed them use the devices before, during, or after their regular work. Especially important was the possibility to use the devices during short breaks, to offer a good alternative to classical physical activities like running or cycling, which are conducted before or after the regular work. The coffee kitchens where the experiment was set up were not closed off like the conference room used in the first experiment and could be visited by any employee at any convenient time. An examiner supervised the experiment at all times.

In the coffee kitchen, all three consoles were set up next to each other so that everyone who entered the room could see what opportunities for exergaming were provided. Those employees who did not know about the experiment got an introduction from the examiner about the possibilities and were encouraged to try different games on all three gaming consoles.

To consider the needs of the exergames potential users of the application in a workplace environment, it was necessary to count in several player characteristics that are known

and have an influence on the usage of the consoles. In theory, there is a distinction between several types of players due to different personality types. Player can be classified according to their behavior pattern they follow while gaming. Since 2008 the Bartle test of gamer typology[250] was applied more than 500.00 times[251]. The test typically totals 200 percent for all categories. For instance, a player can score 90 percent achiever, 60 percent explorer, 30 percent socializer and 20 percent killer. In general, only the strongest type is considered for the analysis[252]. In Figure 30 an exemplary overview of the player classification according to Bartle is presented.

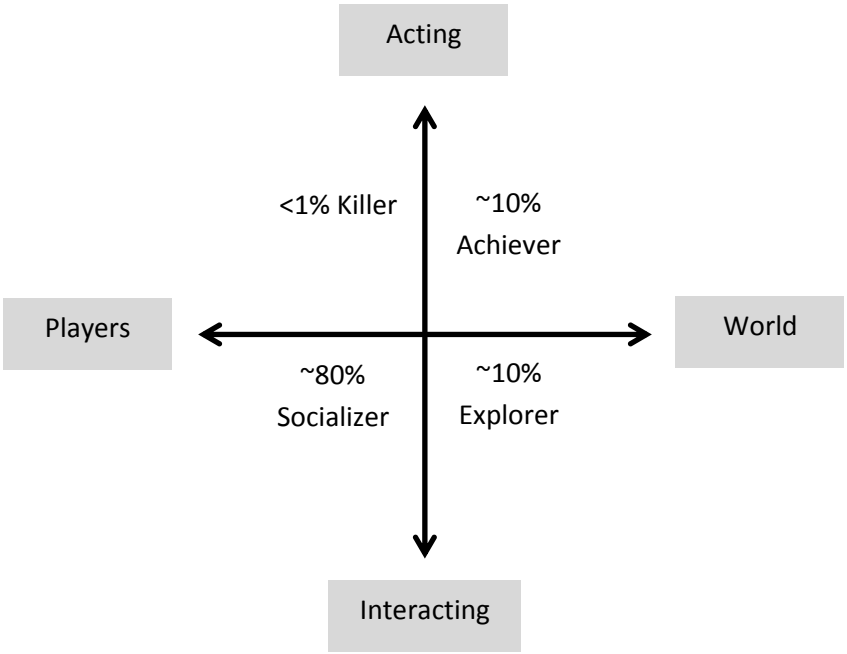

Figure 30: Bartle´s player types classification (Source: Own diagram, cf. (Heger, 2013))

The achiever wants to gain points, reach the highest level or the best equipment while he is gaming. He seeks a 100 percent completion rate just for the prestige that is associated with it. He enjoys the elite status and to show his superior gaming skills to others. He therefore tends to check the scoreboards to compare himself to others and to evaluate his position in the competition against other players. It can happen that he defines his own very special goals and thereby fully engage in repetitive actions until finally reaching them and accomplishing their set mission goal.

[250] cf. (Bartle, 1996)
[251] cf. (Williams, Yee, & Caplan, 2008)
[252] cf. (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011)

For the explorer, gaining points or levels is subordinate. Instead, he prefers to gain new maps, explore hidden places or discover new areas. He does not like restricted games that push him to the next level after a certain time. He can be characterized to be very fickle and tends to abandon a popular game while preferring and deeply delving into a less popular one.

The socializer tends to play games to connect with other people rather than to play the actual game itself. He likes games that allow him to play within a virtual environment with a controllable character and enjoys the interaction with other players during the gaming. The interaction can either be virtual or direct, i.e. with players in front of the same gaming console. Furthermore he prefers popular games that he can play together with other players.

Lastly, the killer likes to beat other players. He enjoys fighting against scripted computer controlled opponents and against actual player controlled rivals. A game therefore has to provide lots of action, fighting and destruction elements to keep him satisfied. He typically aligns himself with the evil side of a provided gaming character.

These presented general player characters prefer different games, but also, and most importantly for the experiment they prefer different settings and want to achieve different goals while gaming. The characteristics are essential to understand the employees fancy for the adaption of exergames in a workplace environment.

To motivate the employees for exergames in a longer term, other effects than just user characteristics must be considered as well for the experiments. As mentioned before, intrinsic motivation is an important driving factor for performing gaming[253]. When implemented in a workplace environment, games may therefore not only provide cognitive benefits, but also have positive effects on motivation, team spirit and the general attitude towards employees' sports. The Transtheoretical Model of Behavior Change (TTM) affords a theoretical access to different stages of intrinsic motivation to establish a sense for positive habits and to eventually reinforce them and make them consistent.

[253] cf. (Holbrook et al., 1984)

The TTM provides a model framework for the intentional modification of health behavior as a process in which several stages need to be passed consecutively and successfully by the participants[254]. In the beginning of the development the TTM was developed to encounter addictive and compulsive behavior[255]. In the process and application however, the TTM developed and was updated several times.

In the current form the TTM includes different stages of behavioral changes that develop over time and can be passed several times by a subject. The stages of change therefore take into account the temporal dimension of change. This is especially interesting for the context of a workplace environment, as it means that the model also provides a possibility to work for a long-term measure. Therefore, it is anticipated that the steps can be iterated several times by the employees and could lead to a positive impact. The different stages of behavioral change are presented in Figure 31. In the TTM five levels are examined, whose characteristics are described in the following paragraph[256].

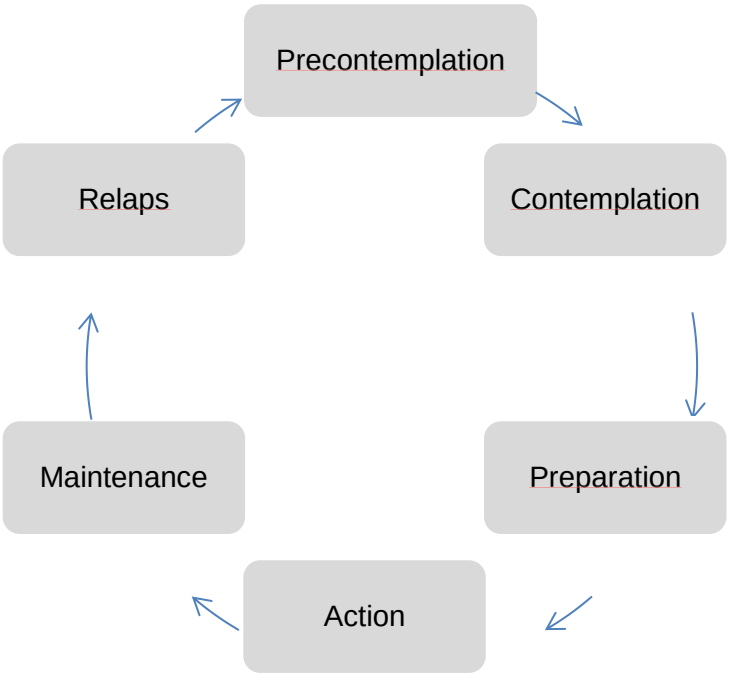

Figure 31: Transtheoretical model of behavior change (Source: Own diagram, cf. (J.O. Prochaska, DiClemente, & Norcross, 1992)

[254] cf. (J.O. Prochaska & Velicer, 1997)
[255] cf. (Miller & Heather, 1998)
[256] cf. (James O Prochaska, Redding, & Evers, 2002). cf. (Ströbl, 2008); cf. (Marshall & Biddle, 2001)

The model has five phases which have different impacts on the persons going through them:

Precontemplation: In the precontemplation stage, a behavior change has not yet taken place. The lack of contention could be caused by ignorance about the effects of the current state of the subject, but could also be a result of resignation after several failed attempts to change their normal behavior.

Contemplation: First thoughts about a behavior change are recognized in this phase and the subject is thinking about altering his current behavior. Irrational decisions by the subjects can sometimes appear during this stage.

Preparation: In the preparation phase, subjects that conclude their personal behavioral change must be initiated. They form a specific action plan and undertake the first steps of change. For the area of physical activity, this could e.g. be signing up for a health promotion activity at work or joining a fitness club.

Action: In this stage the subject starts to practice their newly obtained behavior (about six months). In this phase the risk of a subject's potential relapse into old behavior is the greatest and often leads to a restart in the above depicted cycle.

Maintenance: In the maintenance phase the applied new behavior has been practiced by the subject for more than six months. The risk of a relapse into old behavior is reduced as the behavioral change has been conducted over a longer time frame and is considered to be the "normal" everyday behavior.

The process of change along the phases can proceed covert or open and clearly visible for an examiner. The experience thereby depends on the individual subject or the social environment in which the behavioral change is performed. For exergaming in a workplace environment as a measure of workplace health promotion these stages need to be taken into account and further incentives must be created to support the employees in every phase due to their individual needs regarding the change process. It is therefore of utmost importance to connect the exergaming experience to one that happens in real life.

To address the different changes in this correctly, ten stages of change in the process were identified and divided into the two categories, cognitive-affective and behavioral processes, suggested by the model[257]. The later stages thereby represent the behavioral changes, while at the start the cognitive-affective processes play a larger role.[258]. In Figure 32 an overview over the categorization is provided.

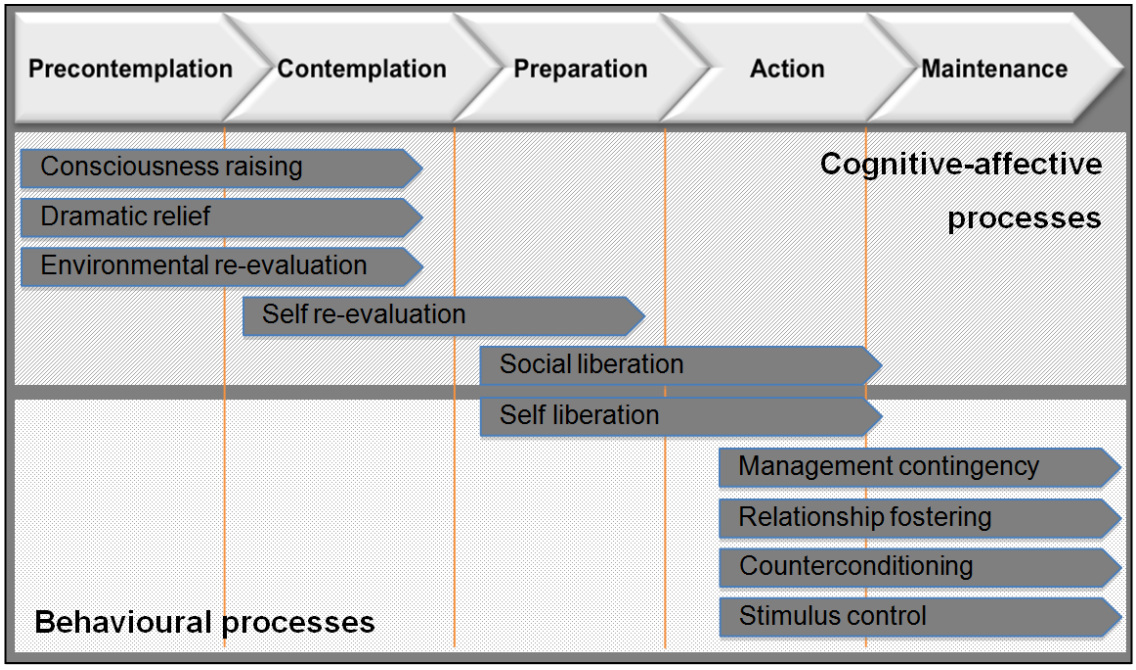

Figure 32: Processes of change in the TTM and their assignment to stages (Source: cf. (James O Prochaska et al., 2002))

Exergaming in a workplace environment supports some of the afore mentioned processes: it embeds the player in a social environment within his work. He can thereby learn that opportunities exist to connect physical activity with his workplace environment.

For the area of physical activity it is, however, still unclear whether the processes of change are all the same along every stage of the model. It is possible that they vary strongly in the application[259]. Additionally, meta-analyses on this topic indicated that both, cognitive-affective and behavioral processes are used more often with increasing

[257] cf. (J.O. Prochaska, Velicer, DiClemente, & Fava, 1988)
[258] cf. (J.O. Prochaska, Redding, Harlow, Rossi, & Velicer, 1994)
[259] cf. (Pahmeier, 2008)

stages of the participants[260]. Therefore it can be assumed that all processes of change are somehow influential at all stage levels.

For the experiment this model provided a theoretical background for the empirical testing of exergames in a workplace environment. Following, the model's application in the experiment is described and the evaluation via a questionnaire is explained.

To create a realistic environment the consoles were set up at two coffee kitchens during the experiment. This allowed the participants to use the devices during their short breaks of work and use them together with colleagues. The two kitchens were close to each other in a separate building of the company at a site in Unterföhring. This building was chosen, because the access is restricted to IT professionals, which allowed to easily control the experiment's participants. As the expert interviews suggested, that the implementation of exergames should be targeted to a specific user group, this circumstance allowed that only IT professionals could participate in the second experiment. Furthermore, the participants from the first experiment were excluded from this, since they already had formed opinions on the gaming consoles. This environment ensured that only a preselected group could participate and additionally it was guaranteed that they were all from the IT department and had least seen each other once before the experiment. This allowed for the best possible control over influences in the field. As stated in the entry of this chapter, this is important for the interpretation of the experiment results.

5.1.2.2 Questionnaire

After the experiment a questionnaire was handed out to all participants to evaluate their assessments of the gaming consoles in a workplace environment[261]. The questionnaire started with collecting the participants' most important demographic data (i.e. age and

[260] cf. (Rosen, 2000); cf. (Marshall & Biddle, 2001)

[261] cf. 8.3.2 Scenario experiment

Table 38 in the appendix for the questionnaire

gender). In item one the respondents were asked how often they exercised with the gaming consoles during the experiment. The answers were scaled in minutes per session and sessions per week.

Item two gathered information about which device was favored most by the partaker during the experiment. This item allowed a cross reference to the results of the first experiment in the later analysis and checked if the Playstation 3 is suited for the implementation of exergames in the workplace, beside the bad usability. To this end, every console had to be rated on a scale from one to ten points (while ten was the best score) according to how much the participants liked to use them in the workplace. In the case, two consoles received the same score, the participants were asked to identify which device they prefer most and why in item 3.1.

For the next item, the participants had to choose the support they need to perform exergaming in the workplace. Multiple choices e.g. department head were offered. The last item of the questionnaire suggested four different scenarios for the implementation of exergames. These scenarios should each address a specific user type and help to identify a possible scenario which is fitted best for the third experiment. As described above the scientific theory distinguishes between the achiever, explorer, socializer and killer. Therefore, the questionnaire presented four different settings that allow every gamer to fully engage in exergaming in a workplace environment.

The first question suggested an environment in which the department head or supervisor is in charge of organizing team events around the exergames console. In periodic time lags he invites his employees to use the console together (e.g. one hour of gaming activity per week). In this scenario the employees would come together, chat and do some exercises while gaming on the console. As long as the supervisor participates and signals that he supports exergaming, the employee will participate.

The second question in this category offered a competitive scenario for the employees. The person in charge will organize tournaments or a department /company-wide exergaming league in which colleagues can participate and competitively play against each other, while the gaming results will be noted and saved for comparison. Depending on the console and the sport offered, the participants could play with up to four members in one team (e.g. Xbox 360 Kinect bowling). These tournaments could be held

inter-divisionally to allow the employees to connect to colleagues from different departments. Through these competitions exergames could evolve to be a well-accepted activity within the company.

The third question implied a supportive setting for the employees. In this scenario not the supervisor, but someone external specialist is offering supportive measures for the use of exergames. This person has experience with exergames and / or teambuilding. Additionally, further instructions on how to use the console would best be offered by this person, providing new hints and introducing new games and their features. This scenario greatly helps inexperienced employees to join the group whenever they want and to adapt slowly and safely to the topic of exergaming.

In the last item, a scenario in which the employees would receive total autonomy in the use of the gaming console was described. Within the other settings the participants could, of course as well have the opportunity to develop their own gaming mechanisms and routines, but in addition they will receive support from either their supervisor or an external person once in a while. In this proposed scenario, the employees are responsible for themselves in the use of the console.

Additionally the last question offered the room for other suggestions that were not considered in the questionnaire.

5.1.2.3 Analysis

The questionnaire was handed out with a neutrally formulated introduction passage that was addressed to the participants. Information about the questionnaire's purpose and the assurance of anonymity for all statements made within it were provided by the examiner.

In the following part the questionnaire's results are presented, starting with the demographic results from the data analyses, followed by results for the items on the gaming consoles and the scenario.

The evaluation and analysis of the data was conducted with the statistical software SPSS version 17 for Microsoft Windows. For this purpose, the data was transferred into SPSS and coded according to the scale levels.

Table 24 depicts the demographic distribution of the scenario experiment participants. In the course of the experiment, 52 employees tried out exergaming in a workplace environment. 40 of them followed the invitation to fill out the questionnaire and completed it. The respondents were between 19 and 56 years old and the average age was 37.24 years. Overall the different age groups were homogenously distributed. The gender distribution however exhibits a 17.5 percent share of women and a 82.5 percent share of men. This circumstance can be attributed to the fact that the experiment was conducted in the IT department of the Allianz in an area of the building were only IT professionals were granted access. This led to an underrepresentation of women in this experiment.

Table 24: Demographic distribution of the scenario experiment participants (Source: Own diagram)

Variable	**Frequency** n=40	**Percent** %
Gender		
male	33	82.5
female	7	17.5
no information	0	0.0
total	40	100.0
Age in years		
< 30 years	13	32.5
31 – 40	12	30.0
41 - 50	11	27.5
51 – 60	4	10.0
> 61 years	0	0.0
total	40	100.0

As this experiments aims to suggest one scenario and an appropriate environment, it is necessary that the participants spends more time on at least two consoles. Those who exercised on one device only are included in the results, but have at least one console at

home and know about its usability and features already, so that even without trying it in a workplace environment, they were able to assess it.

The first item is aimed at analyzing the participant's attitude towards exergaming in a workplace environment. It concerns the term of playing with the gaming console. The respondent was asked to provide information about the minutes he invests per session he exercises and how many sessions he performs per week. On average, the reported time was 3.13 times per week with an average session duration of 14.26 minutes[262]. As this was the perceived time of use, it was conditional on the partaker's judgment. The directly observed and noted values of the examiner show that actually the training sessions lasted for 12.67 minutes on average[263]. This number does not indicate whether the employee really used the console, though. Often the participants arranged to play together in bigger groups. This meant that two used the gaming console, while the others were watching and commenting on the games.

The second item aimed to let the respondent remember the gaming console and was a transition to the item 3.1. The participant had to remember the different devices and their individual features. On a scale from 1 to 10 with 10 being the highest score, they had to give every console points. Thereby the participants were allowed to rate them with the same total points. Because of this, they did not have to choose a favorite device, but could indicate how much they preferred one. Here, the Playstation 3 performed poorly and scored 3.68 out of 10 points. The Wii received 7.70 out of 10 possible points and the Xbox 360 Kinect almost reached the total maximum with an average score of 9.18 points. In eight cases, the Wii and the Xbox 360 Kinect got the same score from a participant.

Item three implied a setting where the gaming consoles are already implemented in the workplace environment and are an accepted alternative to classical workplace health promotion measures. If the respondent rated one device over another device in item two, they also stated it as their favorite in item 3.1. When the Wii and the Xbox 360 Kinect scored equally, the respondents four times indicated that the device from Nintendo was

[262] cf. Table 40 in the appendix
[263] cf. Table 40 in the appendix

their favorite and the other 50 percent claimed that they preferred the Xbox 360 Kinect[264].

None of the partakers affirmed that they wanted to use the Playstation 3 in a workplace environment. Nine preferred the Wii and the solid majority of 31 out of 40 participants confirmed the Xbox 360 Kinect as the best device, as already found in the first experiment's results. An overview of the favored exergaming device is presented in Figure 33. Only eight respondents wrote a reason for their decision. For the Wii it was the intuitive handling and the usability and for the Xbox 360 Kinect mainly that there was no controller required to use the console, that the menu guidance was easy to understand and that the transfer time was the shortest. As this was an anonymous experiment, it is not possible to attribute these results with a corresponding time of usage, but the examiner's record emphasizes these results.

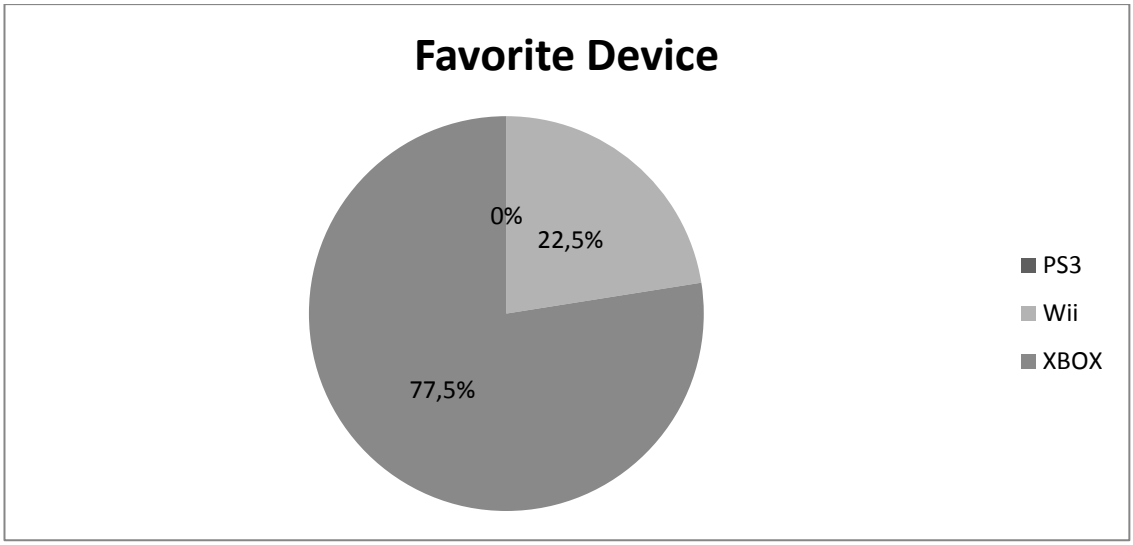

Figure 33: Favorite exergaming device in the scenario experiment (Source: Own diagram)

Within the experiment the respondents used the Playstation 3 for 318 minutes. This is compliant with 7.95 minutes per user. The Wii was in use for 502 minutes, which is in line with 13.94 minutes per user. This number seems rather low, but the main body of participants already knew this device. Most of the time, the respondents used the Xbox 360 Kinect. They used it 3745 minutes overall, which, on average, makes for 93.63 minutes per user. As explained before this does not mean that every participant actually

[264] cf. Table 39 in the appendix

played that long, but on average this was the observed time. The respondents stated that the usability and the missing controller were the reason why they picked the Xbox 360 Kinect as their favorite device.

In item 3.2 the participants had to answer whether they needed external support to feel comfortable playing exergames in the workplace environment or not. Multiple answers were permitted so they could check as many as they wanted. In Figure 34 the results of the item are presented along the possible answers in the questionnaire. Four male participants stated that they do not need support from anybody. Support from the department head would only help 3 participants. Most important seems to be the affirmation from their supervisor (26 votes) and their direct colleagues (30 votes). The possibility to label other support was not used by the participants.

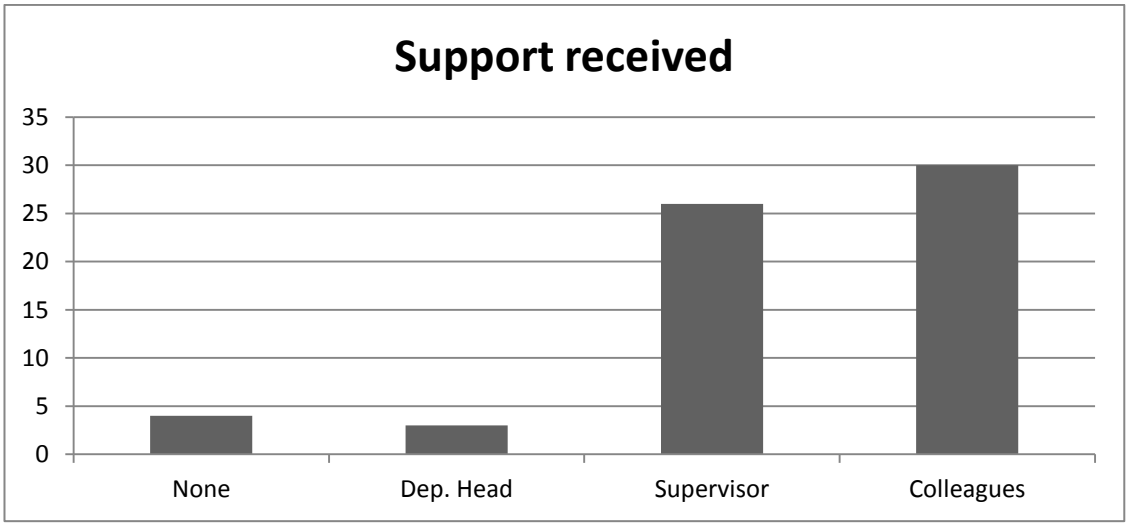

Figure 34: Requested support types in the scenario experiment (Source: Own diagram)

In item four, different settings were presented to the respondents. They answered which they would prefer for the implementation of exergames in their workplace environment. During the experiment an examiner always supervised the gaming consoles and answered participants' questions as well as motivated them to test the different devices. This kind of support cannot be implemented in a long term application of exergames. Therefore the employees could choose between four scenarios which could foster the use of the gaming consoles and thereby lead to a broader application of exergames. As

in item two the settings could be rated on a scale from 1 to 10 points with 10 points being the best. An overview of the results is presented in Figure 35.

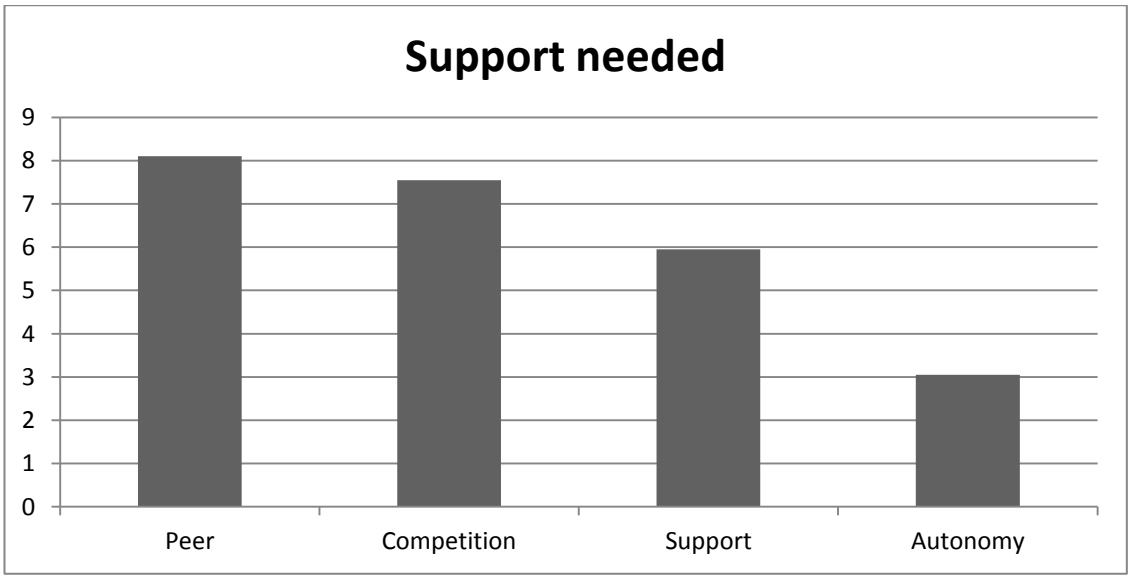

Figure 35: Sample distribution of the proposed exergames settings (Source: Own diagram)

Item 4.1 suggested a peer approach where the department head is in charge of organizing team sessions for the use of exergames. As found through the expert interviews and the online questionnaire for executives the aspect of acceptance is important during the implementation. The fact that, in this scenario, the department head shows his acceptance of the measure as such, reached the highest average score during the questioning, with 8.1 out of 10 points.

The next item described a scenario in which every couple of months a tournament would be hold within the company, where teams of employees could participate and play competitively against each other. A prize would be received by the winner, however, it was left open in the questionnaire what this price would be. No indication was given whether a title, merchandize price or else would be provided. This environment found the respondents approval with 7.55 points out of 10 points.

The setting presented in item 4.3 (external support) and in item 4.4. (No support at all - autonomy) were not as popular among the employees. The support scenario in which an

external staff would provide some guidance for the use of exergames and provide some training on new features received 5.95 points.

The autonomy scenario received the overall lowest score with only 3.05 points, suggesting the employees would not adapt exergames as a new measure in the workplace environment if they receive no further support and have to use the devices independently.

In item 4.5 the respondents had the possibility to add individual usages to the topic and suggest further scenarios, however, only two respondents answered. These two suggested a weekly session, not necessarily with the supervisor, but with direct colleagues. In half an hour per week or so, the whole team could come together in a steady environment and play against each other. This suggestion shows that some employees are keen to use the devices for exergaming and are possibly interested in using them in the long term. Furthermore, they can imagine to motivate their colleagues to join them in their effort and to create a team experience with a relatively short amount of time usage.

5.1.3 Motivation experiment

The third experiment aimed to identify the influence of externally induced changes on an exergaming measure at the workplace to increase the motivation of the employees, respectively to increase the participation rate and frequency of them. To remain motivated over a longer period of time, users of exergames might need additional incentives to keep exergaming, and therefore need extrinsic incentives (e.g. tournaments, group exercises) or intrinsic motivation (e.g. new products)[265]. Although the topic of motivation in a workplace environment is a well-researched field[266], the connection to technical innovations and health promotion has not yet been researched for the specific case of exergames. Since motivation is one of the most important factors for exercising a deeper analysis regarding this topic is necessary from the exergaming perspective.

[265] cf. (Kreps, 1997)
[266] cf. (Amabile, 1993); cf. (Fred D Davis, Bagozzi, & Warshaw, 1992)

5.1.3.1 Approach

For the experiment two gaming consoles were chosen. According to the previous experiments' results these where the Wii and the Xbox 360 Kinect. Due to their superior for the workplace environment usability compared to the Playstation 3 they are well suited for exergaming. The experiment was conducted at an office location of the AMOS SE IT in the area of Munich in the period from 10th December 2012 till 1st February 2013. This however included a break between the 21th December until the 7th January due to holiday. The different time periods were part of the experiment, which procedure will be described in the following. The consoles were accessible from 9 am to 6 pm from Monday to Friday. These reflected the employees' main working hours and allowed them use the devices before, during, or after their regular work.

To measure the impact of an employee's motivation towards the activity of exercising with a gaming console, a two treatment approach was chosen. For this, a control group and a treatment group were performing exergames in a workplace environment. The difficulty for the research objective of motivation in the context of a workplace environment are the numerous influence factors that can affect the motivation of an employee to participate. Nevertheless, to obtain data about this topic an easy and reproducible experimental design was selected to counter most of the problems of field experiments in an effective way. In Figure 36 the experiments' treatment design is depicted in a temporal sequence of events.

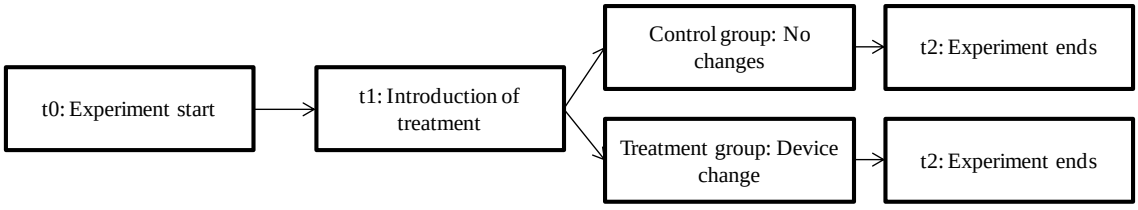

Figure 36: Experimental treatment design of the motivation experiment (Source: Own diagram)

In t0 the experiment started with two gaming consoles of a kind and lasted till the treatments are introduced in t1. This date was chosen to be after the holidays. After an introduction phase, which lasted the first two weeks of the experiment, the Xbox 360

Kinect was switched to a Wii to introduce a change for one treatment group. Afterwards, the experiment ran from t1 to t2 for four more weeks in two separate groups. The groups thereby were separate departments of the company which participated in the experiment. The selection of two departments was necessary to prevent the treatment group and the control group to exchange too much information and to thereby bias the result of the experiment through spill-over effects. Furthermore, the focus was on the motivation objective and no other topics in this experiment, in order to reduce the possibility that the participant's decisions could be driven by other factors than performing exergames on the respective gaming console. The participation among colleagues and the support and involvement of the department head were mentioned as a necessary requirement, compared to the other scenarios. Therefore, the aspect of a peer situation is enabled through this experimental design, as the participants directly know each other and have gaming sessions together, so that the prerequisite of colleague involvement is fulfilled.

5.1.3.2 Questionnaire

In order to evaluate the impact of the experimental setting on the employees' motivation, a post-experimental questionnaire was handed out to the participants. To this end, the Behavioral Regulation in Exercises Questionnaire (BREQ) was selected. This questionnaire is based on the self-determination theory of human motivation within social contexts. Here, one theory from Deci and Ryan is especially fitting for the context of exergames with the theory of Organismic Integration[267]. This theory integrates extrinsic incentives with factors that interfere with the behavioral change of the subject. Standage et al[268] provide a short taxonomy of the theory and its understanding of motivation:

> *"…motivation is structured in the form of a continuum that covers the different degrees of self-determination of behavior, from the non-self-determined, to the self determined, establishing three types of motivation (amotivation, extrinsic motivation and intrinsic motivation) and a series of behavioral regulation stages (amotivation, external regulation, introjected regulation, identified regulation*

[267] cf. (Deci & Ryan, 2011)
[268] cf. (Standage, Gillison, Ntoumanis, & Treasure, 2012)

and intrinsic regulation). Every one of the motivation types is determined by a series of regulatory processes, which can be values, rewards, self-control, interests, fun, satisfaction, etc…"

In Figure 37 the components of the described theory of organismic integration are depicted.

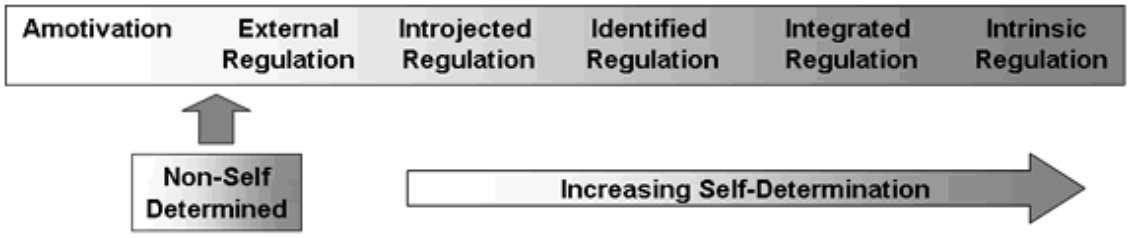

Figure 37: Overview of components of the organismic integration theory (Source: cf. (Deci & Ryan, 1991))

Out of this theory the so called BREQ was developed by Mullan et al. in 1997[269] to measure a set of regulatory variables for physical exercises. In the year 2004, Markland & Tobin performed a modification and update to the BREQ[270] to create BREQ-2 version[271] which is used today. The questionnaires' adaption and application to the topic of exergames has been performed in recent years for the test subjects of university students[272]. In this a positive efficacy could be observed, which was evaluated with the help of the BREQ-2 questionnaire, regardless of a small sample size.

The BREQ-2 consists of 19 items that measure the different stages of the self-determination continuum. It is thereby multidimensional in regard to the presented components of the organismic integration theory. An overview of the item sets in connection to scales is presented in Table 25. However, it can also be used as a one dimensional scale by calculating the Relative Autonomy Index (RAI). Therefore the subscales are weighted with different factors and a single RAI score is calculated, which then ranges from -24 to +20. The higher the score, the higher the motivation of a respondent then is in the context of self-determination and vice versa.

[269] cf. (Mullan, Markland, & Ingledew, 1997)
[270] cf. (Markland & Tobin, 2004)
[271] cf. (Markland, 2011)
[272] cf. (Jacobs et al., 2011).

Table 25: Overview of scales and items of the BREQ-2 (Source: (Markland, 2011)

Scale	**Item**
Amotivation	5,9,12,19
External regulation	1,6,11,16
Introjected regulation	2,7,13
Identified regulation	3,8,14,17
Intrinsic regulation	4,10,15,18

The questions are answered on a 5-point Likert scale that ranges from 0 (not true for me) to 4 (very true for me). Additionally, the participants' demographic factors age and gender are recorded. The time regularly required to answer the questionnaire is about 10 minutes per participant.

5.1.3.3 Analysis

In this section the results from the motivation experiment are presented and analyzed. At first, an overview of the descriptive results is given and afterwards further results concerning the reliability and correlations of the used scales are described.

The statistical evaluation and analysis of the data was conducted with the statistical software SPSS version 17 for Microsoft Windows. The data was transferred from the questionnaires into SPSS and coded according to the scale, and for the case of the RAI the weighting. A detailed description of the applied statistical methods for the executive questionnaire and was used likewise for the experiment, is given in chapter 4.2 of this thesis.

Table 26 presents the demographic distribution of the motivation experiment participants. A total 62 of employees participated in the experiment and filled out the post-experiment questionnaire. The respondents were between 21 and 58 years old and the average age was 38.53 years. The age groups were homogenously distributed with comparable shares for the first three age groups, with the smaller group being the of over 50 years old. The gender distribution in the experiment showed an overrepresentation of men with 74.2 percent of the participants being male and only 25.8 being female. As in the experiments before this, this skewed gender distribution may be attributed to the fact that the experiment was conducted in the IT business area of the Allianz which show an overrepresentation of male employees. Resulting, this leads to an underrepresentation of women in this experiment.

Table 26: Demographic distribution of the motivation experiment participants (Source: Own diagram)

Variable	**Frequency** n=62	**Percent** %
Gender		
male	46	74.2
female	16	25.8
no information	0	0.0
total	62	100.0
Age in years		
< 30 years	18	29.0
31 – 40	17	27.4
41 - 50	21	33.9
51 – 60	6	9.7
> 61 years	0	0.0
total	62	100.0

The scales provided first insights about participants' motivation, when the scales' mean values were compared to gender, age and the treatment group. In Table 27 the mean scale values are sorted by gender. Here the overall values of female participants

exceeded the scores of men in the categories of introjected regulation and intrinsic regulation. For the RAI however the difference was even larger at over 1.5 scale values.

Table 27: Mean scale values by gender of the motivation experiment (Source: Own diagram)

	Female	**Male**
Amotivation	1.41	1.46
External regulation	2.62	2.95
Introjected regulation	3.12	2.75
Identified regulation	2.58	2.65
Intrinsic regulation	3.23	2.79
Relative Autonomy Index	2.27	0.64

For the different age groups in the experiment it can be concluded that the oldest age group is influenced by external regulations. Furthermore, the age group of 41-50 years showed the highest overall RAI value of all age groups. An overview of the values is provided in Table 28.

Table 28: Mean scale values by age groups of the motivation experiment (Source: Own diagram)

	<30 years	**31-40**	**41-50**	**51-60**
Amotivation	1.42	1.49	1.45	1.42
External regulation	2.87	2.88	2.77	3.13
Introjected regulation	2.96	2.78	2.76	3.00
Identified regulation	2.49	2.59	2.70	2.96
Intrinsic regulation	2.97	2.91	2.90	2.71
Relative Autonomy Index	0.93	0.91	1.45	0.54

The most interesting results from the mean scale comparison of the experiment were, however, the scale values compared by treatments. In Table 29 the scores show a larger amotivation in the control treatment, as well as a higher level of external regulation and a much higher overall RAI for the device change treatment.

Table 29: Mean scale values by treatment of the motivation experiment (Source: Own diagram)

	Control treatment	**Device change treatment**
Amotivation	1.98	1.04
External regulation	2.46	3.18
Introjected regulation	2.70	2.96
Identified regulation	2.56	2.69
Intrinsic regulation	2.74	3.04
Relative Autonomy Index	-0.22	2.05

The scales' internal consistency was determined by the Cronbach's alpha. The scales' reliability was acceptable with values up to 0.844 for the intrinsic regulation, with the exception of the introjected regulation scale which only offered an alpha of 0.153 and can therefore not be assumed to be reliable[273]. A test for normality and a correlation analysis were carried out as well and the respective results can be found in the appendix in Table 47 with a Shapiro-Wilk test and in Table 43 with the correlation analysis among the scales including the RAI. As the experiment aimed at the research objective of overall motivation the interdependencies of the scales of the questionnaire are not described and analyzed in further detail. The experiment's data showed an interesting development among the treatments for the RAI scale.

In Figure 38 the difference for the calculated RAI between the treatment groups becomes visible. The overall reported motivation was higher in the device change

[273] For an overview of the reliability calculation see "8.3.3.1 Reliability of the motivation experiment scales" in the appendix.

treatment than in the control treatment. The change induced by the device switch after the introduction of the treatments could have resulted the increased motivation among this participant group. The treatments' external regulation scale, which was also reported as higher, supports this interpretation of the results. Items like e.g. "I exercise because other people say I should" received higher values and documented that the external change of conditions led to a higher reported motivation. However, a different interpretation of the results can also be given.

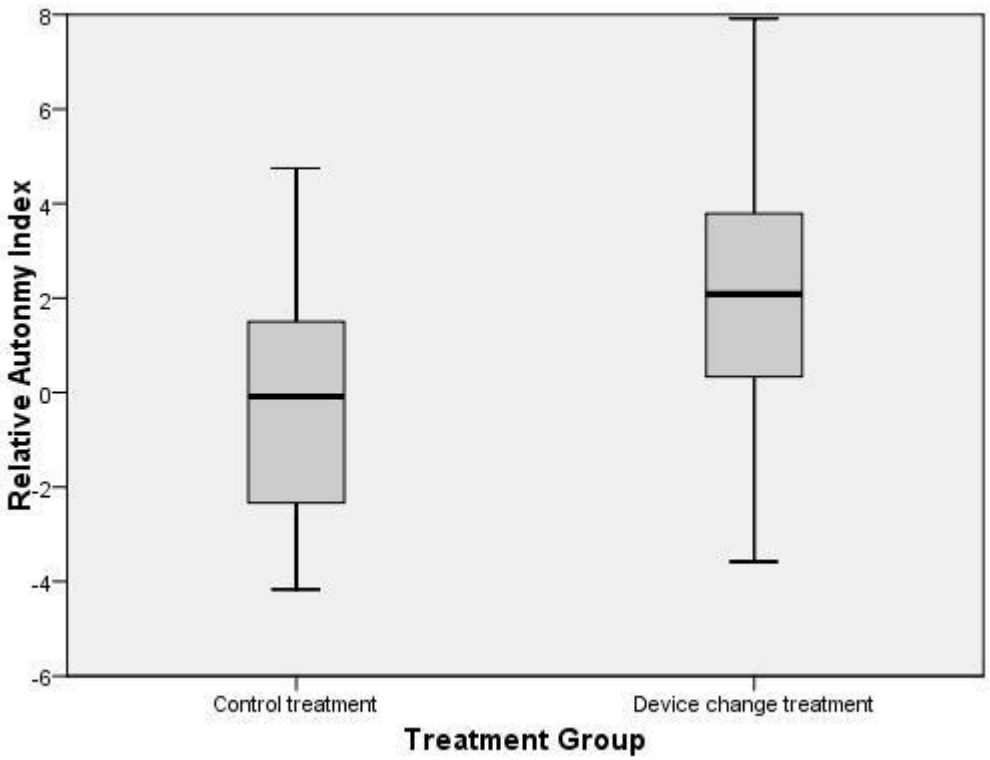

Figure 38: Boxplot per treatment group for the RAI of the motivation experiment (Source: Own diagram)

In Figure 39 the difference between the amotivation scales for the treatment groups is depicted. Here, one clearly sees that the control treatment reported a much higher level of amotivation than the treatment that received a device change. In the amotivation scale, statements are e.g. "I don't see why I should have to exercise" or "I can't see why I should bother exercising". Due to the amotivation in the control treatment, the motivation in the other treatment might not have been increased by the induced change, but the difference between the groups might be grounded in the demotivation of the

participants in the control group. As the experiment was conducted as a field experiment in a workplace environment, a communication, and thereby knowledge of the other treatments, couldn't be completely and effectively avoided. It can therefore potentially have led to a demotivation of the participants in the control treatment when they got to know about the device change for the other department.

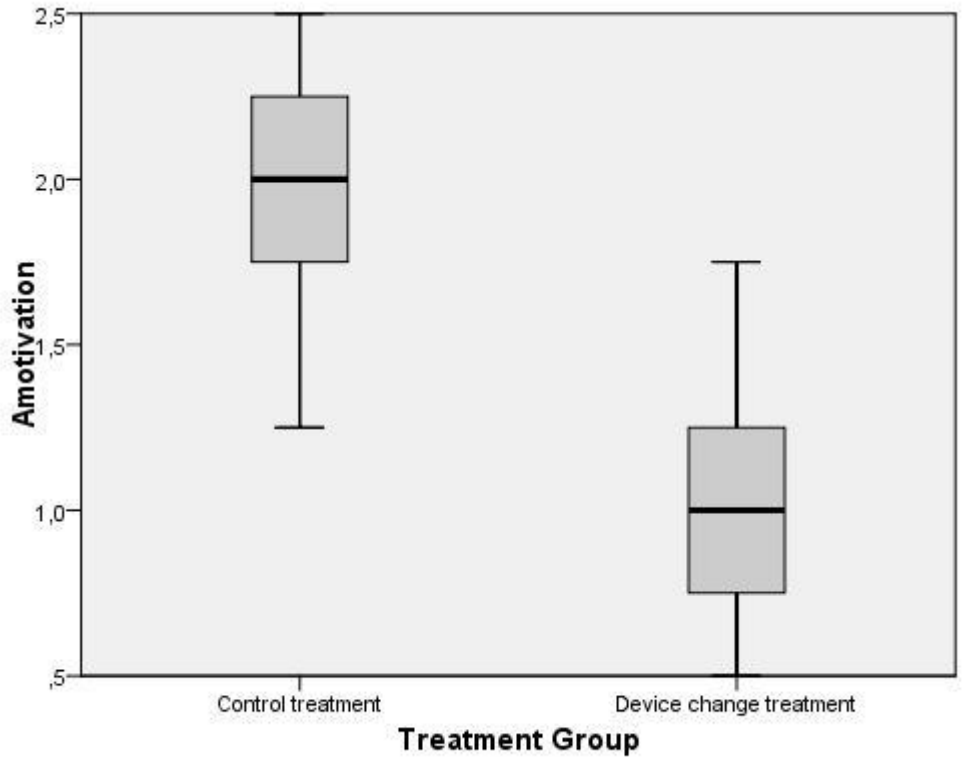

Figure 39: Boxplot per treatment for the scale amotivation of the motivation experiment (Source: Own diagram)

These reported values can be the result of the Hawthorne effect, which is generally a problem in field experiments[274]. It describes participants' behavioral change due to the fact that they know they are part of an experiment. However, this does not explain the higher amotivation in the control group, because the difference in motivation to the device change treatment can arise through the motivation of the participants that they are part of an experiment and there is interest/interaction with their treatment, instead with the participants of the control treatment.

[274] cf. (Adair, 1984)

Another explanation is that the John-Henry effect[275] could have occurred, in which case the control group would have become aware of the fact that they are the control group and would have changed their behavior relatively to the other treatment group. In general, however, this effect is not observed in a negative direction, but in the over-performance of the control group, as they try to compensate for the fact that they are compared to others. Therefore, the results do not clearly show a known reactivity effect by the participants to the different treatments in a field experiment. A higher motivation due to a device change can therefore be assumed, as well as a demotivating effect for the control group.

5.2 Evaluation of the major findings

In this section, the presented results of the three experiments are critically compared to each other and the applied theories. The provided literature overview on exergaming and its effects, as well as the SUS, TTM and the BREQ are taken into account for the discussion whether exergaming can have an impact when used in the context of workplace health promotion. Following this part, it will be analyzed which gaming console is suited best for a workplace environment, considering the results of the first and second experiment. By referencing the results, the settings and the needed support will be discussed and further learning's from the application will be drawn.

As presented in the end of chapter three, exergaming can have a positive impact on the level of users' concentration and is suitable for motivating them to moderate physical activity. Exergaming as a measure to improve physical activity or getting people to move from time to time is becoming increasingly accepted for the rehabilitation processes. The advantage of this setting is that during the application of exergames, participants are under medical observation and receive frequent support from medical experts. Within other contexts, such as workplace health promotion measures, the problem of high drop-out rates and an insufficient ability to reach the target group of people who would benefit most from exergaming subsists. To this end, a motivation treatment was tested in the third experiment, to allow for a statement as to whether motivation can be increased for exergames and to provide guard for this dilemma.

[275] cf. (Saretsky, 1972); cf. (Roth & Kagel, 1995)

Since it requires a certain level of activity the measure was seen as fitting in workplace environment to support employee's physical activity. Athletic movements are embedded in a playful context, which motivates the players to exercise. As it is only a moderate level of physical activity, the employees can mostly go back to their deskwork afterwards, without being negatively affected by the exercise, e.g. through exhaustion and the necessary relapse phase.

Korean researchers considered the cognitive benefits of such activities[276] and Mullins et al. proved that exergaming actually increases the physical activity of users[277]. This shows that the impact created by exergames is fostering the physical activity and concentration levels. Employees profit from breaks as they improve their level of attention. In addition, the contact with colleagues, which was observed during the experiments, has to be emphasized. It was noted, that employees rather prefer playing with their team members to playing by themselves and throughout the self-statements they testified to use exergaming to evoke stress reduction. These observations and statements are in line with the assertions from the executive questionnaire, in which a possible positive stress reduction through the measure is postulated.

However, this could not be clearly shown in the experiments, as well as clearly measured peer effects which can create a positive impact in the usage of the devices. The application of the TTM could be a tool to help the employees to stay motivated. The measure's acceptance as such was shown through the experiments and in combination with the questionnaires. The results of the third experiment then strengthened the assumption that employees' motivation to exercise can be fostered. Through small changes during the field experiment the BREQ provided an estimation of how the employees' motivation is influenced.

The experiments as well helped to answer the question "Which device is best suited for exergaming in a workplace environment". To this end, it is necessary to consider the results of the usability experiment, as well as from the scenario experiment. Both of them provided valid answers. During the first experiment users played three different gaming consoles, each for 15 minutes. For most of the participants not only the games, but every device was unknown until the experiment. As stated before, 15 minutes were

[276] cf. (Gao & Mandryk, 2012)
[277] cf. (Mullins et al., 2012)

hardly enough to experience all features of the different devices. Nonetheless, the results clearly revealed that the Playstation 3 seemed rather unsuitable for an exergaming measure in a workplace environment.

Of course, the system of the Playstation 3 is far more complex compared to the Wii or the Xbox 360 Kinect. Therefore one could assume, that in case the users had more time to use the device, they would like it more after trying it more often and understanding the underlying logic and structure of the system. Maybe this complexity would even lead to a superior position among the exergaming consoles. During the second experiment, however, the participants had the time to figure out all the provided devices' features. As shown in the results in the appendix, the employees' didn´t like to invest time into dealing with the console and learning its different features, when in a workplace environment[278].

It was noted that the participants neither understood the menu navigation nor did they like the solution of the movement based input and the response time of the controller. Furthermore, they did not develop any technical ambitions when playing the games. The results could not be improved throughout the second experiment which strongly suggested that the Playstation 3 is not fitted to be used as an exergaming console in the workplace environment.

As the first experiment's results revealed, there is only a slight difference between the Wii and the Xbox 360 Kinect in the SUS scores with a margin of only one point in favor for the Xbox 360 Kinect. This was by far not as unique as the Playstation 3 result. To figure out, which console works best as an exergaming device in the workplace environment, it was necessary to change the original settings for the second experiment and to test again whether the participants prefer one device over the other. That is also why the questionnaire in the second experiment forced the participants to give a clear answer on that topic. For the SUS this was not necessary.

From the first two experiments two conclusions can be drawn on the matter of determining a suitable device: Firstly, the SUS invented by Brook in 1986 submitted a reliable result irrespective of the small sample size and the limited time of testing. Secondly, according to the experiments the Xbox 360 Kinect seems to be the most

[278] cf. Table 40 in the appendix for the usage time of the consoles during the second experiment

fitting exergaming console for use in a workplace environment. This result is mainly attributed to the fact that, at the time of the experiments, the Xbox 360 Kinect offered the technically most advanced command input system of the three tested consoles, with the ability to track the motion of multiple users without game controllers.

Additionally, the scenario experiment helped to evaluate different possible settings for exergaming in the workplace. All participants attending the second experiment had 20 days to develop an opinion and to gather impressions about exergaming in a workplace environment. The evaluation of the results revealed a request for more support. The employees stated that most of them would only participate if it were a measure accepted by their supervisor and within the company.

The executive questionnaire, which was conducted in the same department within the company, showed that the executives see a high potential for using exergaming as a mean to improve the company's workplace health promotion. Over 90 percent of respondents stated that they needed further support to perform the measure. Most of them indicated that they appreciate the approval of colleagues and their supervisor. During the second experiment most of the participants played with or against their teammates and seldom against their supervisor. This, however, was changed in the third experiment, wherein the experiment was conducted in departments, which included the supervisors.

Three out of the four presented settings required a certain amount of commitment and communication between the team members and their supervisor. All of them were more popular that the forth setting, which suggested implementing exergaming, but without any framing or additional support. In contrast, the peer environment received the highest positive feedback. It presented monthly team activities around exergaming which are organized by the supervisor. The next best setting suggested a competitive approach where employees participate in an inter-divisional tournament in the company. A third framework offered support through external personnel. The introduction of new features, hints and offered explanations would be provided and new games introduced. This setting is most comparable to individual counseling, which is offered for many fitness related activities at institutions and clubs.

The recommendation on and further testing of a setting could not be made before taking the data sheet of the examiner's direct observations into account. As mentioned before, not every participant played all the time. This made no difference in the beginning, as some participants needed more time to feel comfortable with the devices and adapted slowly to participation, especially the female employees. This, however, is not uncommon, since women use computers and technical devices less frequently than men and show a lower computer related self-efficacy[279].

So gender differences in the first use of exergaming are expectable and with the result concerning the intrinsic motivation, a first notion for different required motivation mechanisms was found. In addition, all participating employees had to leave their desk to come together in the coffee kitchen to play. This habit benefitted team spirit, socializing and the fostering of communication among the partakers, even if they did not know each other before the experiment.

Except for two employees, who visited the kitchen during the second experiment, all tried exergaming within the 20 days. These two formerly mentioned were not included into the observation. Both, however, explained to the examiner why they did not want to participate: The first was worried to spend too much time in front of a monitor (the consoles however used a projector), and the second was concerned that exergaming could foster compulsive gambling habits among the employees.

These statements show that regardless of the framing and implementation of the health promoting measure, there will never be a measure which all employees see as fitting for them. However, the number of inactive employees can be reduced, as exergaming offers an alternative way of a health promotion, alongside the "classical" workplace health promotion measures such as gyms, running clubs and Yoga and Pilates sessions.

[279] cf. (Schumacher & Morahan-Martin, 2001)

6. Summary and future work

This thesis evaluated the incentivation of IT-based health interventions in a workplace environment. The advancing technological development provide new possibilities of health promotion activities for the workplace environment which were approached with different research methods in an iterative way and described in this work. The presented analysis provided further insights about the application of exergames as a health promotion measure in this context and revealed recommendations for the implementation.

After introducing the background information on health promotion, explaining the demarcation to disease prevention and providing the necessary information about the scenario of the workplace, the importance of the topic was pinpointed for research. Thereafter, three generally different approaches were described: First, a literature review to gather the relevant scientific information at the point of time and a market analyses which identified the current technological developments for health promoting activities were conducted. The expert interviews and the executive questionnaire then provided in-depth insights about complications that arise from the workplace context and further revealed motivations for the successful implementation of exergames. Lastly, the field experiments showed important factors for the implementation of a workplace health intervention with regards to the usability of the selected devices, the context of the scenario in which the devices are used by the employees and how motivation can be fostered. Together these steps helped to improve the knowledge about the application of exergames in a workplace and lead to a new promising model of health promotion.

6.1 Overview of the findings

To summarize the findings of this research approach, each methodology is shortly described with regards to the knowledge and insights gained from it. Following, the results will then be combined and a connection to the introductory research questions of this thesis is presented. The description thereby follows the presented research design of chapter two.

Literature review[280]: The systematic review investigated the effect of multiple incentives in worksite health promotion programs. The usage of IT based incentive mechanisms looked most promising for these programs. However, little evidence of such strategies could be observed and the number of studies including incentives apart from monetary rewards is sparse. Further research addressing this lack could help to improve the intervention programs and allow for a broader and more constant participation rate among employees in worksite health promotion.

A number of 23 studies were included into the review, after multiple iteration cycles which excluded 99.8% of the search results. The studies included a total number of 22,100 participants facing four different incentive mechanisms. While in ten studies classical incentives like monetary rewards were used to motivate the employees, seven studies included electronically supported mechanisms to improve the health promotion programs. It could also be concluded from the selected articles that the participation rate was more constant among the participants when different incentives were offered in the same workplace health promotion program.

Market analysis[281]: The market analysis documented the progress of the advancing technological development that is used for health promotion purposes. Growing out of the market for professional athletes, different solutions that find their way into the private sector are available nowadays. The adaption for the context of workplace health promotion, however, currently is sparse to non-existing. The leading sport goods manufacturers provide the solutions for monitoring various training data automatically and processing it to create individualized virtual training recommendations.

Furthermore, the growing market of mobile devices in combination with applications tailored to health promotion showed an interestingly development in recent years. Herein, different incentive mechanisms were found, such as the possibility for direct feedback during the exercise and the further integration into social networks which can provide mutual motivation and support for performing strenuous activities.

Lastly, the development of motion based gaming consoles was covered in this section. These devices chose a different approach to being included into the analysis for

[280] cf. (Kerssenfischer & Fritsch, 2012b)
[281] cf. (Kerssenfischer & Fritsch, 2012a)

workplace health promotion programs. As studies have shown for other target groups, e.g. elderly user[282] or users in rehabilitation[283], the devices offer the potential to improve the users' health conditions[284]. Overall, six aspects were identified in the analysis that can act as an incentive or motivation mechanism to be integrated into workplace health promotion via the usage of the reviewed technical solutions. The gaming consoles in combination with the development of exergames offered a promising and innovative solution for workplace health promotion. Therefore, the taxonomy for exergames was presented, to highlight the possibilities and the usefulness of this measure and to show the aptness for the further implementation and testing of exergames in this context.

Expert interviews[285] : The analysis of data from 23 semi-structured interviews with experts in different roles in the Allianz insurance company identified 12 key factors for the implementation of exergames in a workplace environment. Beside positive factors such as e.g. innovative, ease of use and cost-efficiency, the lack of experience with this topic, its general acceptance and the ability to activate the right target group were the identified as weaknesses of the topic as a result of the expert interviews.

Additionally, the most important criteria sorted by different user roles, were received from the interviewees. Here, the relevant target groups of employees stated that the ease of use and the innovative approach are most important for a successful implementation of exergames in the workplace environment. In addition, the executives were most concerned about the employee satisfaction with the newly discussed measure, as they see herein see a crucial factor for the positive development for exergames as a measure of health promotion.

Out of the findings from the expert interviews, a set of five recommendations was formulated for the further implementation of exergames. These recommendations were specifically issued for exergames in the context of a workplace health promotion measure and aided the later experimental testing. Interestingly, there were also counter-intuitive recommendations formulated in the interviews, such as the adaption of exergames to a specific user target group and in contrast to the clear communication of

[282] cf. (Gerling, Schild, & Masuch, 2010)
[283] cf. (Ahnert, Schuler, & Vogel, 2012), cf. (Göbel, Hardy, Steinmetz, Cha, & Saddik, 2011)
[284] cf. (Whitehead, Johnston, Nixon, & Welch, 2010);cf. (Chamberlin & Gallagher, 2008)
[285] cf. (Frederik Kerssenfischer, Svenja Simonsen, Tobias Fritsch, & Helmut Krcmar, 2013)

the measure to all employees of the company. Overall, the experts agreed upon the statement that health promotion will be an increasingly relevant topic for companies in the future.

Executive questionnaire: The questionnaire was conducted with 40 executives of the AMOS SE IT department and consisted of 40 items regarding the general topic of workplace health promotion and in particular the acceptance of exergames. A pre-test with 21 participants was done to ensure the correct linguistic perception of the questions, as well as the consistency of the content. A number of insights were gained from the results the questionnaire's results: In general, the executives' actual knowledge about exergames was reported to be low, however the potential of them to be integrated as a measure of workplace health promotion was rated very highly by the participants. The chance for an implementation, however, was estimated to be only close to 50 percent, leaving it unclear, whether a measure would receive the support of the important user group of executives.

The low acceptance of exergames at the moment was identified as a factor which dampens the support for an implementation. This fact can be countered by another finding of the questionnaire, which suggested that, with an increase of knowledge on the topic of exergames, the acceptance could be increased. Moreover, more than half of the participants stated that they believe that an exergames measure can motivate inactive employees to participate in health promotion activities.

In accordance with findings in the scientific literature, the responding executives were confident that exergames are a fitting measure to reduce users' the stress level. Over 60 percent held such an opinion and only 2.5 percent disagreed on that. The additionally conducted correlation analyses further revealed different prerequisites for the acceptance of exergames as a measure of health promotion in a workplace environment. In total, the questionnaire provided a good image of the current perception of exergames from the perspective of a company.

Usability experiment: The first experiment was conducted with 21 employees of the Allianz insurance company within the time span of two days, to test the usability of three exergaming consoles. As suggested by the results of the previous questionnaire

and expert interviews the ease of use can be seen as a critical factor for motivating employees to participate in an exergames health promotion measure.

The findings of this experiment were, that the Playstation 3 offers the lowest overall usability score, which out rules the gaming console for the implementation as an exergaming device. Its achieved score was, on average, only half as high as the score for the Wii or the Xbox 360 Kinect. These two gaming consoles, meanwhile, could not be differentiated in their usability throughout the experiment, as they scored exactly the same with only 1 percent difference in total score. This result was recorded regardless of the experience with the other devices and strengthens the fact that the usability was perceived as deciding factor by the participants.

Scenario experiment: The second experiment featured a testing period of 20 days for the employees of the Allianz IT department in the company location in Unterföhring. During the experiment, different data was received from the participants. On the one hand, direct observations were made during the experiment about on the usage of the gaming consoles. On the other hand, a paper-based questionnaire for evaluation was handed out after the testing phase. In total, a number of 52 employees participated in the second experiment and 40 filled out the follow-up questionnaire.

Interestingly, participants' self-reported session time of usage was, on average higher than the time directly observed by the examiner. This result, in combination with the overall average usage time of roughly one and a half hours per month per user, provides the first indications on how exergaming is actually used by employees in the context of a workplace. These numbers could provide a comparative baseline for further applications of exergames as a measure of health promotion.

The experiment also gathered information about the gaming consoles suited best for implementation in a workplace environments, which was reported to be the Xbox 360 Kinect, due to the missing required controller for input. The setup time, which is an important factor for the use in short breaks, is lowest and the configuration of the device for the employees is most intuitive. Additionally, different scenarios were presented to the participants and the support of the supervisor or a colleague was rated as a preferred possible implementation scenario. The approach of other health promotion activities to offer the user a great autonomy in the undertaking of the activity was, however, not

favored by the participants. Overall the scenario experiment provided good quantitative and qualitative data on the topic of IT-based health intervention in a workplace environment.

Motivation experiment: The third experiment was conducted over six weeks and featured two treatments, with a control group and a treatment group, in which the gaming console was changed in the course of the experiment. Two departments participated in this experiment and overall 62 participants filled out a questionnaire after the experiment, which was used to measure the participants' motivation to exercise exergames. No direct observations of exercise time or other variables were made throughout this experiment. The questionnaire revealed, that the motivation could be increased in the treatment that experienced a change in the gaming console from the Xbox 360 Kinect to the Wii. At the same time, the control treatment group reported a higher demotivation among participants. This effect can be attributed to the method of a field experiment, however, the known bias effects in their description for the situation do not fit and the experiment's results.

Additionally, the results suggested a higher intrinsic motivation of women during the exercise with gaming consoles than men and a stronger external motivation for elderly participants than younger ager groups in the experiment. For the context of an exergames as a health promotion measure in the workplace, this experiment covered the aspect of a motivational increase for the participants, which can be implemented in the course of a promotion. The change of the gaming console is thereby one possible measure to increase the motivation to exercise, among other options.

The experiment concluded the approach of the field experiments in a workplace environment and delivered the first evidence for a possible successful implementation of exergames as a measure of health promotion into this context.

6.1.1 Interconnection with the leading research questions

The thesis in the second chapter presented three research questions that guided throughout the investigation of the research topic by providing clearly stated questions that should be answered by the research approach. Following, these questions are answered with the knowledge gained from the different applied research methods.

Which IT focused features can be found in workplace health intervention programs?

The systematic literature review and the market analysis provided the results which were needed to answer the introductory research question. At first, the scientific literature provided an overview over different IT-focused features in health interventions. There it was shown that a dissemination of IT can be found throughout different health promotion programs. Most common are the coordination of the activities over a web portal which organizes the participants and provides background information about health promotion topics. Further, the messaging method of email can be documented to be a part of the workplace setting. There it is used for recruiting, coordination and information services. Another feature where computer based questionnaires or other types of self-reported forms, that are meant to provide custom-tailored feedback to the participants and increase the interaction and involvement with the health promoting measure. Lastly, in the scientific literature review, the trend to use additional IT devices or sensors in the programs was found. However, due to the novelty of this trend and the period of time required since an article is published, these information were rarely found for the case of the workplace.

This recognition started the further investigation of the market analysis to improve the knowledge about the currently available solutions that are - and can be – applied in the context of a workplace for health promotion purposes. Here, a number of interestingly developments were found, such as the devices of the leading sport good manufacturers (i.e. Adidas and Nike). They offer devices that include a broad range of services that aim to improve the experience of a sport activity. Features like a virtual trainer, automated data recording and training plans are available through the integration of GPS and heart rate monitors, as well as communication channels such as web portals or social networks. Even though the number of features that are offered by the products is large, the application within the context of a workplace is questionable at this point in time, due to the high costs that accrue by procuring a large number of devices for all employees.

The applications developed for smartphones show a very similar offered features, compared to the devices of the sporting goods manufacturers. Through the integrated GPS sensors and the mobile internet connection, these devices can offer the same

features as described above. Furthermore, they, in general, provide a faster analysis of the training data and even give cues to the user if he is close to a set goal and thereby motivate him further to exercise. Overall, the features offered by the applications on smartphones today can be compared to the services that where described by Knebel with the Personal Health Manager[286].

A third exciting development, which was found to emerge into health promotion purposes, but has not yet has been adapted for the workplace scenario, were the motion-based gaming consoles, e.g. Nintendo Wii or Microsoft Xbox 360 Kinect. These devices also offer a virtual trainer, but moreover, through the motion based input, turn the gaming experience through the motion based input into an exercise for the user. In combination with the level of competition that can arise from the gaming setting of the console, this makes for a fitting device for a workplace. In addition, this development has recently started to be scientifically evaluated under the term of exergaming and thereby found different application scenarios ranging from rehabilitation, countering obesity among children, as well as the fitness of the elderly.

Which incentive mechanisms should be used for workplace health intervention programs?

With the knowledge gained from the applied research methods to answer the first research question, a short set of possible incentive mechanisms emerged and was further evaluated. At first, these, included features that were directly connected to the chosen device for a measure of health promotion in a workplace environment. Automatic data recording and preparation of training data, individual training plans, direct feedback, and a social component that allows for information sharing and the possibility to enable a competition among the users were identified. Additionally, the importance of the combination of a larger number of incentive mechanisms in a single health promotion measure was highlighted. Nowadays, the programs, in general, provide one or two features, which are hardly enough to motivate a wide participation among the employees on a long-term basis. This is due to the fact that the mechanisms through which an individual can be extrinsically motivated to perform an activity are

[286] cf. (Uta Knebel, 2011)

heterogenically distributed among the users and must lead to a mixture of mechanisms to appeal to a large number of employees.

To this end, the incentive mechanisms for a measure can be categorized in two ways. The first is the above described understanding of the device's technical features, the second one are the incentives that directly arise from the company's environment, in which the measure is carried out. That is why different management and employee perspectives were included in the answering process of this question. From these, 12 factors and five recommendations arose, in the application of a SWOT analysis. The time efficiency of gaming within break time was thereby found to be a crucial point that has to be regarded for implementation. The low threshold of exergames is seen as fitting for health promotion purposes. Additionally, aspects that were identified are the cost effectiveness, the general satisfaction level and also the contradicting opinion of information transparency and anonymity of data connected to the health promotion measure. The high usability of the technical device was mentioned, as well as the high potential to increase the physical activity if a measure is seen as innovative by the employees.

A gap was found between the current knowledge about the measure of exergames and the greater understanding of the topic that is called for to evolve exergames' potential from it. Especially the notion of a combination of a measure that is suited to increase the physical activity and simultaneously reduces a user's stress level was considered to have a high potential for implementation in a workplace environment. This statement is even reinforced as the typical session time of exergames is shorter than comparable health promotion measures.

To answer the third research question of this thesis, these insights were processed in the experiments and provided the groundwork for upcoming works.

What can be learned from the application of motivational mechanisms in a workplace health intervention program?

The experiments at the Allianz insurance company provided a great number of insights about the implementation and application of exergames in the workplace. In the first experiment it was revealed that the usability of the individual gaming consoles greatly differs and that the different devices are therefore not all suitable for the workplace.

Even though the same game was tested with the three main gaming consoles at that time, the Playstation 3 was unfit to be used for corporate health activities. The overly complex movement input and menu guidance were major flaws compared to the controller-less Xbox 360 Kinect. In comparison, this console and the Wii were used to a great extent by the employees throughout the experiments, as they only need a short setup time and no further learning phase for the input control. This fact was decisive, as the consoles were seen as a good addition to other health promotion offers, but differed in the application, as they were used on short breaks between work or during a team event. Classic health promotion does not offer this degree of both individuality and team involvement, as it mostly consists of courses that follow fixed schedules.

The circumstances in which exergames should be introduced in a company were part of the second experiment. Here, the employees clearly stated that an environment that allows them to play together with their colleagues and their supervisor are favored compared to an autonomous use of the device. They also stated that a competitive component can as well be a part of it, as the gaming console offers a large variety of team exercises. Interestingly, the employees stated that they believe that exergames have an effect on their stress level. Although this couldn't be evaluated in this thesis, it is an important clue for the future research and application of exergames in the workplace environment. Moreover, the reported time spend exercising was on average lower than the actual time, which indicates that possibly a certain flow state could be achieved for the measure[287].

From the third experiment it can be concluded that motivation for exergames can be increased at the workplace. In the experiment the induced change was as simple as a switch of the gaming console after two weeks, which led to higher motivation in the treatment group. In combination with other identified measures, this could encourage the usage of exergames as a measure of health promotion.

[287] cf. (Csikszentmihalyi & Csikszentmihalyi, 1975)

6.2 Limitations

The research approach of this thesis was confronted with several limitations which each will be presented along with the applied research method. However, through the combination of different research methods it was possible to reduce the limitations so that more general statements can be made. The various methods applied each offer a unique way to evaluate the topic and to provide qualitative and/or quantitative data to advance the knowledge in this research area.

6.2.1 Conceptual and methodological limitations

Literature review: The literature review had to battle some limitations in the research process. First, the selection of online databases posed a challenge, due to the diverse nature of the topic at hand. While health promotion literature can be found in medical databases, the topic of incentives in worksite interventions can mainly be found in psychological literature and the aspect of IT solutions for this area is rare in itself. It is assumed that, with the selection of PubMed and JSTORE, the most relevant articles could be included into the literature review.

Second, the information provided in the articles was very heterogenic. Some publications included participant numbers, potential qualified employees, amount of incentives offered and a specific description of program components, while other articles failed to provide detailed information about these topics. This fact complicates the comparison of worksite health promotion programs in the literature review.

Third, due to the fact, that only English language articles were included into the literature review, a distorted picture is drawn, because the selected studies focused heavily on the North American work sector.

Fourth and finally, within articles assessed in the literature review, many included programs are conducted in field conditions at the workplace and therefore lack the necessary scientific accuracy and comparability. Under these circumstances, the gathered data always leaves room for interpretation due to factors which could have an influence on the result, but could not be excluded because of the field environment.

Market analyses: The market analysis was limited in its extent, as it had to be focused on exemplary devices and products of the presented categories. This limitation on three product types and, further, on a selection of devices or apps leads to a possible restriction of predictions that were drawn from the market analysis for the products' motivational effects.

This limitation had to be accepted just through e.g. the rapid development in the smartphone area and the connected app development which is directly attached to the new possibilities of newer smartphone hardware.

The same holds true for the development in the gaming console area. Although new generations of gaming consoles, such as the Wii U, were introduced by the manufacturers during the time period of the research[288], these possible improvements could not be analyzed, as the market analysis had already been conducted.

Expert interviews: The results are subject to a number of limitations. Firstly, all of the experts were from Germany, therefore an internationally representative statement cannot be drawn from the results and a German-centered view is presented.

Secondly, all experts were employed by the same company, so all statements made are situational for the specific company.

The findings showed how the predefined set of stakeholders described their thoughts on the topic at hand. All statements made are personal perceptions of the interviewees and not an assessment of underlying reasons and driving factors which motivated the given answers by the experts. At every possible occasion a cross-check of statements was made between the information provided by the participants and the publically available data, such as announcements, surveys and research publications.

Third, the interviewees' status as "expert" does not hold for all areas and explains certain biases. While e.g., management experts focused on aspects of motivation, the occupational health experts focused heavily on the possible health status improvement of employees after the introduction of exergames.

[288] cf. (Nintendo, 2012c)

Executive questionnaire: The questionnaire had to fight some methodological limitations. First, all of the experts were from Germany, therefore an international ly representative statement cannot be drawn from the results, and a German-centered view is presented.

Second, the number of possible participants was limited due to the focus on IT executives of the Allianz in Munich. This also implies that only the perspective of one company can be presented in this work and that in other companies different factors could have been found.

Third, the applied bivariate correlation analysis is a statistical method to determine the strength and direction of a relationship between two variables. It is not designed to identify causal relationships. For this purpose, the regression analysis represents the appropriate method.

This method could not be applied in the analysis, because several relevant premises for the application were infringed. The most important infringement is the premise of a normal distribution of disturbance factors, which has the consequence that the significance tests (F-test and t-test) are invalid for small sample sizes[289]. Since the test for normal distribution found that the assumption of a normal distribution can be rejected for all items, no regression analysis was possible. With the help of statistical methods, such as the artificial approximation to a normal distribution by removing statistical outliers or the transformation of data, a regression analysis would have been possible. However, this opportunity was not taken, due to the small sample size.

Experiments: The conducted experiments are limited in their meaningfulness due to some aspects of their design. Some of these aspects could be addressed through conducting three separate experiments to isolate the observed factor and to reduce the complexity and possible cross-influences; however, not all disturbances could be excluded due to the nature of field experiments. The research was conducted in the IT department of the Allianz insurance in the Munich area. Because of this, the results are only generically generalizable for the department. Within departments with a higher share of women, exergaming might not become as popular, due to a lower affinity for

[289] cf. (Backhaus, Erichson, Plinke, & Weiber, 2006)

gaming consoles compared to men[290]. In general, the experiments were possible subjects to the mentioned Hawthorne effect and John-Henry effect[291] that could have biased the results from the field experiments. This was, however, a necessary shortcoming, as the experiments' execution in a lab environment would, with certainty, have led to different results in the second and third experiment, as they could not have reproduced the working environment, the longer time period and the colleagues to the same extent as it was possible in the field.

Additionally, in the second experiment the TTM provided a theoretical background. The TTM is a widespread and relatively sophisticated model to explain behavioral changes[292]. Some aspects, and in particular its lack of empirical testing, are criticized by various authors. Two main points of the criticism are:

Firstly, it is debatable whether the stages of change in the model are discrete levels or just pseudo levels. For that case only a continuum would be categorized. The results on this proposition in the scientific literature are, however, inconsistent, so far. An overview of the current research strategies and results on this topic can be found in Ströbl[293].

Secondly, the effective directions of the variables in the TTM are not secured. In most cases, anticipation of self-efficacy and pros and cons are viewed as predictors of improvement. Conversely, scientific findings exist that sports performance has an impact on participants' cognitive variables (mutual interference)[294]. Summarizing this knowledge for the applied case of exergaming in a workplace environment, this would imply that employees need special treatments in the beginning to stay motivated and focused on the activity. To really change the employee's behavior it would therefore be important to support them during all stages of the model.

Overall, it can be criticized that the conducted experiments only allow for a short-term perspective on the behavior and reaction of the participants, as these can deviate from the observed results in a long term. This problem can, however, be found in several

[290] cf. (Ogletree & Drake, 2007)
[291] cf. (Adair, 1984); cf. (Saretsky, 1972)
[292] cf. (Pahmeier, 2008)
[293] cf. (Ströbl, 2008)
[294] cf. (Kanning, 2007)

workplace related field experiments, as the environment is not suitable for a long term RCT, which is standard in other areas of research.

6.3 Outlook

Further research should focus on the suggested settings for exergaming in a workplace environment and validate the results of this thesis. For this end, the recommendations and applied settings should be tested in different fields e.g. other companies and different branches. In addition, the SUS and BREQ can be used as a comparison tool to test, whether the Xbox 360 Kinect and the gaming consoles of the next generation are suitable for a non-IT context and other user groups, as well.

Overall, exergaming in a workplace environment is a possibility to support the employees within their daily routine to perform health promoting activities. However, the actual health improvements need to be evaluated in a further step, as the workplace environment can hardly be seen as sufficient to prove this, compared to a RCT conducted in research areas as medicine or pharmacology. The newly evolving research field of exergames can hereby benefit from ideas and research approaches from different practice areas.

Based on such insights it would then be possible to estimate the true beneficial impact of an exergaming measure for the purpose of health promotion. This is a necessary step to increase the acceptance of the measure among the established health promotion measures in a workplace environment.

7. References

Adair, J. G. (1984). The Hawthorne effect: A reconsideration of the methodological artifact. *Journal of applied psychology, 69*(2), 334.

Adidas. (2013). Official internet presence of Adidas miCoach. Retrieved 16.1., 2013, from http://www.adidas.com/de/micoach/

Ahnert, J., Schuler, M., & Vogel, H. (2012). Aktivierung und Stimmungsaufhellung bei depressiven Patienten durch Einsatz der Wii-Konsole: Machbarkeit und Akzeptanz.

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.

Amabile, T. M. (1993). Motivational synergy: Toward new conceptualizations of intrinsic and extrinsic motivation in the workplace. *Human Resource Management Review, 3*(3), 185-201.

Amundson, N., & Morley, J. (2002). Workplace wellness and worker well-being. *Technical and Vocational Education and Training in the 21st Century: New Roles and Challenges for*.

Antonovsky, A. (1997). Salutogenese. *Zur Entmystifizierung der Gesundheit. Tübingen, 119.*

Armour, J., Deakin, S., Lele, P., & Siems, M. (2009). How do legal rules evolve? Evidence from a cross-country comparison of shareholder, creditor, and worker protection. *American Journal of Comparative Law, 57*(3), 579-629.

Årsand, E., Tatara, N., Østengen, G., & Hartvigsen, G. (2010). Mobile phone-based self-management tools for type 2 diabetes: the few touch application. *Journal of diabetes science and technology, 4*(2), 328.

Ba, S., & Wang, L. (2013). Digital health communities: The effect of their motivation mechanisms. *Decision Support Systems*.

Backhaus, K., Erichson, B., Plinke, W., & Weiber, R. (2006). Multivariate Analysemethoden. Eine anwendungsorientierte Einführung. *Springer-Verlag: Berlin.*

Badura, B., Walter, U., & Hehlmann, T. (2010). *Betriebliche Gesundheitspolitik: Der Weg zur gesunden Organisation*: Springer.

Baicker, K., Cutler, D., & Song, Z. (2010). Workplace wellness programs can generate savings. *Health affairs, 29*(2), 304-311.

Bamberg, E., Ducki, A., & Metz, A.-M. (2011). Gesundheitsförderung und Gesundheitsmanagement in der Arbeitswelt. *Ein Handbuch. Hogrefe, Göttingen*.

Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An empirical evaluation of the system usability scale. *Intl. Journal of Human–Computer Interaction, 24*(6), 574-594.

Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD research, 1*(1), 19.

Baumann, R., Czarny, M., Flach, T., Hetzel, C., & Mozdzanowski. (2007). Teilhabe am Arbeitsleben durch Betriebliches Gesundheitsmanagement. In I. f. Q. i. P. u. R. G. a. d. D. S. Köln (Ed.). Köln.

Bechmann, S., Jäckle, R., Lück, P., & Herdegen, R. (2010). iga. Report 20. *Motive und Hemmnisse für Betriebliches Gesundheitsmanagement*.

Berg, B. L. (2004). *Qualitative research methods for the social sciences* (Vol. 5): Pearson Boston.

Biddiss, E., & Irwin, J. (2010). Active video games to promote physical activity in children and youth: a systematic review. *Archives of pediatrics & adolescent medicine, 164*(7), 664.

Bortz, J., & Döring, N. (2006). *Forschungsmethoden und Evaluation: für Human-und Sozialwissenschaftler*: Springer.

Brooke, J. (1996). SUS-A quick and dirty usability scale. *Usability evaluation in industry, 189*, 194.

Brosius, F. (2008). *SPSS 16*: Hüthig Jehle Rehm.

Bruner, G. C., Hensel, P. J., & James, K. E. (2005). *Marketing scales handbook*.

Bucholz, K. K., Cadoret, R., Cloninger, C. R., Dinwiddie, S. H., Hesselbrock, V. M., Nurnberger, J. I., . . . Schuckit, M. A. (1994). A new, semi-structured psychiatric interview for use in genetic linkage studies: a report on the reliability of the SSAGA. *Journal of Studies on Alcohol and Drugs, 55*(2), 149.

Bull, S. S., Gillette, C., Glasgow, R. E., & Estabrooks, P. (2003). Work site health promotion research: To what extent can we generalize the results and what is needed to translate research to practice? *Health Education & Behavior, 30*(5), 537-549.

Bundes, S. Ä.-d. (2011). Demografischer Wandel in Deutschland. Bevölkerungs-und Haushaltsentwicklung im Bund und in den Ländern. Heft 1. Wiesbaden, 2011.

Arbeitsschutzgesetz - Grundpflichten des Arbeitgebers, §3 C.F.R.

Bundesministerium-des-Inneren. (2012). Demografiebericht - Bericht der Bundesregierung zur demografischen Lage und künftigen Entwicklung des Landes. Berlin.

Sozialgesetzbuch 5, § 20 C.F.R.

Bundesverband-der-Betriebskrankenkassen. (2004). Auf dem Weg zum gesunden Unternehmen. *Argumente und Tipps für ein modernes betriebliches Gesundheitsmanagement.*

Bundeszentrale-für-gesundheitliche-Aufklärung. (1996). *Leitbegriffe der Gesundheitsförderung: Glossar zu Konzepten, Strategien und Methoden in der Gesundheitsförderung*: Fachverlag Peter Sabo.

Cahill, K., & Perera, R. (2008). Competitions and incentives for smoking cessation. *Cochrane Database of Systematic Reviews, 3*.

Carr, W., & Kemmis, S. (2003). *Becoming critical: education knowledge and action research*: Routledge.

Chamberlin, B., & Gallagher, R. (2008). *Exergames: Using video games to promote physical activity.* Paper presented at the Children, Youth and Families At Risk Conference, San Antonio, TX.

Chang, S. H., Chou, C. H., & Yang, J. M. (2010). The literature review of technology acceptance model: a study of the bibliometric distributions.

Chang, Y. J., Chen, S. F., & Huang, J. D. (2011). A Kinect-based system for physical rehabilitation: A pilot study for young adults with motor disabilities. *Research in developmental disabilities, 32*(6), 2566-2570.

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*.

Cousineau, T., Houle, B., Bromberg, J., Fernandez, K. C., & Kling, W. C. (2008). A pilot study of an online workplace nutrition program: the value of participant input in program development. *Journal of nutrition education and behavior, 40*(3), 160-167.

Csikszentmihalyi, M., & Csikszentmihalyi, I. (1975). *Beyond boredom and anxiety: The experience of play in work and games*: Jossey-Bass San Francisco.

Daniel, F., Casati, F., Silveira, P., Verga, M., & Nalin, M. (2011). Beyond Health Tracking: A Personal Health and Lifestyle Platform. *Internet Computing, IEEE, 15*(4), 14-22.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science, 35*(8), 982-1003

.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace1. *Journal of applied social psychology, 22*(14), 1111-1132.

Dearing, J. W. (2009). Applying diffusion of innovation theory to intervention development. *Research on social work practice, 19*(5), 503-518.

Deci, E. L., & Ryan, R. M. (1991). *A motivational approach to self: Integration in personality.* Paper presented at the Nebraska symposium on motivation.

Deci, E. L., & Ryan, R. M. (2011). Self-determination theory. *Handbook of theories of social psychology, 1*, 416-433.

Deplazes, S., & Künzli, H. (2010). Arbeit und Gesundheit–Betriebliches Gesundheitsmanagement. *Angewandte Psychologie für das Human Resource Management*, 435-449.

Destatis. (2010). Niedriglohn und Beschäftigung 2010. Berlin.

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). *Gamification. using game-design elements in non-gaming contexts.* Paper presented at the PART 2-Proceedings of the 2011 annual conference extended abstracts on Human factors in computing systems.

Dixon, S. (2003). Implications of population ageing for the labour market. *Labour Market Trends, 111*(2), 67-76.

Donner, A., Goldstein, D., & Loughran, J. (2008). Health e-games market report: Status and opportunities. *San Francisco, CA: Physic Ventures*.

Eckey, H. F., Kosfeld, R., & Türck, M. (2005). *Deskriptive Statistik*: Gabler.

Ederer, F. (2010). Feedback and motivation in dynamic tournaments. *Journal of Economics & Management Strategy, 19*(3), 733-769.

ENWHP. (1997). Die Luxemburger Deklaration zur betrieblichen Gesundheitsförderung in der Europäischen Union. Luxembourg.

Ermes, M., Parkka, J., Mantyjarvi, J., & Korhonen, I. (2008). Detection of daily activities and sports with wearable sensors in controlled and uncontrolled conditions. *Information Technology in Biomedicine, IEEE Transactions on, 12*(1), 20-26.

Faller, G. (2010). *Lehrbuch Betriebliche Gesundheitsförderung*: Huber.

Fink, A. (2008). *How to conduct surveys: A step-by-step guide*: Sage Publications, Incorporated.

Finstad, K. (2006). The system usability scale and non-native English speakers. *Journal of usability studies, 1*(4), 185-188.

Flick, U. (2009). *An introduction to qualitative research*: Sage Publications Limited.

Franke, A. (2007). Modelle von Gesundheit und Krankheit.

freegamesystems. (2013). Gaming consoles. Retrieved 26.1., 2013, from http://www.freegamesystems.info/images/All%20Systems.jpg

Fromm, S. (2011). *Datenanalyse mit SPSS für Fortgeschrittene*: VS-Verlag.

Gao, Y., & Mandryk, R. (2012). *The acute cognitive benefits of casual exergame play*. Paper presented at the Proceedings of the 2012 ACM annual conference on Human Factors in Computing Systems.

Garmin. (2013). Official internet presence of Garmin. Retrieved 16.1., 2013, from http://www.garmin.com/de-DE/explore/intosports

Gartner. (2012). Worldwide Mobile Device Sales to End Users by Vendor. Retrieved 17.12., 2012, from http://www.gartner.com/newsroom/id/2237315

Gebele, N. (2010). *Arbeit und Gesundheit: Zur objektiven Erfassung von Tätigkeitsmerkmalen nach dem Job Demand-Control Modell*. Universitätsbibliothek Marburg.

Gebert, A. (2009). Gesundheitsförderung und Prävention. *Beraterhandbuch—Präventive Hausbesuche bei Senioren. Hannover: Schlütersche Verlagsgesellschaft, 17*, 33.

Gegenfurtner, A. (2011). Motivation and transfer in professional training: A meta-analysis of the moderating effects of knowledge type, instruction, and assessment conditions. *Educational Research Review, 6*(3), 153-168.

Gerling, K. M., Schild, J., & Masuch, M. (2010). *Exergame design for elderly users: the case study of SilverBalance.* Paper presented at the Proceedings of the 7th International Conference on Advances in Computer Entertainment Technology.

Göbel, S., Hardy, S., Steinmetz, R., Cha, J., & Saddik, A. E. (2011). Serious Games zur Prävention und Rehabilitation. *Ambient Assisted Living-AAL*.

Goetzel, R. Z., Baker, K. M., Short, M. E., Pei, X., Ozminkowski, R. J., Wang, S., & Bowen, J. D. (2009). First-year results of an obesity prevention program at The Dow Chemical Company. *Journal of occupational and environmental medicine/American College of Occupational and Environmental Medicine, 51*(2), 125.

Gorgu, L., O'Hare, G. M. P., & O'Grady, M. J. (2009). *Towards mobile collaborative exergaming.* Paper presented at the Advances in Human-oriented and Personalized Mechanisms, Technologies, and Services, 2009. CENTRIC'09. Second International Conference on.

Graf, H., & Grote, V. (2003). *Betriebliche Gesundheitsförderung als Personal-und Organisationsentwicklung in Klein-und Mittelunternehmen aus Sicht von Führungspersonen: Studie*: Logo consult Unternehmensberatung.

Graves, L. E. F., Ridgers, N. D., Williams, K., Stratton, G., & Atkinson, G. T. (2010). The physiological cost and enjoyment of Wii Fit in adolescents, young adults, and older adults. *Journal of physical activity & health, 7*(3), 393-401.

Greben, K. (2011). *Motivation der Mitarbeiter für den Betriebssport der Allianz – Analyse von Anforderungen, Auswirkungen und technischen Möglichkeiten.* (Master Thesis), TU München.

Green, B. B., Cheadle, A., Pellegrini, A. S., & Harris, J. R. (2007). Peer Reviewed: Active for Life: A Work-based Physical Activity Program. *Preventing chronic disease, 4*(3).

Groeneveld, I. F., Proper, K. I., Van Der Beek, A. J., Hildebrandt, V. H., & Van Mechelen, W. (2009). Factors associated with non-participation and drop-out in a lifestyle intervention for workers with an elevated risk of cardiovascular disease. *International Journal of Behavioral Nutrition and Physical Activity, 6*(1), 80.

Grossberg, S. (1987). A psychophysiological theory of reinforcement, drive, motivation, and attention. *Advances in psychology, 42*, 3-81.

Guillen, S., Arredondo, M. T., & Castellano, E. (2010). A Survey of Commercial Wearable Systems for Sport Application. *Wearable Monitoring Systems*, 165.

Guiness-World-Records. (2011). Fastest-selling gaming peripheral. Retrieved 2.1., 2013, from http://www.guinnessworldrecords.de/world-records/9000/fastest-selling-gaming-peripheral

Harden, A., Peersman, G., Oliver, S., Mauthner, M., & Oakley, A. (1999). A systematic review of the effectiveness of health promotion interventions in the workplace. *Occupational Medicine, 49*(8), 540-548.

Harrison, G. W., & List, J. A. (2004). Field experiments. *Journal of Economic Literature, 42*(4), 1009-1055.

Hassmén, P., Koivula, N., & Uutela, A. (2000). Physical exercise and psychological well-being: a population study in Finland. *Preventive medicine, 30*(1), 17-25.

Heger, M. (2013). Enterprise Gamification. Retrieved 11.1., 2013, from www.enterprise-gamification.com

Högg, R., Schmid, H. P. D. B., & Stanoevska-Slabeva, F. P. D. K. Erweiterung und Evaluation des Technologieakzeptanzmodells zur Anwendung bei mobilen Datendiensten.

Holbrook, M. B., Chestnut, R. W., Oliva, T. A., & Greenleaf, E. A. (1984). Play as a consumption experience: The roles of emotions, performance, and personality in the enjoyment of games. *Journal of consumer research*, 728-739.

Holzinger, A., Dorner, S., Födinger, M., Valdez, A. C., & Ziefle, M. (2010). Chances of increasing youth health awareness through mobile wellness applications *HCI in Work and Learning, Life and Leisure* (pp. 71-81): Springer.

Houston, T. K., Sands, D. Z., Jenckes, M. W., & Ford, D. E. (2004). Experiences of patients who were early adopters of electronic communication with their physician: satisfaction, benefits, and concerns. *Am J Manag Care, 10*(9), 601-608.

Hulshof, C., Verbeek, J., Van Dijk, F., van der Weide, W. E., & Braam, I. (1999). Evaluation research in occupational health services: general principles and a systematic review of empirical studies. *Occupational and environmental medicine, 56*(6), 361-377.

Hurrelmann, K. (2010). *Gesundheitssoziologie: eine Einführung in sozialwissenschaftliche Theorien von Krankheitsprävention und Gesundheitsförderung*: Juventa.

Irvine, A. B., Philips, L., Seeley, J., Wyant, S., Duncan, S., & Moore, R. W. (2011). Get moving: a web site that increases physical activity of sedentary employees. *American Journal of Health Promotion, 25*(3), 199-206.

Isidoro Losada, F., & Mellenthin-Schulze, M. (2010). Betriebliches Gesundheitsmanagement und Krankenstand in der Bundesverwaltung. *Fehlzeiten-Report 2010*, 441-452.

Jacobs, K., Zhu, L., Dawes, M., Franco, J., Huggins, A., Igari, C., . . . Umez-Eronini, A. (2011). Wii health: A preliminary study of the health and wellness benefits of Wii Fit on university students. *The British Journal of Occupational Therapy, 74*(6), 262-268.

Joggen-online. (2012). GPS Watches.

Jørgensen, M. B., Rasmussen, C. D. N., Ekner, D., & Søgaard, K. (2010). Successful Reach and Adoption of a workplace health promotion RCT targeting a group of high-risk workers. *BMC medical research methodology, 10*(1), 56.

Jung, Y., Song, H., & Vorderer, P. (2012). Why do people post and read personal messages in public? The motivation of using personal blogs and its effects on users' loneliness, belonging, and well-being. *Computers in human behavior*.

Kanning, M. (2007). Körperlich aktive Herzerkrankte: Änderungsprozesse und Strategien zur Aufrechterhaltung von körperlich-sportlicher Aktivität.

Kato, P. M. (2010). Video games in health care: Closing the gap. *Review of General Psychology, 14*(2), 113.

Kennedy, C. M., Powell, J., Payne, T. H., Ainsworth, J., Boyd, A., & Buchan, I. (2012). Active assistance technology for health-related behavior change: an interdisciplinary review. *Journal of medical Internet research, 14*(3).

Kerssenfischer, F., & Fritsch, T. (2012a). *Motivational aspects for workplace health interventions*. Paper presented at the Third International Conference on Sport & Society, University of Cambridge, Cambridge, UK.

Kerssenfischer, F., & Fritsch, T. (2012b). *A Systematic Review of IT Based Health Interventions*. Paper presented at the Med-e-Tel 2012, Luxembourg.

Kerssenfischer, F., Simonsen, S., Fritsch, T., & Krcmar, H. (2013). *Recommendations for the Implementation of Exergames in the Context of Workplace Health Promotion: Results From Expert Interviews.* Paper presented at the eTelemed - The Fifth International Conference on eHealth, Telemedicine, and Social Medicine, Nice.

Kirsten, W. (2008). How to make the Business case for health promotion at the workplace. *GOHNET Newsletter (WHO), 14*, 25-27.

Knebel, U. (2011). *IT-gestützte Gesundheitsförderungsprogramme: Design, Einführung und Evaluation am Beispiel Gesundheitssport.* (Doctor thesis), TU München.

Knebel, U., Leimeister, J. M., Esch, S., Pressler, A., & Krcmar, H. (2009). Online, Set, Go-Design and empirical test of an IT-based physical activity intervention. *ECIS 2009 Proceedings*.

Koivisto, M. (2009). *Mobile information system adoption and use: beliefs and attitudes in mobile context*: Teknillinen korkeakoulu.

Kolip, P., Wydler, H., & Abel, T. (2000). Gesundheit: Salutogenese und Kohärenzgefühl. *Salutogenese und Kohärenzgefühl. Grundlagen, Empirie und Praxis eines gesundheitswissenschaftlichen Konzepts (S. 11-19). Weinheim ua: Juventa*.

Koolhaas, J., Bartolomucci, A., Buwalda, B., De Boer, S., Flügge, G., Korte, S., . . . Palanza, P. (2011). Stress revisited: A critical evaluation of the stress concept. *Neuroscience & Biobehavioral Reviews, 35*(5), 1291-1301.

Kornmeier, K. (2009). *Determinanten der Endkundenakzeptanz mobilkommunikationsbasierter Zahlungssysteme: eine theoretische und empirische Analyse.* Universität Duisburg-Essen, Mercator School of Management-Fakultät für Betriebswirtschaftslehre» Technology and Operations Management» Unternehmens-und Technologieplanung/Telekommunikationswirtschaft.

Krämer, K., & Nolting, H.-D. (2012). *DAK Gesundheitsreport 2012: Analyse der Arbeitsunfähigkeitsdaten Schwerpunktthema: Job, Gene, Lebensstil–Risiko fürs Herz?* (Vol. 4): medhochzwei Verlag.

Kreis, J., & Bödeker, W. (2003). *Gesundheitlicher und ökonomischer Nutzen betrieblicher Gesundheitsförderung und Prävention.* Paper presented at the Zusammenstellung der wissenschaftlichen Evidenz. Hrsg.: BKK BV und HVBG. IGA-Report.

Kreps, D. M. (1997). Intrinsic motivation and extrinsic incentives. *The American Economic Review, 87*(2), 359-364.

Kumar, S., & Nigmatullin, A. (2010). Exploring the impact of management of chronic illnesses through prevention on the US healthcare delivery system–A closed loop system's modeling study. *Information, Knowledge, Systems Management, 9*(3), 127-152.

Kummervold, P. E., Chronaki, C. E., Lausen, B., Prokosch, H. U., Rasmussen, J., Santana, S., . . . Wangberg, S. C. (2008). eHealth trends in Europe 2005-2007: a population-based survey. *Journal of medical Internet research, 10*(4).

Lam, S. F., Yim, P. S., Law, J. S. F., & Cheung, R. W. Y. (2004). The effects of competition on achievement motivation in Chinese classrooms. *British Journal of Educational Psychology, 74*(2), 281-296.

Lanningham-Foster, L., Foster, R. C., McCrady, S. K., Jensen, T. B., Mitre, N., & Levine, J. A. (2009). Activity promoting games and increased energy expenditure. *The Journal of pediatrics, 154*(6), 819.

Lenhardt, M., Lecanto, F., Ricketts, J. C., Morgan, A. C., & Karnock, K. J. (2011). Leadership behaviors of Georgia golf course superintendents: implications for post-secondary programs. *NACTA Journal, 55*(4), 23-30.

Lenhardt, U. (2010). Akteure der Betrieblichen Gesundheitsförderung: Interessenlagen–Handlungsbedingungen–Sichtweisen. *Faller, Gudrun (Hg.): Lehrbuch Betriebliche Gesundheitsförderung. Bern: Verlag Hans Huber*, 112-120.

Levin, M., & Greenwood, D. (2001). Pragmatic action research and the struggle to transform universities into learning communities. *Handbook of action research*, 103-113.

Lewis, J., & Sauro, J. (2009). The factor structure of the system usability scale. *Human Centered Design*, 94-103.

Lintonen, T., Konu, A., & Seedhouse, D. (2008). Information technology in health promotion. *Health education research, 23*(3), 560-566.

Longhurst, R. (2003). Semi-structured interviews and focus groups. *Key methods in geography*, 117-132.

MacKinnon, D. P., Elliot, D. L., Thoemmes, F., Kuehl, K. S., Moe, E. L., Goldberg, L., . . . Ranby, K. W. (2010). Long-term effects of a worksite health promotion program for firefighters. *American Journal of Health Behavior, 34*(6), 695-706.

Magnussen, R., Zafar, S., & Poulsen, K. (2013). The Role of Technology in Workplace Health Promotion Interventions: a rapid literature review. *Health Promotion International*.

Markland, D. (2011). BREQ.

Markland, D., & Tobin, V. (2004). A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology, 26*(2), 191-196.

Marlatt, G. A., & Donovan, D. M. (2005). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*: Guilford Press.

Marr, A. C. (2010). *Serious Games für die Informations-und Wissensvermittlung-Bibliotheken auf neuen Wegen* (Vol. 28): BIT Verlag.

Marschollek, M., Wolf, K. H., Plischke, M., Ludwig, W., Haux, R., Mihailidis, A., & Howe, J. (2009). People's perceptions and expectations of assistive health-enabling technologies: an empirical study in Germany. *Assistive Technology, 21*(2), 86-93.

Marshall, S. J., & Biddle, S. J. H. (2001). The transtheoretical model of behavior change: a meta-analysis of applications to physical activity and exercise. *Annals of Behavioral Medicine, 23*(4), 229-246.

McCall, W. A. (1926). *How to experiment in education*: The Macmillan Company.

McNiff, J., & Whitehead, J. (2010). *You and your action research project*: Taylor & Francis.

Michaels, E., Handfield-Jones, H., & Axelrod, B. (2001). *The war for talent*: Harvard Business Press.

Microsoft. (2012). Official Internet Presence of the XBOX. Retrieved 2.1., 2013, from http://www.xbox.com/de-DE/Xbox360?xr=shellnav

Middleton, L. E., Barnes, D. E., Lui, L. Y., & Yaffe, K. (2010). Physical activity over the life course and its association with cognitive performance and impairment in old age. *Journal of the American Geriatrics Society, 58*(7), 1322-1326.

Miller, W. R., & Heather, N. (1998). *Treating addictive behaviors*: Plenum Press New York.

Mullan, E., Markland, D., & Ingledew, D. K. (1997). A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analytic procedures. *Personality and Individual Differences, 23*(5), 745-752.

Mullins, N. M., Tessmer, K. A., McCarroll, M. L., & Peppel, B. P. (2012). Physiological and perceptual responses to Nintendo® Wii Fit™ in young and older adults. *International Journal of Exercise Science, 5*(1), 9.

Nike. (2013). Official internet presence of Nike+. Retrieved 16.1., 2013, from http://nikeplus.nike.com/plus/

Nintendo. (2012a). Nintendo History. Retrieved 2.1., 2013, from http://www.nintendo.de/NOE/de_DE/service/nintendo-geschichte_9911.html

Nintendo. (2012b). Official Internet Presence of Nintendo. Retrieved 2.1., 2013, from http://www.nintendo.de/NOE/de_DE/index.html

Nintendo. (2012c). Official internet presence of the Wii U. Retrieved 26.1., 2013, from http://www.nintendo.com/wiiu

NLM. Medical Subject Headings. Retrieved 25.11.2012, from http://www.nlm.nih.gov/mesh/

Nöhammer, E., Schusterschitz, C., & Stummer, H. (2009). Nutzenpotenziale und Effekte betrieblicher Gesundheitsförderung. *Gruppendynamik und Organisationsberatung, 40*(4), 425-439.

Nowak, R. C. (2011). *Transaktionsanalyse und Salutogenese: Der Einfluss transaktionsanalytischer Bildung auf Wohlbefinden und emotionale Lebensqualität* (Vol. 2): Waxmann Verlag.

Ntoumanis, N., Taylor, I. M., & Thøgersen-Ntoumani, C. (2012). A longitudinal examination of coach and peer motivational climates in youth sport: Implications for moral attitudes, well-being, and behavioral investment. *Developmental psychology, 48*(1), 213.

Oberlinner, C., Lang, S., Germann, C., Trauth, B., Eberle, F., Pluto, R., . . . Zober, A. (2007). Prevention of overweight and obesity in the workplace. *Das Gesundheitswesen, 69*(7), 385-392.

OECD. (2012, 2.12.2012). Average annual hours actually worked per worker. from http://stats.oecd.org/Index.aspx?DatasetCode=ANHRS

Ogletree, S. M., & Drake, R. (2007). College students' video game participation and perceptions: Gender differences and implications. *Sex Roles, 56*(7-8), 537-542.

Oh, Y., & Yang, S. (2010). *Defining Exergames & Exergaming.* Paper presented at the Proceedings of the Meaningful Play Conference, East Lansing MI, Retrieved from http://meaningfulplay. msu. edu/proceedings2010.

Ojala, J., & Saarela, J. (2010). *Understanding social needs and motivations to share data in online sports communities.* Paper presented at the Proceedings of the 14th International Academic MindTrek Conference: Envisioning Future Media Environments.

Pahmeier, I. (2008). Partizipation, Bindung und Dropout im Freizeit-, Breiten-und Gesundheitssport. *Anwendungen der Sportpsychologie (Beckmann, J. and Kellmann, M., Eds)*, 426-497.

Pasch, M., Bianchi-Berthouze, N., van Dijk, B., & Nijholt, A. (2009). Movement-based sports video games: Investigating motivation and gaming experience. *Entertainment Computing, 1*(2), 49-61.

Patton, M. Q. (1987). *How to use qualitative methods in evaluation* (Vol. 4): SAGE Publications, Incorporated.

Peterson, R. A. (1994). A meta-analysis of Cronbach's coefficient alpha. *Journal of consumer research*, 381-391.

Plath, S. C., Köhler, T., Krause, H., & Pfaff, H. (2008). Prevention, health promotion and workplace health management in German banks: Results from a nationwide representative survey. *Journal of Public Health, 16*(3), 195-203

.

Polar. (2013). Official internet presence of Polar. Retrieved 16.1., 2013, from http://www.polar.com/en

Portnoy, D. B., Scott-Sheldon, L. A. J., Johnson, B. T., & Carey, M. P. (2008). Computer-delivered interventions for health promotion and behavioral risk reduction: a meta-analysis of 75 randomized controlled trials, 1988–2007. *Preventive medicine, 47*(1), 3.

Powell, K. E., Caspersen, C. J., Koplan, J. P., & Ford, E. S. (1989). Physical activity and chronic diseases. *The American journal of clinical nutrition, 49*(5), 999-1006.

Prochaska, J. O., Butterworth, S., Redding, C. A., Burden, V., Perrin, N., Leo, M., . . . Prochaska, J. M. (2008). Initial efficacy of MI, TTM tailoring and HRI's with multiple behaviors for employee health promotion. *Preventive medicine, 46*(3), 226.

Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American psychologist, 47*(9), 1102.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2002). The transtheoretical model and stages of change. *Health behavior and health education: Theory, research, and practice, 2*, 60-84.

Prochaska, J. O., Redding, C. A., Harlow, L. L., Rossi, J. S., & Velicer, W. F. (1994). The transtheoretical model of change and HIV prevention: A review. *Health Education & Behavior, 21*(4), 471-486.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*(1), 38-48.

Prochaska, J. O., Velicer, W. F., DiClemente, C. C., & Fava, J. (1988). Measuring processes of change: applications to the cessation of smoking. *Journal of Consulting and Clinical Psychology; Journal of Consulting and Clinical Psychology, 56*(4), 520.

Quaas, W., Kubitscheck, S., & Thiele, L. (1997). Betriebliche Gesundheitsförderung durch Arbeitsgestaltung und Unternehmenskultur. *Journal of Public Health, 5*(3), 208-238.

Ramaswamy, V. (2008). Co-creating value through customers' experiences: the Nike case. *Strategy & Leadership, 36*(5), 9-14.

Rau, R., Gebele, N., Morling, K., & Rösler, U. (2010). Untersuchung arbeitsbedingter Ursachen für das Auftreten von depressiven Störungen. *Auflage. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin*.

Reason, P., & Bradbury, H. (2001). *Handbook of action research: Participative inquiry and practice*: SAGE Publications Limited.

Richter, P., & Wegge, J. (2011). Occupational Health Psychology–Gegenstand, Modelle, Aufgaben. *Klinische Psychologie & Psychotherapie*, 337-359.

Rigotti, T., & Mohr, G. (2011). Gesundheit und Krankheit in der neuen Arbeitswelt. *Gesundheitsförderung und Gesundheitsmanagement in der Arbeitswelt. Göttingen: Hogrefe*.

Robroek, S. J. W., Van Lenthe, F. J., Van Empelen, P., & Burdorf, A. (2009). International Journal of Behavioral Nutrition and Physical Activity. *International Journal of Behavioral Nutrition and Physical Activity, 6*, 26.

Robson, L. S., Clarke, J. A., Cullen, K., Bielecky, A., Severin, C., Bigelow, P. L., . . . Mahood, Q. (2007). The effectiveness of occupational health and safety management system interventions: a systematic review. *Safety Science, 45*(3), 329-353.

Rosen, C. S. (2000). Is the sequencing of change processes by stage consistent across health problems? A meta-analysis. *Health Psychology, 19*(6), 593.

Roth, A. E., & Kagel, J. H. (1995). *The handbook of experimental economics* (Vol. 1): Princeton university press Princeton.

Rudow, B. (2004). *Das gesunde Unternehmen*: Oldenbourg Wissenschaftsverlag.

RunKeeper. (2013). Official internet presence of RunKeeper. Retrieved 26.1, 2013, from http://runkeeper.com/

runtastic. (2013). Official internet presence of runtastic. Retrieved 26.1., 2013, from http://www.runtastic.com/

Sachs, L. (2003). *Angewandte statistik*: Springer DE.

Sallis, J. F. (2011). Potential vs Actual Benefits of Exergames. *Archives of pediatrics & adolescent medicine, 165*(7), 667.

Saponas, T. S., Lester, J., Hartung, C., Agarwal, S., & Kohno, T. (2007). *Devices that tell on you: Privacy trends in consumer ubiquitous computing.* Paper presented at the Usenix Security.

Saretsky, G. (1972). The OEO PC experiment and the John Henry effect. *The Phi Delta Kappan, 53*(9), 579-581.

Schempp, N., Zelen, K., & Strippel, H. (2012). Präventionsbericht 2011. *Leistungen der gesetzlichen Krankenversicherung: Primärprävention und betriebliche Gesundheitsförderung. Essen, Berlin: Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen, GKV-Spitzenverband*.

Schmidt, A. (2010). Normalverteilungsannahme und Transformationen bei Regressionen. *Methodik der empirischen Forschung. Wiesbaden: Gabler. Online: http://www. bwl. uni-kiel. de/bwlinstitute/grad-kolleg/new/index. php*.

Schneider, G. (2008). *Exergames.* uniwien. Retrieved from http://othes.univie.ac.at/2808/1/2008-11-27_9847979.pdf

Schnell, R., Hill, P. B., & Esser, E. (2011). *Methoden der empirischen Sozialforschung*: Oldenbourg Wissenschaftsverlag.

Schulze, P. M. (2007). *Beschreibende Statistik*: Oldenbourg Wissenschaftsverlag.

Schumacher, P., & Morahan-Martin, J. (2001). Gender, Internet and computer attitudes and experiences. *Computers in human behavior, 17*(1), 95-110.

Schunk, D. H., & Swartz, C. W. (1993). Goals and progress feedback: Effects on self-efficacy and writing achievement. *Contemporary Educational Psychology, 18*, 337-337.

Siegrist, J., Dragano, N., & Wahrendorf, M. (2009). Psychosoziale Arbeitsbelastungen und Gesundheit bei älteren Erwerbstätigen: eine europäische Vergleichsstudie. *Abschlussbericht zum Projekt der Hans-Böckler-Stiftung. Düsseldorf: Inst. für Medizinische Soziologie der Univ. Düsseldorf Volltext*.

Slesina, W. (2001). Formen betrieblicher Gesundheitsförderung: Bedarf an Evaluation und Qualitätssicherung. *Pfaff H u. Slesina W (Hrsg.): Effektive betriebliche Gesundheitsförderung. Juventa, Weinheim*, 17-26.

Slootmaker, S. M., Paw, M. J. M. C. A., Schuit, A. J., Seidell, J. C., & van Mechelen, W. (2005). Promoting physical activity using an activity monitor and a tailored web-based advice: design of a randomized controlled trial [ISRCTN93896459]. *BMC Public Health, 5*(1), 134.

Smedslund, G., Fisher, K., Boles, S., & Lichtenstein, E. (2004). The effectiveness of workplace smoking cessation programmes: a meta-analysis of recent studies. *Tobacco Control, 13*(2), 197-204.

Sockoll, I., Kramer, I., & Bödeker, W. (2000). *Wirksamkeit und Nutzen betrieblicher Gesundheitsförderung und Prävention.* Paper presented at the Zusammenstellung der wissenschaftlichen Evidenz.

Soler, R. E., Leeks, K. D., Razi, S., Hopkins, D. P., Griffith, M., Aten, A., . . . Goetzel, R. Z. (2010). A systematic review of selected interventions for worksite health promotion: the assessment of health risks with feedback. *American journal of preventive medicine, 38*(2), S237-S262.

Sony. (2012a). Official Internet Presence of Sony. Retrieved 2.1., 2013, from http://www.sony.com/index.php

Sony. (2012b). Official Internet Presence of the Playstation. Retrieved 2.1., 2013, from http://de.playstation.com/ps3/

SoSci-Survey. (2012). SoSci Survey (oFb - der onlineFragebogen). Retrieved 8.12.2012, 2012, from https://www.soscisurvey.de/

Spicker, I., & Schopf, A. (2011). *Betriebliche Gesundheitsförderung erfolgreich umsetzen: Praxishandbuch für Pflege-und Sozialdienste*: Springer Verlag.

Spittaels, H., De Bourdeaudhuij, I., Brug, J., & Vandelanotte, C. (2007). Effectiveness of an online computer-tailored physical activity intervention in a real-life setting. *Health education research, 22*(3), 385-396.

Spitzenverbände-der-Krankenkassen. (2006). Leitfaden Prävention. *Gemeinsame und einheitliche Handlungsfelder und Kriterien der Spitzenverbände der Krankenkassen zur Umsetzung von, 20*, 13.

Staiano, A. E., & Calvert, S. L. (2011a). Exergames for physical education courses: Physical, social, and cognitive benefits. *Child development perspectives, 5*(2), 93-98.

Staiano, A. E., & Calvert, S. L. (2011b). The promise of exergames as tools to measure physical health. *Entertainment Computing, 2*(1), 17-21.

Standage, M., Gillison, F. B., Ntoumanis, N., & Treasure, D. C. (2012). Predicting students' physical activity and health-related well-being: a prospective cross-domain investigation of motivation across school physical education and exercise settings. *Journal of Sport & Exercise Psychology, 2012*(34), 37-60.

Station, J. R. E. (1926). The arrangement of field experiments.

STATISTA. (2013). Sales of gaming consoles since 2008. Retrieved 4.1., 2013, from http://de.statista.com/statistik/daten/studie/214670/umfrage/absatz-von-ausgewaehlten-spielkonsolen-weltweit-seit-2008/

Statistisches-Bundesamt. (2012). Bevölkerung Deutschlands bis 2060 12. koordinierte Bevölkerungsvorausberechnung.

Steinbach, H. (2007). *Gesundheitsförderung: Ein Lehrbuch für die Pflege-und Gesundheitsberufe*: facultas. wuv/maudrich.

Stoffel, S. (2009). *Multi-Modulares Gesundheitsförderungsprogramm für Mitarbeitende 40plus. Programm-Entwicklung und-Akzeptanz sowie-Effekte auf die Gesundheit.*

Ströbl, V. (2008). Überprüfung des Stufenkonzeptes im Transtheoretischen Modell der Verhaltensänderung am Beispiel sportlicher Aktivität.

Swan, M. (2009). Emerging patient-driven health care models: an examination of health social networks, consumer personalized medicine and quantified self-tracking. *International journal of environmental research and public health, 6*(2), 492-525.

Tamborini, R., & Skalski, P. (2006). The role of presence in the experience of electronic games. *Playing video games: Motives, responses, and consequences*, 225-240.

Tullis, T. S., & Stetson, J. N. (2004). *A comparison of questionnaires for assessing website usability.* Paper presented at the Usability Professional Association Conference.

Ulich, E., & Wülser, M. (2010). *Gesundheitsmanagement in Unternehmen: Arbeitspsychologische Perspektiven*: Gabler Verlag.

Valente, T. W. (2010). *Social Networks and Health: Models, Methods, and Applications: Models, Methods, and Applications*: Oxford University Press, USA.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

Verdonk, P., Seesing, H., & de Rijk, A. (2010). Doing masculinity, not doing health? a qualitative study among dutch male employees about health beliefs and workplace physical activity. *BMC Public Health, 10*(1), 712.

Vogel, M., & Zendler, A. (2009). Lateinische Quadrate und parameterfreie Auswertungs-verfahren für die experimentelle Unterrichtsforschung. *Notes on Educational Informatics–Section A: Concepts and Techniques, 5*(1), 1-12.

Vogeler, F.-C. (2008). Pr ä vention und Gesundheitsförderung. *Querschnittsbereiche*, 281-295.

Webster, J., & Watson, R. T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly, 26*(2), xiii-xxiii.

Wellmann, H., & Lempert-Horstkotte, J. (2009). *Die präventiven Potentiale der Unfallversicherung: Zwischen Good Practice und verpassten Reformchancen* (Vol. 107): edition sigma.

Westermayer, G. (1996). Der Aufbau von Vertrauensorganisationen durch Betriebliche Gesundheitsförderung. *Vom Fehlzeitenmanagement zur Betrieblichen Gesundheitsförderung, 14*.

Whitehead, A., Johnston, H., Nixon, N., & Welch, J. (2010). *Exergame effectiveness: what the numbers can tell us.* Paper presented at the Proceedings of the 5th ACM SIGGRAPH Symposium on Video Games.

WHO. (1986). 1. World Health Organisation: Ottawa charter for health promotion. *J Health Promotion, 1*, 1-4.

WHO. (2010). Global recommendations on physical activity for health. *Geneva: World Health Organization*, 8-10.

Wiemeyer, J. (2009). Digitale Spiele. *Sportwissenschaft, 39*(2), 120-128.

Wijnalda, G., Pauws, S., Vignoli, F., & Stuckenschmidt, H. (2005). A personalized music system for motivation in sport performance. *Pervasive Computing, IEEE, 4*(3), 26-32.

Wikipedia. (2013). Mobile Operating System (Vol. 2013).

Williams, D., Yee, N., & Caplan, S. (2008). Who plays, how much, and why? A behavioral player census of a virtual world. *Journal of Computer Mediated Communication, 13*(4), 993-1018.

Wissenschaftliches-Institut-der-AOK. (2011). Fehlzeitenreport 2011. Berlin.

Wolf, G., Carmichael, A., & Kelly, K. (2010). The quantified self. *TED http://www. ted. com/talks/gary_wolf_the_quantified_self. html*.

Wroblewski, A., & Leitner, A. (2005). *Lernen von den Besten: Interdependenzen von Frauenerwerbsbeteiligung und Geburtenzahlen im Ländervergleich* (Vol. 130): Hans Böckler Stiftung.

Yang, S., Smith, B., & Graham, G. (2008). Healthy video gaming: Oxymoron or possibility. *Journal of online education, 4*(4).

Yen, L., Schultz, A. B., Schaefer, C., Bloomberg, S., & Edington, D. W. (2010). Long-term return on investment of an employee health enhancement program at a Midwest utility company from 1999 to 2007. *International Journal of Workplace Health Management, 3*(2), 79-96.

Ziegler, M., & Bühner, M. (2009). *Statistik für Psychologen und Sozialwissenschaftler*: Pearson Deutschland GmbH.

Zinnbauer, M., & Eberl, M. (2004). *Die Überprüfung von Spezifikation und Güte von Strukturgleichungsmodellen: Verfahren und Anwendung*: Inst. für Organisation, EFOplan.

8. Appendix

8.1 Interview Protocol

Leitfragen
1. Bitte stellen Sie sich in Ihrer Funktion vor.
2. Offene Fragen
2.1 Was halten Sie von Betrieblicher Gesundheitsförderung?
2.2 Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.
2.3 Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?
2.4 Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?
3. Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.
4. Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Proband 1

Interviewdauer: 60 Minuten

Angaben zur Person:

- Männlich, 43 Jahre alt, Angestellter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Dem Angestellten ist die eigene Gesundheit wichtig.

- Er findet es gut, dass sein Arbeitgeber sich um die Gesundheit der Beschäftigten kümmert.

- Seiner Meinung nach hat der Arbeitgeber die Verpflichtung, die Gesundheit der Beschäftigten am Arbeitsplatz sicherzustellen.

- Er denkt, dass der Arbeitgeber davon profitiert, wenn die Beschäftigten gesund sind. Aus diesem Grund findet der Angestellte Betriebliche Gesundheitsförderung nützlich.

- Auch ist der Angestellte der Überzeugung, dass die Förderung der Gesundheit für das Unternehmen wichtig sei.

- Er führt an, dass das Angebot an Gesundheitsförderung in seinem Unternehmen recht groß sei, allerdings könnte es seiner Meinung nach noch weiter ausgebaut werden.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Angestellte kennt den Begriff „Exergames“ nicht.

- Er gibt an, die Nintendo Wii Spielkonsole zu kenne, da er selber eine besitzt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Angestellte gibt an, die Nintendo Wii Spielkonsole nicht so oft zu benutzen.

- Obwohl ihm das Spielen mit der Wii Spaß bereitet, kann er sich nicht vorstellen, dass es die gleiche Wirkung haben könne wie ein tägliches Lauftraining.

- Der Angestellte denkt, dass das Spielen mit der Nintendo Wii Spielkonsole anstrengend sein kann. Er führt beispielsweise an, dass er nach dem Wii Boxen immer recht ausgepowert sei. Jedoch komme er bei Wii Tennis hingegen nicht ins Schwitzen.

- Der Angestellte gibt an, in einem Zeitungsartikel gelesen zu haben, dass in der Physiotherapie die Nintendo Wii Spielkonsole eingesetzt wird. Daraus schlussfolgert er, dass es einen Effekt auf die Gesundheit geben müsse.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Angestellte findet die Idee gut, ist aber zugleich auch skeptisch.
- Er kann sich vorstellen, dass das Spiel der Nintendo Wii Spielkonsole mehr Spaß machen würde als eine Aerobic-Stunde.
- Er gibt jedoch zugleich zu bedenken, dass er sich nicht vorstellen kann, dass Exergames als Maßnahme der Betrieblichen Gesundheitsförderung genauso effektiv sei.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Angestellte ist der Meinung, dass der Spaßfaktor die größte Stärke der Maßnahme sei und somit die Mitarbeiter zur Teilnahme an dem Angebot motivieren würde. Zudem kann er sich vorstellen, dass durch das neuartige Angebot auch Mitarbeiter zur Teilnahme motiviert werden würden, die sonst nicht an Maßnahmen der Gesundheitsförderung teilnehmen. Der Angestellte zweifelt jedoch an den Effekten der Exergames auf die Gesundheit der Spieler. Er kann sich nicht vorstellen, dass Exergames genauso effektiv seien wie andere Fitnessprogramme wie Aerobic-Kurse.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der Angestellte ist der Meinung, dass das wichtigste Kriterium der nachgewiesene positive Effekt von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung sei. Er bezieht sich dabei auf die psychische Fitness und sieht hier insbesondere Stressabbau als erforderlich an. Der Angestellte führt an, dass ohne diesen Effekt die Maßnahme nicht akzeptiert werden würde oder nicht als Maßnahme der Betrieblichen Gesundheitsförderung eingeordnet wird, sondern als Pausenaktivität.

Proband 2

Interviewdauer: 66 Minuten

Angaben zur Person:

- Männlich, 37 Jahre alt, Angestellter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Angestellte ist der Meinung, dass die Betriebliche Gesundheitsförderung prinzipiell eine gute Sache sei, aber für die Mitarbeiter nicht die höchste Priorität hat.

- Er ist der Ansicht, dass Mitarbeiter, die kein Interesse an der Förderung ihrer Gesundheit haben, nicht von dem Unternehmen motiviert werden können.

- Er ist sich nicht sicher, ob durch Betriebliche Gesundheitsförderung die Gesundheit der Mitarbeiter verbessert werden kann.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Dem Angestellten ist der Begriff „Exergames“ unbekannt. Mit der Erläuterung des Interviewers kann er den Begriff zuordnen, da er eine Nintendo Wii Spielkonsole besitzt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Angestellte kann sich vorstellen, dass Exergames die Spieler zu mehr Bewegung motiviert als normale Videospiele. Somit kann er sich vorstellen, dass sie einen positiven Effekt auf die Gesundheit ausüben.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Angestellte ist der Überzeugung, dass Exergames im Rahmen der Betrieblichen Gesundheitsförderung eingesetzt werden können. Seiner Meinung nach können Exergames als Bewegungsprogramm das bestehende Angebot der Gesundheitsförderung ergänzen.

- Er glaubt, dass ein innovatives Angebot die Gesundheitsförderung im Betrieb verbreiten kann.

- Allerdings hinterfragt er, ob Exergames als Instrument der Gesundheitsförderung sowohl von den Managern als auch von den Beschäftigten ernst genommen werden würde.

- Auch findet der Angestellte, dass er sich nicht vorstellen kann, wo und wie Exergames im Unternehmen angeboten werden würden. Er führt an, dass es denkbar wäre, entsprechende Spielkonsolen in den Pausenräumen aufzustellen.

- Auch hinterfragt er, zu welchen Zeiten die Konsolen genutzt werden könnten.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Angestellte sieht in Exergames als Maßnahme der Betrieblichen Gesundheitsförderung das Potential, die Mitarbeiter zu mehr Bewegung zu motivieren. Weiterhin führt er an, dass Exergames als innovative Maßnahme das Interesse der Mitarbeiter wecken würde und somit die Teilnahme an gesundheitsförderlichen Programmen erhöhen würde. Auch nennt er die Benutzerfreundlichkeit als klare Stärke der Maßnahme. Seiner Meinung nach sind Maßnahmen der Gesundheitsförderung einfach und unkompliziert zu erlernen. Als Schwächen identifiziert der Angestellte die Akzeptanz von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung. Auch führt er an, dass er nicht wisse, wie die konkrete Umsetzung auszusehen hätte. Der Angestellte sieht in Exergames als Maßnahme der Betrieblichen Gesundheitsförderung die gleichen Chancen, wie bei den Stärken. Seiner Meinung nach bieten Exergames das Potential, Mitarbeiter zu einem Mehr an Bewegung zu motivieren. Als innovative Maßnahme weckt es möglicherweise das Interesse der Mitarbeiter, etwas für ihre Gesundheit zu tun. Zudem wird die Benutzerfreundlichkeit der Exergames durch den Angestellten hervorgehoben. Als Potentielle Risiken nennt der Angestellte die Unterstützung des Managements und die Akzeptanz sowohl vom Management als auch von den Mitarbeitern.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der Angestellte nennt als wichtigstes Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung die Akzeptanz seitens der Führungskräfte und der Mitarbeiter.

Proband 3

Interviewdauer: 60 Minuten

Angaben zur Person:

- Weiblich, 41 Jahre alt, Angestellte

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Angestellte ist der Meinung, dass Betriebliche Gesundheitsförderung ein wichtiges Thema für das Unternehmen darstellt.
- Ihrer Ansicht nach kann die Förderung der Gesundheit am Arbeitsplatz eine Möglichkeit darstellen, um die Angestellten an dem Ort zu erreichen, wo sie sich am Häufigsten aufhalten
- Zudem sei der Arbeitgeber ohnehin zur Betrieblichen Gesundheitsförderung verpflichtet.
- Allerdings merkt die Angestellte an, dass Betriebliche Gesundheitsförderung attraktiver für den Mitarbeiter angeboten werden könnte. Ihrer Meinung nach werden für das große Angebot zu wenige Personen tatsächlich erreicht.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Angestellten ist der Begriff „Exergames“ nicht bekannt. Auf die Erklärung entgegnet sie, dass ihr die Nintendo Wii Spielkonsole bekannt sei.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Angestellte gibt an, bisher keine Erfahrung im Umgang mit einer bewegungsfördernden Spielkonsole gemacht zu haben, allerdings sei ihr die Nintendo Wii aus der Werbung bekannt.

- Auf die Frage nach der Wirkung gibt sie an, dass durch die Werbung suggeriert wird, dass die Konsole ein Spaß für die ganze Familie sei und die Spieler viel Bewegung aufbringen müssen. Zudem bringt sie an, dass sie in der Werbung gesehen habe, dass mit der Spielkonsole richtige Fitnessprogramme durchgeführt werden können.

- Obwohl sie betont, selber keine Erfahrung mit solchen Spielkonsolen gemacht zu haben, schätzt die Angestellte, dass Exergames einen positiven Effekt auf die Gesundheit haben können. Die Aussage bezieht sich auf die bewegungsfördernde Wirkung von Exergames.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Angestellte kann sich vorstellen, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können, wenn das Werbeversprechen gehalten wird. Auf Nachfrage des Interviewers, was genau sie damit gemeint hat führt die Angestellte aus, dass ein nachgewiesener positiver Effekt auf die Gesundheit bestehen muss, damit eine solche Maßnahme im Betrieb eingesetzt wird.

- Sie ist der Meinung, dass schon so viele verschiedene Maßnahmen angeboten werden, dass Exergames ebenfalls angeboten werden könnten. Sie stellt die Vermutung auf, dass durch so eine innovative Maßnahme mehr junge Arbeitnehmer und Computerbegeisterte für Bewegung motiviert werden können. Sie vermutet, dass gerade computerbegeisterte Personen im Vergleich zu anderen Personen weniger Sport machen und somit an dem Programm interessiert sein könnten.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Angestellte infiziert das innovative Konzept als Stärke von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung. Dadurch würden möglicherweise

neue Mitarbeiter und vor allem Personengruppen zu Bewegung motiviert werden. Als Schwäche nennt die Angestellte das notwendige Interesse an Videospielen. Sie persönlich habe bis zum derzeitigen Zeitpunkt kein Interesse für diese Spielkonsolen gezeigt. Dadurch sei ihr zum Beispiel die Nintendo Wii Spielkonsole nur aus der Werbung bekannt. Die Angestellte ist der Überzeugung, dass viele Personen wie sie kein Interesse an diesem System zeigen werden. Die Angestellte führt an, dass durch die Werbung suggeriert wird, dass selbst Kinder die Bedienung leicht erlernen würden. Somit würde sie diese leichte Benutzung als Chance bezeichnen. Als Risiko bezeichnet die Angestellte das Interesse und die Akzeptanz der potentiellen Zielgruppe. Wird die Maßnahme von der Zielgruppe abgelehnt, ist eine derartige Maßnahme auch nicht umzusetzen, bzw. es wäre in ihren Augen eine Verschwendung von Zeit und Geld.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium für die Angestellte sei das Interesse und die Akzeptanz der Maßnahme durch die Zielgruppe. Es sollten nur Maßnahmen implementiert werden, für die auch tatsächlich ein Bedarf besteht, weil sie sonst die Gefahr sieht, dass Ressourcen verschwendet werden.

Proband 4

Interviewdauer: 63 Minuten

Angaben zur Person:

- Weiblich, 52 Jahre alt, Betriebsrat

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Betriebliche Gesundheitsförderung ist ein wichtiges Instrument zur

- Ihrer Meinung nach kann es einen wertvollen Beitrag dazu leisten, das Wohlbefinden der Mitarbeiter zu erhöhen.

- Maßnahmen, die Gruppen von Mitarbeitern erfordern können zudem das Betriebsklima verbessern.

- Ein wichtiges Thema der Betrieblichen Gesundheitsförderung in diesem Jahr sei die Stressprävention.

- Die Betriebsrätin ist der Meinung, dass durch Betriebliche Gesundheitsförderung die Krankheitstage zurückgehen können und somit für das Unternehmen Kosten eingespart werden können.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Betriebsrätin ist der Begriff „Exergames“ nicht bekannt, jedoch ist sie mit dem Beispiel der Nintendo Wii Spielkonsole vertraut.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Betriebsrätin ist der Überzeugung, dass Exergames sowohl einen positiven Effekt auf die körperliche Bewegung als auch auf die Stressverarbeitung ausüben kann.

- Die Betriebsrätin ist der Überzeugung, dass Exergames eine interessante Option darstellen kann, um ein für die Mitarbeiter zugeschnittenes Angebot zur Bewegungsförderung anzubieten.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Betriebsrätin ist der Meinung, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können. Es muss jedoch zuvor festgelegt werden, welche Personengruppen davon profitieren würden und zu welchen Zeiten die Arbeitnehmer diese nutzen können. So ist zu überlegen ob es erlaubt wäre, während der Arbeitszeit kleine Unterbrechungen mit einem Exergame durchzuführen oder ob diese Konsolen nur außerhalb der Arbeitszeit genutzt werden dürfen.

- Zudem betont die Betriebsrätin, dass keinerlei Benachteiligung durch die Nutzung der Exergames verursacht werden dürfen und keine personenbezogenen Daten erhoben werden dürfen.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Betriebsrätin nennt den innovativen Charakter und den leichten Zugang zur den potentiellen Nutzern als Stärke von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung. Ihrer Meinung nach können Exergames einen leichten Zugang zu Personengruppen schaffen, die vom bestehenden Gesundheitsförderungsprogramm nicht erreicht werden. Als Schwäche nennt die Betriebsrätin unbekannte Erfahrungen von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung. Sie persönlich habe noch von keinem derartigen Projekt erfahren und sorgt sich um die Effektivität der Maßnahme. Ihrer Ansicht nach dürfen die knappen Ressourcen im Unternehmen nicht verschwendet werden. Die Betriebsrätin sieht die Chancen von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung in den potentiellen positiven Effekten auf die Gesundheit und das Wohlbefinden der Beschäftigten. Die potentiellen Effekte von Exergames auf die Gesundheit von Personen werden als größtes Risiko von der Betriebsrätin angegeben. Ohne einen nachgewiesen Effekt auf die Gesundheit wird sie als Mitglied im Betriebsrat eine Implementierung nicht befürworten. (keine Verschwendung von Ressourcen)

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Zur erfolgreichen Implementierung benennt die Betriebsrätin als wichtigstes Kriterium ein klares Konzept. Dieses Konzept soll in Abstimmung mit den Beauftragten der Betrieblichen Gesundheitsförderung, der Zielgruppe und dem Management erarbeitet werden, um möglichst umfassend die notwendigen Ressourcen zu identifizieren, die Bedürfnisse der Zielgruppe zu identifizieren und somit die Maßnahme nicht als „Insellösung“ zu schaffen sondern in die Strukturen des Unternehmens und der Betrieblichen Gesundheitsförderung einzubetten.

Proband 5

Interviewdauer: 58 Minuten

Angaben zur Person:

- Männlich, 46 Jahre alt, Betriebsrat

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Betriebsrat führt an, dass für die Mitarbeiter der Druck durch die Arbeit und die Zielvorgaben des Managements zunehmend zunimmt. Die Mitarbeiter müssen nach Aussage des Betriebsrats immer mehr Arbeit in immer kürzeren Zeitfenstern erledigen. Dieser Druck macht die Beschäftigten krank. Betriebliche Gesundheitsförderung ist ein Baustein, um die Gesundheit der Mitarbeiter zu erhalten. Allerdings dürfen interne Strukturen nicht außer Acht gelassen werden. Angebote der Betrieblichen Gesundheitsförderung bringen nichts, wenn der Arbeitnehmer trotz allem unter einem hohen Leistungsdruck steht. Es erfordert nach Ansicht des Betriebsrats ein Gesundheitsmanagement, welches auch die Strukturen am Arbeitsplatz berücksichtigt. So kann das Wohlbefinden der Mitarbeiter durch Job Rotation oder Job Enrichment stark verbessert werden.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist dem Betriebsrat nicht bekannt. Das Prinzip am Beispiel der Nintendo Wii Spielkonsole hat der Betriebsrat verstanden.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Betriebsrat ist der Überzeugung, dass Exergames die Gesundheit der Spieler positiv beeinflussen kann. Er nennt sowohl potentielle positive Effekte auf das Bewegungsverhalten der Spieler, positive kognitive Effekte, als auch positive Gruppeneffekte. Er führt die kognitiven Effekte aus und gibt an, dass er der Überzeugung sei, dass Exergames als eine Art Ventil zum Stressabbau dienen könnte.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Betriebsrat ist der Überzeugung, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können, wenn die Rahmenbedingungen stimmen. Dazu gehört ein klares Konzept, welches die Standorte, die Zielgruppe und die Ressourcen festlegt. Zudem müssten die direkten und indirekten Kosten berücksichtigt werden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Betriebsrat nennt den innovativen Charakter der Maßnahme als Stärke. Neuartige Maßnahmen wecken das Interesse der potentiellen Nutzer. Als Schwäche wurde das fehlende Konzept für Exergames als Maßnahme der Betrieblichen Gesundheitsförderung genannt. Ohne ein entsprechendes Konzept sei eine Implementierung unmöglich. Der Betriebsrat sieht als Chance von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung das Potential, das Wohlbefinden der Mitarbeiter zu erhöhen und diese zu einem Mehr an Bewegung zu motivieren. Der Betriebsrat sieht das größte Risiko in Exergames als Maßnahme der Betrieblichen Gesundheitsförderung in den fehlenden Langzeitresultaten. Er führt aus, dass Exergames möglicherweise nicht die gewünschten körperlichen Effekte bergen.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Für den Betriebsrat ist das wichtigste Kriterium für die erfolgreiche Implementierung von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung die Festlegung eines klaren Konzeptes. Es muss klar definiert sein, welche Mitarbeiter oder ob alle Mitarbeiter von der Maßnahme profitieren, welche Voraussetzungen zur Teilnahme erfüllt werden müssen, zu welchen Zeiten die Maßnahme genutzt werden darf (Arbeitszeit oder außerhalb der Arbeitszeit) uvm.

Proband 6

Interviewdauer: 67 Minuten

Angaben zur Person:

- Männlich, 57 Jahre alt, Betriebsrat

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Betriebsrat ist der Meinung, dass Betriebliche Gesundheitsförderung eine wichtige Strategie darstellt, um die Gesundheit der Beschäftigten zu erhalten und zu verbessern. Er führt aus, dass Arbeitnehmer heutzutage immer mehr leisten müssen und der Arbeitsdruck stark angestiegen sei. Mit dieser Entwicklung steige auch die psychische Belastung am Arbeitsplatz. Der Betriebsrat gibt an, dass in diesem Jahr verstärkt der Fokus gesundheitlicher Aktivitäten im Unternehmen auf psychische Belastungen und Stress gelegt wird.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist dem Betriebsrat nicht bekannt. Die Nintendo Wii Spielkonsole ist dem Betriebsrat bekannt. In Folge der Erläuterung kann er den Begriff zuordnen.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Betriebsrat schätzt, dass Exergames die Spieler dazu motivieren kann, sich körperlich zu bewegen. Somit würden sie wohl auch einen Einfluss auf die Gesundheit der Spieler haben. Er glaubt jedoch nicht, dass dieser Einfluss besonders groß sei.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Betriebsrat findet, dass die Idee einer Spielkonsole zum Beispiel in Kommunikationszonen oder Teamräumen sehr interessant klingt. Er glaubt, dass durch das gemeinsame Spiel die Kommunikation unter den Beschäftigten gefördert wird und somit das Wohlbefinden der Beschäftigten und dies letztendlich einen positiven Einfluss auf das Betriebsklima hätten.

- Zudem kann sich der Betriebsrat vorstellen, dass die Beschäftigten ein so innovatives Angebot schnell annehmen. Er findet, dass die Hemmschwelle zur Teilnahme seiner Meinung nach sehr gering ist und somit kein Beschäftigter benachteiligt wird. Er betont, wie wichtig es sei, allen Beschäftigten den Zugang zu diesen Maßnahmen zu ermöglichen.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Betriebsrat gibt als Stärke von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung den innovativen Charakter und den leichten Zugang für alle Beschäftigten an. Seiner Meinung nach ist die Bedienung der Spielkonsolen so einfach gestaltet, dass die Mitarbeiter unabhängig vom Alter, Geschlecht oder sonstigen Eigenschaften der Personen das Angebot nutzen können. Der Betriebsrat gibt an, dass es Personen gibt, die dieser Art von Aktivität nicht mögen bzw. keinen Zugang dazu haben, weil sie der Meinung sind, dass diese unangemessen für eine erwachsene Person sei.

Den innovativen Charakter der Exergames sieht der Betriebsrat ebenfalls als Chance an. Neue, andersartige Angebote seien immer verlockend und ziehen das Interesse auf sich. Er glaubt, dass somit Beschäftigte für Maßnahmen der Gesundheitsförderung interessiert werden können. Er führt diesen Gedanken aus: Stellen Sie sich vor, eine Person spielt Nintendo Wii Tennis und entdeckt darüber sein Interesse für diesem Sport und meldet sich für einen Tennis Kurs an.

Obwohl der Betriebsrat findet, dass Exergames eine interessante Möglichkeit der Gesundheitsförderung darstellen, sieht er das Risiko, dass das Angebot nicht langfristig genutzt wird. Er sieht die Gefahr, dass kurzfristig viel Interesse gezeigt wird, aber dieses schnell wieder nachlässt. Er begründet diese Meinung indem er angibt, dass er sich nicht vorstellen kann, dass die Gesundheitseffekte besonders groß seien und diese auch nicht kurzfristig eintreten. Zudem gibt der Betriebsrat an, dass bei Konsolenspielen automatisch Daten erhoben werden, welche unter anderem auch persönliche Daten über die gesundheitliche Leistungsfähigkeit beinhalten. Derartige Daten dürfen nicht öffentlich für jeden Mitarbeiter einsehbar sein.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der Betriebsrat gibt an, dass das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung die Sicherstellung der Anonymität der Spieler sei. Er betont erneut, dass personenbezogene Daten in keinem Fall öffentlich einsehbar sein dürfen. Auch findet er, dass bei der Benutzung der Konsole klare Regeln gelten müssen, die in einem Konzept verankert sein sollten. Darin muss u.a. festgelegt sein, zu welchen Zeiten die Konsole genutzt werden kann.

Proband 7

Interviewdauer: 59 Minuten

Angaben zur Person:

- Weiblich, 45 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Führungskraft ist der Überzeugung, dass die Betriebliche Gesundheitsförderung eine moderne Unternehmensstrategie sei, die dabei hilft die Krankenstände und Fluktuation niedrig zu halten und die Mitarbeiterzufriedenheit zu erhalten bzw. zu erhöhen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Führungskraft nicht bekannt. Allerdings hat sie die Bedeutung korrekt hergeleitet (Exercise, Game). Die Nintendo Wii Spielkonsole ist der Führungskraft bekannt, da sie selber eine Konsole besitzt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft ist der Überzeugung, dass Exergames zwar einen Effekt auf die Gesundheit ausüben kann, dieser jedoch nicht so groß sei. So hat sie die Erfahrung gemacht, dass bei bestimmten Spielen keine große Anstrengung aufgewendet werden muss, um Resultate in den Spielen zu erzielen. Sie gibt aber auch an, dass bestimmte Spiele wie die Nintendo Wii Fit Reihe ein gutes Training darstellen können, wenn die Übungen ernsthaft durchgeführt werden.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Führungskraft ist der Meinung, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden kann. Allerdings müssen zuvor die notwendigen Strukturen implementiert werden. Die Führungskraft gibt aber als Argument für Exergames an, dass die Maßnahme im Verhältnis zu anderen Gesundheitsförderungsprogramme kostengünstig sei.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Führungskraft gibt die geringen Kosten an, die mit Exergames als Maßnahme der Betrieblichen Gesundheitsförderung verbunden sind. Als innovatives Konzept können Exergames nach Ansicht der Führungskraft die körperliche Aktivität der Mitarbeiter steigern.

Als Schwächen nennt die Führungskraft die Tatsache, dass Exergames als Instrument der Gesundheitsförderung unbekannt sind und somit erst kommunizieren werden muss.

Die Führungskraft sieht in Exergames als Maßnahme der Betrieblichen Gesundheitsförderung die Chance, die Betriebliche Gesundheitsförderung effektiver zu gestalten und an die Bedürfnisse der Mitarbeiter anzupassen.

Die Führungskraft nennt fehlende Konzepte bzw. Regelungen als Risiken für Exergames als Maßnahme der Betrieblichen Gesundheitsförderung. Sie führt aus, dass die Mitarbeiter ohne festgelegte Regelungen die Konsolen übermäßig nutzen würden und somit den Arbeitsalltag ungünstig beeinflussen würden.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Die Führungskraft gibt die geringen Kosten direkten und indirekten Kosten der Exergames als Argument für Exergames als Betriebliche Gesundheitsförderung an. Im Vergleich zu anderen Maßnahmen der Gesundheitsförderung sind die Anschaffungskosten gering, es wird kein zusätzlicher Trainer oder zusätzliche Räumlichkeiten benötigt, da sowohl Pausenräume als auch die Fitnessräume genutzt werden könnten und weiterhin gibt sie an, dass die Instandhaltungskosten ebenfalls verhältnismäßig gering seien.

Proband 8

Interviewdauer: 70 Minuten

Angaben zur Person:

- Männlich, 49 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Führungskraft betont, dass Betriebliche Gesundheitsförderung eine wichtige Unternehmensstrategie darstelle, um die Gesundheit und Leistungsfähigkeit der Angestellten zu erhalten. Die Gesundheit der Arbeitnehmer sei heutzutage ein wichtiger Wettbewerbsfaktor. Die Führungskraft möchte jedoch nicht nur über Betriebliche Gesundheitsförderung sprechen, sondern umfassender von Betrieblichem Gesundheitsmanagement. Er betont, dass bei diesem Konzept sowohl das Unternehmen als auch die Angestellten profitieren. Die Angestellten durch die Erhaltung ihrer Gesundheit und das Unternehmen durch sinkende Krankheitstage.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergames“ ist der Führungskraft aus einem wissenschaftlichen Artikel bekannt. Er gibt an, das Konzept sehr interessant zu finden und besitzt selber ein paar Spielkonsolen.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft gibt an, dass in den wissenschaftlichen Artikel von einem nachgewiesenen positiven Effekt auf die körperliche Aktivität der Spieler und von kognitiven Effekten berichtet wurde. Er selber findet, dass das Spielen von Exergames je nach Spiel anstrengend sein kann, wenn man es als Trainingsinstrument nutzen möchte.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Führungskraft gibt an, dass das Prinzip der Exergames ebenfalls in der Betrieblichen Gesundheitsförderung einen Nutzen stiften kann. Die Idee, diese im Unternehmen einzusetzen findet er sehr interessant. Er ist der Überzeugung, dass diese auch einfach im Unternehmen zu etablieren seien. Seiner Meinung nach wären die Anschaffungskosten verhältnismäßig gering. Standorte kann er sich auch genügend im Unternehmen vorstellen. So sei es seiner Meinung nach möglich, in Teamräumen, Pausenräumen oder auch in den Fitnessräumen die Spielkonsolen aufzustellen.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Nach Meinung der Führungskraft stellen Exergames eine interessante und innovative Möglichkeit dar, um die Angestellten für Betriebliche Gesundheitsförderung zu interessieren und die Mitarbeiterzufriedenheit zu erhöhen. Allerdings ist nach Meinung der Führungskraft das Kosten-Nutzen Verhältnis wichtig. Seiner Ansicht nach stellen Exergames ein kosteneffektives Angebot dar, welches verhältnismäßig leicht umzusetzen sei. Jedoch muss auch sichergestellt werden, dass die Maßnahme auch einen langfristigen Nutzen birgt.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Die wichtigste Voraussetzung zur Implementierung sei nach Ansicht der Führungskraft das Kosten-Nutzen-Verhältnis. Sei dies sichergestellt ist notwendig, die geeigneten Räumlichkeiten zu finden und die Beschäftigten über das neue Angebot zu informieren.

Proband 9

Interviewdauer: 51 Minuten

Angaben zur Person:

- Männlich, 53 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Führungskraft ist der Überzeugung, dass die Gesundheit der Mitarbeiter für das Unternehmen eine kritische Erfolgsgröße darstellt. Aus diesem Grund ist die Betriebliche Gesundheitsförderung für ihn ein wichtiger Wettbewerbsfaktor. Es trägt dazu bei die Fehlzeiten im Unternehmen zu reduzieren, die Fluktuation zu reduzieren und die Mitarbeiterzufriedenheit zu erhöhen. Dabei ist es relevant, dass die Gesundheit nicht nur von einem beauftragten Team fokussiert wird, sondern von allen Unternehmensebenen gelebt wird. Insbesondere die Führungskräfte beeinflussen in ihrer Funktion die ihnen nachgeordneten Mitarbeiter. Ihr Verhalten beeinflusst die Gesundheit direkt und indirekt und ermöglicht den Mitarbeitern, an dem bestehenden Angebot teilzunehmen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Führungskraft ist der Begriff zwar unbekannt, aber hat sich aus dem Wort hergeleitet, dass es um Spiele geht. Durch die Erläuterung mit dem Beispiel der Nintendo Wii Spielkonsole ergibt der Begriff für die Führungskraft der Begriff Sinn.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft kann sich vorstellen, dass Exergames einen Einfluss auf die Gesundheit ausüben, da der Begriff Exergames einen sportlichen Aspekt suggeriert. Er führt an, dass die Spiele durch die Bewegungen der Spieler gesteuert werden und somit

wie ein innovatives Möglichkeit des Trainings betrachtet werden kann. Allerdings hinterfragt er die Stärke des Nutzens.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Führungskraft kann sich prinzipiell interessant, eine computer- bzw. konsolenbasierte Maßnahme der Gesundheitsförderung anzubieten. Die Führungskraft gibt an, selber an einem derartigen Programm teilnehmen zu wollen. Er kann sich auch vorstellen, dass andere Mitarbeiter ebenfalls Interesse an einem derartigen Programm haben würden. Es sieht als Vorteil, dass die Exergames nicht so viel Zeit beanspruchen und auch zwischen den Arbeitszeiten im Rahmen von kleinen Pausen genutzt werden können. Zudem kann er sich nicht vorstellen, dass viele Barrieren im Unternehmensumfeld existieren. Die Ressourcen seien überschaubar. Die Anschaffungskosten seien verhältnismäßig gering und es müssten keine zusätzlichen Räumlichkeiten geschaffen werden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Führungskraft gibt an, dass ein solches innovatives Angebot einen Beitrag dazu leisten könnte, die Mitarbeiterzufriedenheit im Unternehmen zu erhöhen. Er ist der Überzeugung dass eine Stärke dieser Maßnahme der Zeitaufwand darstellt, der für die Exergames aufgebracht werden muss. So kann er sich vorstellen, dass auf Basis von Exergames richtige Trainingseinheiten konzipiert und im Rahmen von Fitnessprogrammen angeboten werden würden, aber auch dass die Spielkonsolen in Pausenräumen aufgestellt werden, so dass die Mitarbeiter in kleinen Pausen spielen können. Ein solches Angebot kann jedoch nur erfolgreich sein, wenn die Mitarbeiter das Angebot annehmen. Dies sieht er als kritische Erfolgsgröße an.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium zur Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung ist nach Ansicht der Führungskraft die Bereitschaft

der Mitarbeiter, dieses Angebot auch zu nutzen. Seiner Meinung nach kann ein Angebot, dass den Bedürfnissen der Mitarbeiter entspricht, einen entscheiden Beitrag dazu leisten, die Zufriedenheit am Arbeitsplatz er erhalten und zu verbessern.

Proband 10

Interviewdauer: 60 Minuten

Angaben zur Person:

- Weiblich, 28 Jahre alt, Wissenschaftliche Mitarbeiterin

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Wissenschaftliche Mitarbeiterin ist der Überzeugung, dass die Gesundheit der Arbeitnehmer und deren langfristiger Erhalt angesichts der demografischen Entwicklungen und der strukturellen Änderungen auf dem Arbeitsmarkt an Bedeutung gewinnen werden. Allein in den letzten zehn Jahren hat die Anzahl gesundheitsförderlicher Maßnahmen in mittelgroßen und großen Unternehmen stark zugenommen. Ihrer Meinung nach ist dies ein sehr erfreulicher Trend.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Da die wissenschaftliche Mitarbeiterin auf diesem Gebiet forscht, ist der Begriff bekannt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die wissenschaftliche Mitarbeiterin gibt an, dass die Literatur über physische, psychische und soziale Effekte berichtet. So gibt es randomisierte-kontrollierte Studien, die in Abhängigkeit der untersuchten Population, der genutzten Exergames und der verwendeten Exergamesysteme (sie nennt beispielhaft die Nintendo Wii Spielkonsole und die Kinect für die xbox), die die Wirkung auf die körperliche Aktivität untersucht haben. Diese berichten von einer moderat-intensiven körperlichen Aktivität durch Exergames.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die wissenschaftliche Mitarbeiterin ist der Überzeugung, dass Exergames die Angebote der Betrieblichen Gesundheitsförderung ergänzen kann. Exergames verknüpfen anstrengende körperliche Bewegungen mit spielerischen Elementen der Unterhaltungselektronik und motivieren somit die Spieler durch Spielspaß zu mehr Bewegung. Der gesundheitliche Effekt sei in verschiedenen Studien ebenfalls nachgewiesen worden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die wissenschaftliche Mitarbeiterin ist der Überzeugung, dass der Motivationsaspekt von Exergames besonders hervorgehoben werden sollte. Exergames als innovative Maßnahme der Gesundheitsförderung können dazu beitragen, die Mitarbeiter während ihrer Arbeitszeit bzw. an ihrem Arbeitsplatz zu einem bestimmten Maß an Bewegung zu motivieren, die sie ohne das Angebot nicht erreichen würden. Ihrer Meinung nach können Exergames im Rahmen der betriebsinternen Sportangebote oder Fitnessräume angeboten werden. Auch könne sie sich vorstellen, dass die Geräte ähnlich wie Kickertische an bestimmten Orten im Unternehmen aufgestellt werden könnten. Ihrer Ansicht nach ist ein Vorteil der Exergames, dass sowohl längere, als auch kurze Aktivitäten mit den Spielkonsolen durchgeführt werden könne, so dass diese im Vergleich zu anderen Angeboten der Gesundheitsförderung auch in kurzen Pausen genutzt werden können.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium für die Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung ist nach Ansicht der wissenschaftlichen Mitarbeiterin die Entwicklung eines Konzeptes und Einbettung in die Strukturen des Unternehmens. Es ist ebenfalls wichtig, dieses Konzept klar zu kommunizieren und allen Mitarbeitern zur Verfügung zu stellen.

Proband 11

Interviewdauer: 65 Minuten

Angaben zur Person:

- Männlich, 26 Jahre alt, Wissenschaftlicher Mitarbeiter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der wissenschaftliche Mitarbeiter ist der Meinung, dass Gesundheitsförderung für Unternehmen ein wichtiges Instrument ist, um die krankheitsbedingten Fehlzeiten zu reduzieren und das Wohlbefinden der Arbeitnehmer zu erhöhen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Dem wissenschaftlichen Mitarbeiter ist der Begriff Exergames bekannt, da er auf diesem Gebiet forscht.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der wissenschaftliche Mitarbeiter gibt an, dass bereits zahlreiche Studien die Wirksamkeit von Exergames untersucht haben. Dabei hat sich gezeigt, dass in Abhängigkeit von verschiedenen Faktoren wie das untersuchte Exergame oder die untersuchte Zielgruppe (Kinder, Ältere Personen) ein Effekt auf die körperliche Aktivität nachgewiesen wurde. Den Studien zufolge können Exergames einen moderat-intensiven Aktivitätslevel erreichen und somit einen Beitrag zur Gesundheit der Personen beitragen.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der wissenschaftliche Mitarbeiter ist der Meinung, dass Exergames ein interessantes und innovatives Instrument für die Gesundheitsförderung im betrieblichen Setting darstellen kann. Er ist der Überzeugung, dass Exergames das bestehende Angebot in den Betrieben ergänzen und somit interessanter und vielfältiger gestalten

kann. Bei Evaluationen von Maßnahmen der Betrieblichen Gesundheitsförderung hat sich gezeigt, dass viele unter dem Problem geringer Teilnehmer- und hoher Abbruchquoten leiden. Dieses Problem können mit einem interessanten Angebot angegangen werden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der wissenschaftliche Mitarbeiter nennt den innovativen Charakter und die leichte Bedienbarkeit der Konsolen als Stärken der Exergames. Exergames könnten eine Möglichkeit darstellen, um das Interesse der Beschäftigten für die Gesundheitsförderung zu wecken. Der wissenschaftliche Mitarbeiter sieht jedoch als Barriere, dass der ernsthafte Einsatz von Spielkonsolen im gesundheitlichen Kontext noch sehr unbekannt ist. Auch kann er sich vorstellen, dass insbesondere ältere Beschäftigten der Maßnahme gegenüber skeptisch gegenüberstehen und diese nicht nutzen würden. Weiterhin gibt er zu bedenken, dass trotz zahlreicher Studien über die Wirkung von Exergames keine die Langzeitwirkung untersucht haben.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der wissenschaftliche Mitarbeiter nennt als wichtigste Voraussetzung zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung das Wissen des Managements als Entscheider und Unterstützer und der Beschäftigten als potentielle Nutzer der Maßnahme.

Proband 12

Interviewdauer: 62 Minuten

Angaben zur Person:

- Männlich, 32 Jahre alt, Wissenschaftlicher Mitarbeiter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Nach Meinung des wissenschaftlichen Mitarbeiters ist Betriebliche Gesundheitsförderung ein wichtiges Instrument, um den Arbeitnehmer zur Stärkung ihrer Gesundheit zu befähigen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff ist dem wissenschaftlichen Mitarbeiter bekannt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der wissenschaftliche Mitarbeiter ist der Ansicht, dass Exergames einen positiven Einfluss auf die Gesundheit der Spieler haben können. Jedoch gibt er zu bedenken, dass dieser sich primär auf die körperliche Aktivität der Spieler auswirkt und zudem nur auftreten kann, wenn der Spieler die Exergames mit vollem Körpereinsatz spielt.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der wissenschaftliche Mitarbeiter ist der Meinung, dass Exergames im gesundheitlichen Kontext ein interessantes Instrument darstellen kann, um neue Zielgruppen zu erschließen. Ihm fallen keine Gründe ein, wieso Exergames nicht im betrieblichen Kontext eingesetzt werden könnten, denn diese kommen bereits in der Gesundheitsförderung in anderen Settings, wie beispielsweise in Schulen oder Rehabilitationseinrichtungen zum Einsatz.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Nach Ansicht des wissenschaftlichen Mitarbeiters sind Exergames eine innovative Möglichkeit, um Mitarbeiter zu mehr Bewegung am Arbeitsplatz zu motivieren. Sie sind im Vergleich zu anderen Angeboten der Bewegungsförderung verhältnismäßig kostengünstig und bieten auch die Möglichkeit, in kurzen Pausen eingesetzt zu werden. Somit sind sie in seinen Augen ein flexibles Instrument. Allerdings gibt er zu bedenken, dass das Prinzip der Exergames bzw. Exergames im

Allgemeinen noch sehr unbekannt sind. Er kann sich vorstellen, dass einige Mitarbeiter bzw. Mitarbeitergruppen nicht durch ein derartiges Programm angesprochen werden. Zudem gibt er zu bedenken, dass bisher keine Studien über Langzeiteffekte durchgeführt wurden. Somit kann zum derzeitigen Zeitpunkt nicht hinreichend belegt werden, ob Exergames auch langfristig einen positiven Nutzen bringen.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium zur erfolgreichen Implementierung von Exergames in der Betrieblichen Gesundheitsförderung ist nach Meinung des wissenschaftlichen Mitarbeiters die Einbettung der Exergames in die Strukturen des Betrieblichen Gesundheitsmanagements, um keine „Insellösung“ zu schaffen.

Proband 13

Interviewdauer: 70 Minuten

Angaben zur Person:

- Männlich, 33 Jahre alt, Wissenschaftlicher Mitarbeiter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Betriebliche Gesundheitsförderung ist nach Ansicht des wissenschaftlichen Mitarbeiters ein geeignetes Instrument, um die Menschen an Ort, an dem sie einen Großteil ihrer Zeit verbringen zu mehr Gesundheit zu befähigen. Maßnahmen der Betrieblichen Gesundheitsförderung zielen jedoch nicht nur auf präventive Aktivitäten, sondern auch darauf ab, das Wohlbefinden der Arbeitnehmer am Arbeitsplatz zu erhöhen. Zudem werden Betriebliche Gesundheitsförderung und vor allem Betriebliches Gesundheitsmanagement in den Betrieben umgesetzt, um neben zufriedener Mitarbeitern auch eine Reduktion krankheitsbedingter Fehltage oder und der Fluktuation zu bewirken.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff und das Prinzip der „Exergames“ sind dem wissenschaftlichen Mitarbeiter bekannt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der wissenschaftliche Mitarbeiter ist der Überzeugung, dass Exergames bedingt geeignet sind, um die Gesundheit der Spieler zu erhöhen. Seinem Wissen zufolge existieren zwar Studien, die einen durch das Spiel von Exergames bedingten Effekt auf die körperliche Aktivität, teilweise auch auf die kognitive Leistungsfähigkeit nachgewiesen haben. Jedoch können dieser Ergebnisse nicht verallgemeinert werden. Er führt an, dass die Ergebnisse in der Wirkung stark mit der untersuchten Personengruppe (z.B. Rehabilitationspatienten), dem eingesetzten Spielkonsole, dem verwendeten Exergame und noch weitern Faktoren variieren. Seiner Meinung nach können Exergames eine gesundheitsförderliche Wirkung haben, allerdings müssen hierzu die geeigneten Exergames und die dazugehörigen Spielkonsolen ausgewählt werden und die Bewegungen korrekt ausgeführt werden. Er nennt hierzu ein Beispiel. Bei der Nintendo Wii Spielkonsole kann das Spiel Tennis sowohl im Stehen mit großen Armbewegungen als auch im Sitzen mit kleinen Bewegungen des Handgelenks ausgeführt werden. Hier unterscheidet sich die Wirkung des gleichen Exergames stark.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der wissenschaftliche Mitarbeiter ist der Meinung, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können. Allerdings gibt er zu bedenken, dass die Bereitstellung an sich keine großen Effekte auf die Gesundheit der Spieler haben wird. Seiner Meinung nach müssten klare Regeln bzw. ein klares Konzept über die Nutzung der Spielkonsole bestehen. Zudem sollte es seiner Meinung nach nur als Baustein eines umfassenden Programms zur Gesundheitsförderung eingesetzt werden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Exergames zeichnen sich nach Ansicht des wissenschaftlichen Mitarbeiters dadurch aus, dass (anstrengende) körperliche Bewegungen mit spielerischen Elementen der Unterhaltungselektronik verknüpft werden, um die Spieler somit durch Spielspaß zu mehr Bewegung zu motivieren. Dieser Motivationsfaktor ist nach Meinung des wissenschaftlichen Mitarbeiters die Stärke der Exergames. Exergames werden zudem soziale Aspekte zugesprochen, da viele Spiele Mehrspieleroptionen besitzen. Der wissenschaftliche Mitarbeiter gibt jedoch zu bedenken, dass die Gesundheitseffekte nur sehr gering oder gar nicht auftreten, wenn die Spiele nicht ernsthaft gespielt werden. Er wiederholt an dieser Stelle sein Beispiel über das Nintendo Wii Tennis Exergame. Als größtes Risiko von Exergames in der Betrieblichen Gesundheitsförderung nennt der wissenschaftliche Mitarbeiter die Akzeptanz und Unterstützung durch das Management. Seiner Meinung nach ist eine derartige Maßnahme nicht ohne die Unterstützung durch das Management umzusetzen, da diese sowohl eine Vorbildfunktion hat, als auch durch ihr Verhaltend als Verhalten der Mitarbeiter beeinflusst.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Als wichtigstes Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung nennt der wissenschaftliche Mitarbeiter die Akzeptanz und Unterstützung durch das Management der Unternehmen.

Proband 14

Interviewdauer: 54 Minuten

Angaben zur Person:

- Männlich, 45 Jahre alt, Angestellter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Angestellte gibt an, dass Gesundheit wichtig sei. Er findet es auch gut, dass im Unternehmen Angebote gemacht werden, um die Gesundheit zu verbessern. So hat er schon einmal an einer Raucherentwöhnung teilgenommen und ist seitdem

Nichtraucher. Allerdings gibt er zu bedenken, dass in seinem Job die Gesundheitsförderung keine große Rolle einnimmt.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergames“ ist dem Angestellten nicht bekannt. Mit dem Beispiel der Nintendo Wii Spielkonsole wurde ihm das Prinzip von Exergames erklärt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Angestellte denkt, dass das Spiel eines Konsolenspiels keinen großen Einfluss auf die Gesundheit des Spielers ausüben kann. Zwar kann er sich vorstellen, dass der Spieler während des Spiels ins Schwitzen gerät, jedoch kann er sich nicht vorstellen, dass dies ausreicht, um zum Beispiel abzunehmen.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Angestellte findet die Idee von Spielkonsolen am Arbeitsplatz gut. Er kann sich gut vorstellen, dass das eine gute Möglichkeit wäre, um Arbeitspausen effektiv zu nutzen.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Angestellte ist der Meinung, dass Exergames eine gute Möglichkeit wären, um in kurzen Pausen ein wenig Bewegung zu bekommen. Zudem kann er sich vorstellen, dass es Spaß machen würde gegen Kollegen in Exergames anzutreten. Er kann sich aber nicht vorstellen, dass Exergames als gesundheitsförderliche Maßnahme besonders effektiv sei.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der Angestellte ist der Meinung, dass das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung der Nutzen sei. Ohne einen nachgewiesenen Nutzen, so ist sich der Angestellte sicher, wird eine derartige Maßnahme im Unternehmen nicht eingesetzt werden.

Proband 15

Interviewdauer: 60 Minuten

Angaben zur Person:

- Weiblich, 47 Jahre alt, Betriebsrätin

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Betriebsrätin ist der Meinung, dass die Gesundheit der Mitarbeiter für das Unternehmen an erster Stelle stehen sollte. Gerade bei Dienstleistungsunternehmen seien gesunde und motivierte Mitarbeiter ein wichtiger Wettbewerbsfaktor.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Betriebsrätin unbekannt. Die Nintendo Spielkonsole kennt die Betriebsrätin.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Betriebsrätin kann sich vorstellen, dass das Spiel von Exergames durch die Bewegung einen positiven Effekt auf die Gesundheit hat.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Betriebsrätin ist der Meinung, dass Exergames eine interessante Abwechslung zu bestehenden Programmen der Gesundheitsförderung darstellen können. Sie ist der Überzeugung, dass ausreichend Ressourcen vorhanden seien. Sie setzt allerdings voraus, dass genauer Regeln in der Nutzung aufgestellt werden. So ist

zum Beispiel im Vorhinein zu klären, ob die Mitarbeiter die Konsole während oder ausschließlich außerhalb der Arbeitszeit nutzen können.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Betriebsrätin ist der Überzeugung, dass Exergames eine interessante und neuartige Möglichkeit darstellen, um Mitarbeiter für Bewegung am Arbeitsplatz zu motivieren. Sie kann sich vorstellen, dass im Vergleich zu anderen Programmen keine Vorerfahrung notwendig sei und somit eine geringe Hemmschwelle zu Nutzung haben. Sie sieht allerdings die Risiken, dass der Nutzen bzw. der Effekt nicht ausreichend groß ist, um in die Betriebliche Gesundheitsförderung aufgenommen zu werden. Auch müssen klare Regelungen aufgestellt werden, zu welchen Konditionen die Konsolen genutzt werden dürfen. Zuletzt merkt die Betriebsrätin noch an, dass durch die Nutzung der Spielkonsolen keine Mitarbeiter diskriminiert werden dürfen.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung nennt die Betriebsrätin die klare Regelung im Rahmen eines Konzeptes.

Proband 16

Interviewdauer: 60 Minuten

Angaben zur Person:

- Männlich, 48 Jahre alt, Betriebsarzt

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Betriebsarzt gibt an, dass Betriebliche Gesundheitsförderung für das Unternehmen von großer Bedeutung sei. Zum derzeitigen Zeitpunkt seien sie dabei, das Thema neu zu strukturieren und alle Ansätze in ein Betriebliches Gesundheitsmanagement zu überführen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Dem Betriebsarzt ist der Begriff „Exergame“ unbekannt. Nach Erläuterung am Beispiel der Nintendo Wii Spielkonsole ist ihm der Begriff verständlich.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Betriebsarzt ist der Überzeugung, dass die neuartigen Spiele für die Spielkonsolen eine interessante Möglichkeit darstellen, um ein potentiell gesundheitsgefährdendes Verhalten, nämlich eine passive Freizeitbeschäftigung, durch eine aktive Freizeitbeschäftigung zu ersetzen.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Betriebsarzt ist der Meinung, dass die Idee von Exergames in der Betrieblichen Gesundheitsförderung prinzipiell interessant wäre. Allerdings sei er nicht von dem gesundheitlichen Outcome überzeugt.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Betriebsarzt sieht die Stärke von Exergames in dem innovativen Konzept und der einfachen Bedienung der Konsolen. Allerdings sieht er die Schwäche, dass der Gesundheitliche Outcome unklar sei. Der gesundheitliche Outcome sei aber zugleich die Chance des Konzeptes. Sollte sich herausstellen, dass es evidenzbasierte Ergebnisse in diesem Bereich gibt, so sei es möglich, Exergames als Instrument der Gesundheitsförderung aufzunehmen. Der Betriebsrat gibt aber zu bedenken, dass eine Umsetzung im betrieblichen Kontext unmöglich sei, wenn sich herausstellt, dass das Spiel der Exergames keinen Effekt bewirkt.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der Betriebsarzt ist der Überzeugung, dass das wichtigste Kriterium zur erfolgreichen Implementierung von Exergames in der Betrieblichen Gesundheitsförderung der gesundheitliche Outcome sei.

Proband 17

Interviewdauer: 67 Minuten

Angaben zur Person:

- Männlich, 54 Jahre alt, Betriebsarzt

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Betriebsarzt berichtet von der Relevanz Betrieblicher Gesundheitsförderung für das Unternehmen. Seiner Meinung nach ist es ein wichtiges Instrument des Managements, um die Gesundheit der Mitarbeiter zu erhalten. Er gibt an, dass das Thema bisher eher vernachlässigt wurde. Seiner Meinung nach existiert lediglich in wenigen großen Firmen ein strukturiertes Betriebliches Gesundheitsmanagement. Man sei noch ganz am Anfang. Er ist jedoch der Überzeugung, dass das Thema auch in Zukunft noch weiter an Bedeutung gewinnen wird.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Dem Betriebsarzt ist der Begriff „Exergame“ unbekannt. Nach der Erklärung gibt er an, dass er bereits über bewegungsfördernde Spielkonsolen gelesen habe.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Betriebsarzt gibt an, dass Spielkonsolen im gesundheitlichen Kontext in der Rehabilitation eingesetzt werden. Sie bieten die Möglichkeit, die Behandlungsprozesse attraktiver für die Patienten zu gestalten und somit den gesundheitlichen Outcome zu verbessern.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Betriebsarzt ist der Überzeugung, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können, wenn sie ihm Rahmen eines gesundheitlichen Konzeptes eingebettet werden. Das Alleinige Spiel wird seiner Meinung nach keinen großen Effekt ausüben. Wenn die Spieler jedoch korrekt angeleitet werden, ist es möglich, mit den Spielkonsolen ein abwechslungsreiches Training anzubieten.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Der Betriebsarzt gibt an, dass die Stärken der Exergames der spielerische Kontext sei. In ein gesundheitsförderliches Konzept eingebettet und korrekt angeleitet könne es ein innovatives Angebot darstellen. Allerdings gibt er zu bedenken, dass es schwierig sei, die korrekte Ausführung tatsächlich zu kontrollieren, da es seiner Meinung nach keine Trainer geben kann. Er gibt zu bedenken, dass die Konsole zweckentfremdet werden könnte und somit keinen gesundheitlichen Nutzen stiften könnte. Jedoch überlegt er, habe das gemeinsame Spiel von Exergames ebenfalls einen Effekt. Das Wohlbefinden den Mitarbeiter seien ebenfalls wichtige Aspekte, die bedacht werden sollten.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung sei die Einbettung in ein gesundheitliches Konzept.

Proband 18

Interviewdauer: 65 Minuten

Angaben zur Person:

- Weiblich, 39 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Betriebliche Gesundheitsförderung ist nach Meinung der Führungskraft ein wichtiges Instrument, um das Problem hoher Fehlzeiten und Fluktuation zu begegnen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Führungskraft nicht bekannt. Der Begriff erscheint ihr aber nach Erläuterung passend. Sie gibt an, selber eine solche Spielkonsole (Nintendo Wii) zu besitzen.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft ist der Meinung, dass Exergames die Spieler zu einer anstrengenden Aktivität motivieren und somit einen positiven Effekt auf die Gesundheit haben können.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Führungskraft würde Exergames im betrieblichen Kontext sehr interessant finden. Sie kann sich vorstellen, dass beispielsweise in ihre Teamräume eine Konsole aufgestellt wird, sodass ihre Mitarbeiter zur Entspannung kurze Pausen einlegen können. Auch kann sie sich vorstellen, dass durch das gemeinsame Spiel die Kommunikation verbessert werden könnte. Sie glaubt, dass Exergames unabhängig von der Wirkung auf die Bewegung einen positiven Effekt haben können.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Führungskraft ist der Meinung, dass Exergames eine interessante Möglichkeit darstellen, um kostengünstig ein Instrument für die Gesundheit und das Wohlbefinden der Mitarbeiter bereitzustellen. Obwohl sie der Meinung sei, dass der Effekt auf die Gesundheit nicht so groß sei wie bei einem Sportkurs, glaubt sie an das Potential für den betrieblichen Kontext.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Die Führungskraft gibt an, dass das wichtigste Kriterium das Kosten-Nutzenverhältnis sei.

Proband 19

Interviewdauer: 25 Minuten

Angaben zur Person:

- Männlich, 56 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Führungskraft gibt an, dass die Förderung der Gesundheit ein wichtiger Success-Factor sei.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Führungskraft nicht bekannt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft gibt an, dass sie sich nicht vorstellen könne, dass das Spiel von Spielkonsolen einen großen Effekt auf die Gesundheit der Spieler habe.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Führungskraft sieht den Einsatz von Exergames in der Betrieblichen Gesundheitsförderung skeptisch, da er der Meinung sei, dass der Nutzen die Kosten nicht überwiegt.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Als Stärke nennt die Führungskraft den innovativen Charakter der Maßnahme. Er betont jedoch seine Skepsis hinsichtlich des Effektes auf die Gesundheit. Er sieht zudem das Risiko, dass die Maßnahme nicht als gesundheitliches Angebot wahrgenommen wird, sondern eher wie ein Kicker-Tisch bei der Cafeteria angenommen wird.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Die Führungskraft gibt an, dass das wichtigste Kriterium zur erfolgreichen Implementierung das Kosten-Nutzen-Verhältnis und der nachgewiesene Effekt auf die Gesundheit sei.

Proband 20

Interviewdauer: 60 Minuten

Angaben zur Person:

- Männlich, 53 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Führungskraft ist der Meinung, dass die Gesundheitsförderung der Angestellten ein wichtiges Thema für das Unternehmen darstellt. Durch gesundheitsförderliche Maßnahmen sei es möglich, Fehlzeiten und Fluktuation zu reduzieren und das Wohlbefinden der Mitarbeiter zu erhöhen. Seiner Ansicht nach sind gesunde und zufriedene Mitarbeiter produktive Mitarbeiter.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Führungskraft nicht bekannt. Das Prinzip der bewegungsfördernden Spielkonsolen findet er aber sehr interessant.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft kann sich vorstellen, dass Exergames durch das Prinzip der Bewegung durchaus einen gesundheitsförderlichen Effekt haben können.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Führungskraft kann sich vorstellen, dass Exergames im betrieblichen Kontext eingesetzt werden können. Er sieht die Chance, dass ein so innovativer Ansatz das Wohlbefinden und die Zufriedenheit der Mitarbeiter erhöht. Er glaubt, dass Mitarbeiter diese beispielsweise zur aktiven Pausengestaltung nutzen könnten.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Führungskraft ist der Meinung, dass Exergames das Wohlbefinden der Mitarbeiter erhöhen können und somit die Arbeitszufriedenheit positive beeinflusst. Er sieht die Chance, dass die Konsolen im Rahmen aktiver Pausengestaltung genutzt werden können. Er sieht jedoch auch das Risiko, dass dieses Angebot missbraucht werden könnte. Daher müssen klare Spielregeln im Umgang mit dem Angebot aufgestellt werden.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Die Führungskraft ist der Überzeugung, dass der wichtigste Grund für eine Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung die Zufriedenheit der Mitarbeiter als Produktionsfaktor sei.

Proband 21

Interviewdauer: 60 Minuten

Angaben zur Person:

- Männlich, 57 Jahre alt, Führungskraft

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Mitarbeiter sind nach Meinung der Führungskraft der wichtigste Produktionsfaktor. Die Erhaltung und Förderung ihrer Gesundheit sei somit ein wichtiges Unternehmensziel. Betriebliche Gesundheitsförderung stellt für das Unternehmen eine wichtige Managementstrategie dar, um die Unternehmensziele zu erreichen.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Führungskraft nicht bekannt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Führungskraft denkt, dass Exergames positiv auf die Gesundheit der Spieler wirken können, indem die Spieler zu Bewegung motiviert werden. Allerdings kann sie sich nicht vorstellen, dass der Effekt genauso groß sei, wie bei einem Aerobic Kurs.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Im Prinzip findet die Führungskraft die Idee von Exergames im Unternehmen interessant. Allerdings setzt er voraus, dass der Nutzen des Angebots die Kosten übersteigt. Die Kosten seien aus seiner Sicht nicht der ausschlaggebende Punkt. Seiner Meinung nach sind diese verhältnismäßig gering und überschaubar. Jedoch sieht er den gesundheitlichen Nutzen kritisch.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Stärke der Maßnahme liegt nach Meinung der Führungskraft in den geringen Kosten der Maßnahme. Die Schwäche in dem unsicheren gesundheitlichen Nutzen. Er sieht die Chance, dass das neuartige Angebot gut von den Mitarbeitern angenommen wird, sieht aber zugleich die Gefahr, dass das Angebot missbraucht werden kann und die Mitarbeiter von ihrer eigentlichen Tätigkeit abhalten könne.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium für die Führungskraft ist die Kosteneffektivität der Maßnahme.

Proband 22

Interviewdauer: 58 Minuten

Angaben zur Person:

- Weiblich, 29 Jahre alt, Angestellte

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Die Angestellte ist der Meinung, dass die betriebliche Gesundheitsförderung ein sinnvolles Angebot des Arbeitgebers sei. Sie selber nutzt einige Angebote und ist sehr zufrieden damit. Ihrer Meinung nach ist das Unternehmen auch in diesem Bereich sehr gut aufgestellt, da es ein sehr breites Spektrum an verschiedenen Maßnahmen anbietet.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist der Angestellten nicht bekannt. Sie besitzt aber eine ähnliche Spielkonsole wie die Nintendo Wii.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Die Angestellte ist der Überzeugung, dass die Exergames gute Trainingsmöglichkeiten bieten. So kann sie mit Ihrer Konsole sowohl Gymnastikübungen, Kräftigungsübungen für die Muskeln als auch Ausdauertrainings machen.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Die Angestellte ist der Überzeugung, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können, da sie diese zum Training im häuslichen Umfeld nutzt. Sie sieht jedoch die Gefahr, dass die Geräte ausschließlich zum Spielen genutzt werden könnte und somit einen negativen Ruf bekommen würden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Die Angestellte sieht die leichte Bedienung der Exergames als klare Stärke. Zudem kann mit Hilfe der Spiele ein individuelles Trainingsprogramm aufgestellt werden. Außerdem betont sie den Spaß der Exergames. Sie sieht jedoch die Gefahr, dass das Angebot nicht zur Förderung der Bewegung, sondern ausschließlich als Freizeitaktivität missbraucht werden könnte. Zudem kann sieht sich das Risiko, dass die Maßnahme nur von bestimmten Personengruppen angenommen wird.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung ist die Bedienungsfreundlichkeit der Maßnahme.

Proband 23

Interviewdauer: 60 Minuten

Angaben zur Person:

- Männlich, 34 Jahre alt, Angestellter

Frage 2.1: Was halten Sie von Betrieblicher Gesundheitsförderung?

- Der Angestellte gibt an, dass die Betriebliche Gesundheitsförderung für ihn nicht so interessant sei. Er findet es zwar gut, dass der Arbeitgeber etwas in diesem Bereich macht, aber dies sei seiner Meinung nach auch seine Aufgabe.

Frage 2.2: Ist Ihnen der Begriff Exergames bekannt? (J/N) Bei N Erläuterung Prinzip von Exergames am Beispiel der Nintendo Wii Spielkonsole.

- Der Begriff „Exergame“ ist dem Angestellten nicht bekannt.

Frage 2.3: Wie schätzen Sie die Wirkung von Exergames auf die Gesundheit der Spieler ein?

- Der Angestellte ist der Meinung, dass Exergames durch den Fokus auf die Bewegung der Spieler positiv auf die Gesundheit wirken kann.

Frage 2.4: Glauben Sie, dass Exergames in der Betrieblichen Gesundheitsförderung eingesetzt werden können?

- Der Angestellte findet die Idee gut, dass Videospiele in der Betrieblichen Gesundheitsförderung eingesetzt werden könnten. Er gibt an, dass die Maßnahme ihn persönlich dazu motivieren würde, an einem Programm der Gesundheitsförderung teilzunehmen. Er kann sich aber nicht vorstellen, dass das Management videospielbasierte Maßnahmen anbieten würden.

Frage 3: Bitte beurteilen Sie die Stärken, Schwächen, Chancen und Risiken von Exergames als Maßnahme der Betrieblichen Gesundheitsförderung.

- Das größte Hindernis bzw. die größte Schwäche sieht der Angestellte in dem Management des Unternehmens. Er kann sich nicht vorstellen, dass dieses eine konsolenbasierte Maßnahme anbieten würde. Seiner Meinung nach würde das Angebot von vielen Mitarbeitern angenommen werden, da es interessant und abwechslungsreich wäre. Zudem sei die Bedienung der Spiele leicht zu erlernen und durch die Vorgabe von Zielen würden Anreize gesetzt werden, höhere Ziele zu erreichen.

Frage 4: Welches ist Ihrer Meinung nach das wichtigste Kriterium zur erfolgreichen Implementierung und Anwendung von Exergames in der Betrieblichen Gesundheitsförderung?

Der Angestellte nennt als wichtigstes Kriterium die offene Einstellung des Managements gegenüber einer konsolenbasierten Maßnahme der Gesundheitsförderung.

8.2 Statistical results of the executives questionnaire

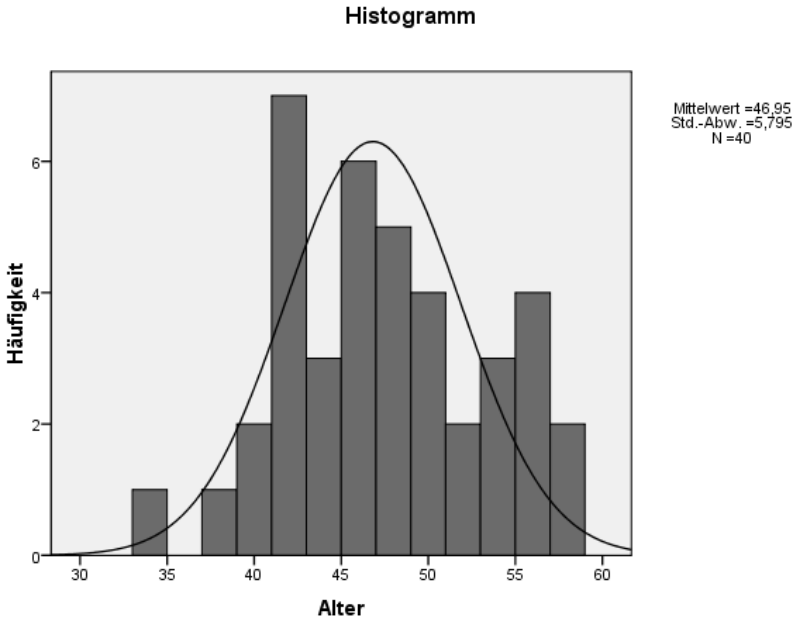

Figure 40: Normal distribution histogram age online questionnaire (Source: Own diagram)

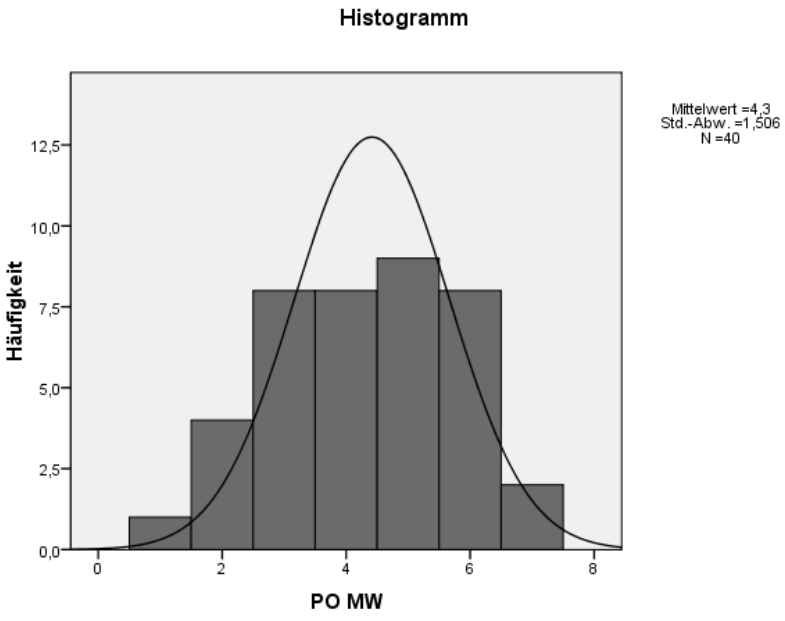

Figure 41: Normal distribution histogram potential exergames online questionnaire (Source: Own diagram)

Table 30: Test normal distribution (Source: Own diagram)

	Shapiro-Wilk		
	Statistic	Df	Significance
Age	.963	39	.232
Sex	.350	39	.000
PW	.902	39	.003
AW	.895	39	.002
KE	.694	39	.000
PUE	.940	39	.039
PEOUE	.913	39	.005
ATUE	.904	39	.003
BITUE	.867	39	.000
PE	.947	39	.066

AW = Attitude towards workplace health promotion

PW = Priority of workplace health promotion

KE = Knowledge of exergames

PE = Potential of exergames

PUE = Perceived usefulness exergames

PEOUE = Perceived ease of use exergames

ATUE = Attitude towards using exergames

BITUE = Behavioral intention to use exergames

Table 31: Correlation matrix (extract) (Source: Own diagram)

		Age	Sex	PW	AW	KE	PUE	PEOUE	PE	ATUE	BITUE
ATUE	Corr. Coef.	-.145	.088	.065	**.312***	**.427****	**.905****	**.720****	**.837****	1.000	
	Sig. (2-tailed)	.373	.594	.691	.050	.006	.000	.000	.000	.	
	N	40	39	40	40	40	40	40	40	40	
BITUE	Corr. Coef.	-.064	.149	.198	**.469****	.307	**.803****	**.617****	**.766****	**.856****	1.000
	Sig. (2-	.694	.365	.221	.002	.054	.000	.000	.000	.000	.

	tailed)									
	N	40	39	40	40	40	40	40	40	40	40

AW = Attitude towards workplace health promotion

PW = Priority of workplace health promotion

KE = Knowledge of exergames

PE = Potential of exergames

PUE = Perceived usefulness exergames

PEOUE = Perceived ease of use exergames

ATUE = Attitude towards using exergames

BITUE = Behavioral intention to use exergames

Table 32: Desciptive statistic (Source: Own diagram)

Construct / Items									
	average	**median**	**mode**	**SD**	**variance**	**selectivity**	**Factorloadings**	**Cronbachs Alpha**	**Total VarianceExplained**
Potential (EG)**								.99	79.28%
PE1	4.68	5.00	3a	1.72	2.943	0.90	0.93		
PE2	4.95	5.00	5	1.55	2.408	0.80	0.86		
PE3	4.70	5.00	5	1.73	2.985	0.88	0.92		
PE4	4.78	5.00	5	1.85	3.410	0.85	0.90		
PE5	4.68	5.00	4a	1.79	3.199	0.90	0.94		
PE6	4.38	4.00	4a	1.98	3.933	0.68	0.77		
Priority (WHP)**								-	-

PW	4.53	5.00	5	1.43	2.051	-	-		
Attitude (WHP)*								.89	63.91%
AW1	4.35	5.00	5	1.81	3.259	0.64	0.74		
AW2	5.45	6.00	6	1.43	2.049	0.88	0.92		
AW3	5.10	5.00	6	1.30	1.682	0.75	0.83		
AW4***	4.18	4.00	4	1.88	3.515	0.55	0.65		
AW5	5.75	6.00	6	1.19	1.410	0.77	0.86		
AW6***	5.65	6.00	7	1.49	2.233	0.62	0.72		
AW7	5.83	6.00	6	1.24	1.533	0.75	0.85		
Knoweldege (EG)*								.97	88.01%
KE1	2.60	2.00	1	1.81	3.272	0.93	0.95		
KE2	1.95	1.00	1	1.58	2.510	0.86	0.91		
KE3	2.60	2.00	1	1.95	3.785	0.90	0.94		
KE4	2.28	1.00	1	1.78	3.179	0.90	0.93		
KE5	2.13	1.00	1	1.70	2.881	0.92	0.95		
PerceivedUsefulness (EG)*								.91	80.12%
PUE1	3.80	3.00	3	1.8	3.497	0.94	0.96		

				7					
PUE2	3.85	3.00	3	2.05	4.182	0.92	0.95		
PUE3	4.20	4.00	3	1.95	3.805	0.54	0.63		
PUE4	4.08	4.00	5	2.03	4.122	0.90	0.94		
PUE5	4.15	4.50	7	2.21	4,900	0,83	0,89		
PUE6	3.85	4.00	5	2.05	4,182	0,91	0,94		
Perceived Ease of Use (EG)*								.95	72.48%
PEOUE1	5.53	6.00	7	1.78	3.179	0.78	0.83		
PEOUE2	5.68	6.00	6[a]	1.44	2.071	0.90	0.95		
PEOUE3	5.63	6.00	6	1.29	1.676	0.82	0.91		
PEOUE4	4.08	4.00	6	2.15	4.635	0.62	0.70		
PEOUE5	5.50	6.00	6	1.34	1.795	0.81	0.90		
PEOUE6	5.53	6.00	6[a]	1.45	2.102	0.68	0.79		
Attitude towardsUsing (EG)*								.97	94.11%
ATUE1	4.28	4.00	4	2.10	4.410	0.93	0.97		
ATUE2	4.88	5.00	7	1.79	3.189	0.91	0.96		

ATUE3	4.48	4.00	7	2.09	4.358	0.97	0.99		
Behavioral Intention to Use (EG)*								.99	98.15%
BITUE1	3.90	4.00	7	2.36	5.579	0.98	0.99		
BITUE2	3.90	4.00	1	2.27	5.169	0.99	1.00		
BITUE3	3.65	4.00	1	2.19	4.797	0.96	0.98		

Note:

Sample size: N=40

SD: standarddeviation

* Response format: 1 = Strongly disagree to 7 = Strongly agree

** Response format: 1 = lowest priority to 7 = highest priority

***Reverse polarity of the items.

Table 33: Correlation matrix (Total) (Source: Own diagram)

		Age	Sex	PW	AW	KW	PUE	PEOUE	PE	ATUE	BITUE
Age	Corr. Coef.	1.000									
	Sig. (2-tailed)	.									
	N	40									
Sex	Corr. Coef.	.489**	1.000								
	Sig. (2-tailed)	.002	.								
	N	39	39								
PW	Corr. Coef.	.288	.248	1.000							
	Sig. (2-tailed)	.072	.128	.							
	N	40	39	40							
AW	Corr. Coef.	.164	.043	.589**	1.000						
	Sig. (2-tailed)	.311	.795	.000	.						
	N	40	39	40	40						
KE	Corr. Coef.	-.369*	-.166	-.030	-.023	1.000					
	Sig. (2-tailed)	.019	.311	.854	.887	.					
	N	40	39	40	40	40					
PUE	Corr. Coef.	-.130	.080	.122	.371*	.447**	1.000				
	Sig. (2-tailed)	.424	.629	.454	.018	.004	.				
	N	40	39	40	40	40	40				
PEOUE	Corr. Coef.	-.136	.073	-.028	.213	.514**	.735**	1.000			
	Sig. (2-tailed)	.403	.657	.865	.186	.001	.000	.			
	N	40	39	40	40	40	40	40			
PE	Corr. Coef.	-.157	.034	.068	.300	.380*	.896**	.815**	1.000		
	Sig. (2-tailed)	.334	.835	.675	.060	.016	.000	.000	.		
	N	40	39	40	40	40	40	40	40		

ATUE	Corr. Coef.	-.145	.088	.065	.312*	.427**	.905**	.720**	.837**	1.000	
	Sig. (2-tailed)	.373	.594	.691	.050	.006	.000	.000	.000	.	
	N	40	39	40	40	40	40	40	40	40	
BITUE	Corr. Coef.	-.064	.149	.198	.469**	.307	.803**	.617**	.766**	.856**	1.000
	Sig. (2-tailed)	.694	.365	.221	.002	.054	.000	.000	.000	.000	.
	N	40	39	40	40	40	40	40	40	40	40

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

AW = Attitude towards workplace health promotion

PW = Priority of workplace health promotion

KE = Knowledge of exergames

PE = Potential of exergames

PUE = Perceived usefulness exergames

PEOUE = Perceived ease of use exergames

ATUE = Attitude towards using exergames

BITUE = Behavioral intention to use exergames

8.3 Experimental data and questionnaires

8.3.1 Usability experiment

System Usability Scale

Xbox 360 Kinect

Participant No_____

Is this your first, second or third test device?_____
* Required

I think that I would like to use this product frequently: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I found the product unnecessarily complex: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I thought the product was easy to use: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I think that I would need the support of a technical person to be able to use this product: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I found the various functions in this product were well integrated: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I thought there was too much inconsistency in this product: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I would imagine that most people would learn to use this product very quickly: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I found the product very awkward to use: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I felt very confident using the product: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

I needed to learn a lot of things before I could get going with this product: *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

Figure 42: SUS Questionnaire (Source: Own diagram)

Table 34: Results of the SUS usability experiment (Source: Own diagram)

	Par No	Device	I think that I would like to use this product frequently:	SUS Score	I found the product unnecessarily complex:	SUS Score	I thought the product was easy to use:	SUS Score	I think that I would need the support of a technical person to be able to use this product:	SUS Score	I found the various functions in this product were well integrated:	SUS Score
Wii	1	3	1	0	2	3	4	3	2	3	3	2
Wii	2	3	4	3	2	3	5	4	1	4	5	4
Wii	3	1	3	2	2	3	4	3	2	3	2	1
Wii	4	1	2	1	1	4	2	1	1	4	3	2
Wii	5	2	5	4	1	4	5	4	1	4	4	3
Wii	6	3	3	2	2	3	5	4	1	4	5	4
Wii	7	3	4	3	1	4	5	4	1	4	5	4
Wii	8	2	1	0	2	3	4	3	2	3	3	2
Wii	9	2	4	3	1	4	5	4	1	4	4	3
Wii	10	2	4	3	2	3	4	3	1	4	4	3
Wii	11	2	5	4	1	4	5	4	1	4	2	1
Wii	12	1	4	3	2	3	4	3	1	4	4	3
Wii	13	1	1	0	1	4	5	4	1	4	4	3
Wii	14	3	3	2	1	4	4	3	2	3	5	4
Wii	15	1	2	1	2	3	5	4	1	4	4	3
Wii	16	1	2	1	1	4	2	1	1	4	3	2
Wii	17	3	4	3	3	2	4	3	2	3	5	4
Wii	18	2	4	3	2	3	4	3	1	4	4	3
Wii	19	2	4	3	2	3	4	3	1	4	4	3
Wii	20	3	3	2	1	4	4	3	1	4	3	2
Wii	21	1	4	3	2	3	4	3	1	4	4	3

	Par No	Device	I thought there was too much inconsistency in this product:	SUS Score	I would imagine that most people would learn to use this product very quickly:	SUS Score	I found the product very awkward to use:	SUS Score	I felt very confident using the product:	SUS Score	I felt very confident using the product:	SUS Score
Wii	1	3	3	2	4	3	3	2	3	2	2	3
Wii	2	3	1	4	5	4	1	4	4	3	1	4
Wii	3	1	3	2	5	4	2	3	4	3	1	4
Wii	4	1	4	1	4	3	2	3	3	2	2	3
Wii	5	2	1	4	5	4	4	1	5	4	1	4
Wii	6	3	5	0	5	4	2	3	4	3	4	1
Wii	7	3	1	4	5	4	1	4	5	4	1	4
Wii	8	2	3	2	4	3	3	2	3	2	2	3
Wii	9	2	2	3	5	4	1	4	5	4	2	3
Wii	10	2	2	3	4	3	3	2	4	3	2	3
Wii	11	2	3	2	5	4	3	2	5	4	1	4
Wii	12	1	2	3	5	4	1	4	4	3	1	4
Wii	13	1	1	4	5	4	1	4	5	4	1	4
Wii	14	3	1	4	4	3	1	4	5	4	2	3
Wii	15	1	3	2	5	4	2	3	5	4	1	4
Wii	16	1	4	1	4	3	2	3	3	2	2	3
Wii	17	3	2	3	5	4	2	3	4	3	2	3
Wii	18	2	2	3	4	3	2	3	4	3	2	3
Wii	19	2	1	4	5	4	1	4	3	2	2	3
Wii	20	3	2	3	3	2	3	2	3	2	1	4
Wii	21	1	3	2	5	4	2	3	4	3	2	3

	Par No	Device	I think that I would like to use this product frequently:	SUS Score	I found the product unnecessarily complex:	SUS Score	I thought the product was easy to use:	SUS Score	I think that I would need the support of a technical person to be able to use this product:	SUS Score	I found the various functions in this product were well integrated:	SUS Score
PS	3	1	2	3	2	4	1	3	2	2	3	2	1
PS	3	2	2	2	1	4	1	2	1	4	1	2	1
PS	3	3	3	3	2	4	1	2	1	4	1	4	3
PS	3	4	3	1	0	4	1	2	1	2	3	2	1
PS	3	5	1	1	0	5	0	1	0	3	2	3	2
PS	3	6	2	1	0	4	1	1	0	2	3	4	3
PS	3	7	2	1	0	4	1	5	4	4	1	2	1
PS	3	8	1	1	0	5	0	1	0	2	3	1	0
PS	3	9	1	1	0	4	1	3	2	2	3	3	2
PS	3	10	1	2	1	4	1	2	1	3	2	2	1
PS	3	11	1	1	0	5	0	3	2	5	0	1	0
PS	3	12	3	2	1	5	0	1	0	4	1	1	0
PS	3	13	3	2	1	5	0	2	1	4	1	4	3
PS	3	14	2	2	1	2	3	3	2	2	3	2	1
PS	3	15	3	4	3	2	3	5	4	1	4	4	3
PS	3	16	3	4	3	1	4	3	2	1	4	4	3
PS	3	17	2	2	1	5	0	2	1	3	2	1	0
PS	3	18	1	3	2	4	1	5	4	1	4	2	1
PS	3	19	1	2	1	5	0	2	1	2	3	3	2
PS	3	20	2	4	3	3	2	4	3	1	4	4	3
PS	3	21	3	2	1	5	0	2	1	4	1	2	1

	Par No	Device	I thought there was too much inconsistency in this product:	SUS Score	I would imagine that most people would learn to use this product very quickly:	SUS Score	I found the product very awkward to use:	SUS Score	I felt very confident using the product:	SUS Score	I felt very confident using the product:	SUS Score
PS	3	1	2	3	2	3	2	3	2	3	2	3	2
PS	3	2	2	3	2	2	1	3	2	3	2	3	2
PS	3	3	3	4	1	3	2	4	1	2	1	2	3
PS	3	4	3	4	1	2	1	2	3	2	1	2	3
PS	3	5	1	3	2	2	1	1	4	1	0	4	1
PS	3	6	2	3	2	2	1	1	4	3	2	2	3
PS	3	7	2	4	1	1	0	3	2	2	1	5	0
PS	3	8	1	1	4	2	1	5	0	1	0	5	0
PS	3	9	1	4	1	4	3	5	0	2	1	3	2
PS	3	10	1	4	1	2	1	4	1	2	1	3	2
PS	3	11	1	2	3	1	0	3	2	1	0	3	2
PS	3	12	3	5	0	2	1	5	0	1	0	4	1
PS	3	13	3	4	1	2	1	4	1	1	0	4	1
PS	3	14	2	2	3	3	2	2	3	2	1	4	1
PS	3	15	3	3	2	4	3	1	4	4	3	2	3
PS	3	16	3	1	4	3	2	2	3	4	3	3	2
PS	3	17	2	4	1	3	2	2	3	3	2	2	3
PS	3	18	1	3	2	3	2	4	1	2	1	3	2
PS	3	19	1	3	2	2	1	4	1	2	1	4	1
PS	3	20	2	2	3	4	3	3	2	4	3	1	4
PS	3	21	3	4	1	1	0	4	1	3	2	4	1

	Par No	Device	I think that I would like to use this product frequently:	SUS Score	I found the product unnecessarily complex:	SUS Score	I thought the product was easy to use:	SUS Score	I think that I would need the support of a technical person to be able to use this product:	SUS Score	I found the various functions in this product were well integrated:	SUS Score
Xbox	1	1	3	2	1	4	4	3	2	3	3	2
Xbox	2	1	4	3	3	2	4	3	1	4	3	2
Xbox	3	2	4	3	3	2	4	3	4	1	2	1
Xbox	4	2	3	2	2	3	4	3	1	4	3	2
Xbox	5	3	4	3	2	3	4	3	2	3	3	2
Xbox	6	1	1	0	2	3	5	4	1	4	4	3
Xbox	7	1	3	2	2	3	2	1	1	4	5	4
Xbox	8	3	5	4	1	4	5	4	1	4	5	4
Xbox	9	3	4	3	1	4	4	3	1	4	5	4
Xbox	10	3	4	3	2	3	4	3	2	3	4	3
Xbox	11	3	3	2	4	1	3	2	4	1	2	1
Xbox	12	2	4	3	3	2	3	2	1	4	2	1
Xbox	13	2	4	3	2	3	4	3	1	4	4	3
Xbox	14	1	5	4	1	4	5	4	1	4	5	4
Xbox	15	2	3	2	2	3	4	3	1	4	4	3
Xbox	16	2	5	4	1	4	4	3	1	4	3	2
Xbox	17	1	4	3	2	3	4	3	1	4	3	2
Xbox	18	3	5	4	2	3	5	4	1	4	4	3
Xbox	19	3	5	4	1	4	5	4	1	4	5	4
Xbox	20	1	4	3	2	3	3	2	2	3	4	3
Xbox	21	2	4	3	3	2	3	2	2	3	4	3

	Par No	Device	I thought there was too much inconsistency in this product:	SUS Score	I would imagine that most people would learn to use this product very quickly:	SUS Score	I found the product very awkward to use:	SUS Score	I felt very confident using the product:	SUS Score	I felt very confident using the product:	SUS Score
Xbox	1	1	3	2	5	4	2	3	2	1	1	4
Xbox	2	1	2	3	5	4	1	4	5	4	1	4
Xbox	3	2	5	0	4	3	3	2	3	2	2	3
Xbox	4	2	3	2	4	3	2	3	4	3	2	3
Xbox	5	3	1	4	3	2	4	1	4	3	3	2
Xbox	6	1	2	3	5	4	1	4	4	3	1	4
Xbox	7	1	1	4	5	4	2	3	4	3	1	4
Xbox	8	3	1	4	5	4	1	4	5	4	1	4
Xbox	9	3	1	4	5	4	1	4	5	4	1	4
Xbox	10	3	2	3	5	4	2	3	5	4	2	3
Xbox	11	3	3	2	4	3	2	3	4	3	1	4
Xbox	12	2	1	4	5	4	3	2	3	2	3	2
Xbox	13	2	2	3	4	3	2	3	4	3	3	2
Xbox	14	1	1	4	5	4	1	4	5	4	1	4
Xbox	15	2	2	3	5	4	2	3	4	3	1	4
Xbox	16	2	1	4	4	3	1	4	3	2	1	4
Xbox	17	1	1	4	5	4	1	4	5	4	1	4
Xbox	18	3	2	3	5	4	2	3	5	4	2	3
Xbox	19	3	1	4	5	4	1	4	5	4	1	4
Xbox	20	1	2	3	3	2	3	2	3	2	2	3
Xbox	21	2	1	4	4	3	3	2	4	3	2	3

Table 35: Wii SUS Score (Source: Own diagram)

SUS Sum	**AVERAGE SUS SCORE**	1st device	2nd device	3rd device
23	57,50			57,50
37	92,50			92,50
28	70,00	70,00		
24	60,00	60,00		
36	90,00		90,00	
28	70,00			70,00
39	97,50			97,50
23	57,50		57,50	
36	90,00		90,00	
30	75,00		75,00	
33	82,50		82,50	
34	85,00	85,00		
35	87,50	87,50		
34	85,00			85,00
32	80,00	80,00		
24	60,00	60,00		
31	77,50			77,50
31	77,50		77,50	
33	82,50		82,50	
28	70,00			70,00
31	77,50	77,50		
SCORE	**Ø77,38**	**Ø74,29**	**Ø79,29**	**Ø78,57**

Table 36: Playstation 3 SUS Score (Source: Own diagram)

SUS Sum	**AVERAGE SUS SCORE**	1st device	2nd device	3rd device
19	47,50		47,50	
14	35,00		35,00	
16	40,00			40,00
15	37,50			37,50
12	30,00	30,00		
19	47,50		47,50	
11	27,50		27,50	
8	20,00	20,00		
15	37,50	37,50		
12	30,00	30,00		
9	22,50	22,50		
4	10,00			10,00
10	25,00			25,00
20	50,00		50,00	
32	80,00			80,00
30	75,00			75,00
15	37,50		37,50	
20	50,00	50,00		
13	32,50	32,50		
30	75,00		75,00	
9	22,50			22,50

SCORE	**∅39,64**	**∅31,79**	**∅45,71**	**∅41,43**

Table 37: Xbox 360 Kinect SUS Score (Source: Own diagram)

SUS Sum	**AVERAGE SUS SCORE**	1st device	2nd device	3rd device
28	70,00	70,00		
33	82,50	82,50		
20	50,00		50,00	
28	70,00		70,00	
26	65,00			65,00
32	80,00	80,00		
32	80,00	80,00		
40	100,00			100,00
38	95,00			95,00
32	80,00			80,00
22	55,00			55,00
26	65,00		65,00	
30	75,00		75,00	
40	100,00	100,00		
32	80,00		80,00	
34	85,00		85,00	
35	87,50	87,50		
35	87,50			87,50
40	100,00			100,00
26	65,00	65,00		
28	70,00		70,00	
SCORE	**∅78,21**	**∅80,71**	**∅70,71**	**∅83,21**

8.3.2 Scenario experiment

Table 38: Questionnaire of the scenario experiment (Source: Own diagram)

Dear participant, thank you very much for participating in the experiment. Please answer all the questions.

Thank you

1.	Female Male					2. Your age: _____					
3.	How often did you exercise?	Min per session _____ Sessions per week_____									
4.	Please indicate which device you like most. You can give every console points from 1 to 10 according to how much you like to play it in a workplace										
	1	Nintendo Wii	1	2	3	4	5	6	7	8	9	10
	2	PS 3 move	1	2	3	4	5	6	7	8	9	10
	3	Xbox 360 Kinect	1	2	3	4	5	6	7	8	9	10
5.	Imagine AMOS decides to implement exergaming within the next two month. To get the full impact it is important that employees participate in a longer-term:										
	1	Which device would you prefer and why?										
	2	Whose support from AMOS do you need to participate in a longer-term?										
		None Department Friends Intern Supervisor Colleagues Other: head										
6.	What kind of support needs to be provided by AMOS to motivate you to participate in a long-term perspective? You can give every setting points from 1										
	1	Peer – every four to six weeks your department head will organize a team session. You and your team members will play together.										
		1 2 3 4 5 6 7 8 9 10										
	2	Competition – your team will participate in a tournament, which will take place every three month. You will play against other colleagues or with your boss against another team. The winning team will obtain a prize.										
		1 2 3 4 5 6 7 8 9 10										

3	Support – every four weeks someone external will come over and give you and your team new hints, instructions for use and introduce new features. 1 2 3 4 5 6 7 8 9 10
4	Autonomy – after the first instruction you and your team won't get any further support. It is your choice how often you play. If you want to set up 1 2 3 4 5 6 7 8 9 10
5	Other suggestions: 1 2 3 4 5 6 7 8 9 10

Table 39: Questionnaire results of the scenario experiment (Source: Own diagram)

No	Gender	Age	Min per Session	Sessions per week	Wii	PS 3	Xbox	Favorite	Reason
1	F	38	15	3	10	5	10	Wii	Usability
2	F	41	10	2	6	1	10	Xbox	
3	F	45	15	3	9	3	9	Xbox	No controller
4	F	42	10	2	5	3	9	Xbox	
5	F	33	15	3	7	1	10	Xbox	
6	F	24	17,5	3	7	2	10	Xbox	
7	F	26	15	3	7	1	10	Xbox	
8	M	47	15	4	9	7	10	Xbox	
9	M	56	15	3	10	8	9	Wii	
10	M	47	15	3	8	1	10	Xbox	
11	M	48	20	4	9	2	10	Xbox	No controller
12	M	52	15	3	7	3	7	Wii	
13	M	21	15	2	5	5	8	Xbox	
14	M	43	15	3	7	1	10	Xbox	
15	M	48	15	4	9	4	7	Wii	Handling
16	M	37	15	3	7	3	10	Xbox	
17	M	33	10	4	7	1	10	Xbox	
18	M	35	15	4	8	4	10	Xbox	
19	M	39	15	4	9	6	9	Xbox	
20	M	20	15	3	9	7	9	Wii	
21	M	19	20	3	8	3	10	Xbox	
22	M	24	15	4	8	8	10	Xbox	
23	M	37	10	2	4	5	9	Xbox	
24	M	51	15	3	8	3	9	Xbox	
25	M	47	10	1	10	6	7	Wii	Handling
26	M	34	6	7	7	4	10	Xbox	
27	M	31	20	2	6	5	10	Xbox	No controller, resolution, sensors
28	M	47	10	4	8	3	8	Wii	
29	M	27	15	3	5	7	10	Xbox	
30	M	29	10	2	9	6	10	Xbox	1
31	M	30	12	3	8	2	6	Wii	
32	M	40	15	3	9	2	9	Xbox	
33	M	55	20	2	6	2	9	Xbox	easy to use
34	M	27	15	3	8	1	9	Xbox	
35	M	29	15	4	7	4	9	Xbox	nice to play
36	M	35	15	4	8	2	10	Xbox	
37	M	41	15	3	8	3	9	Xbox	
38	M	24	10	3	7	5	10	Xbox	
39	M	37	15	2	9	2	9	Xbox	
40	M	30	15	4	10	6	7	Wii	
		36,73	14,26	3,13	7,70	3,68	9,18		
Support from whom?					Kind of support				

None	Department Head	Supervisor	Colleagues	Peer	Competition	Support	Autonomy	Other
		1	1	9	4	4	4	
			1	8	5	5	3	
		1	1	9	10	7	1	
		1	1	10	9	8	1	1 weekly session (á 30 min)
	1		1	8	5	1	1	
		1	1	10	1	8	3	
		1	1	8	10	5	6	
		1	1	10	10	3	8	
1				8	10	1	7	
		1	1	10	8	7	1	
		1	1	10	10	1	1	
		1	1	8	10	8	1	
			1	10	8	1	4	
1				1	1	6	10	
		1	1	9	9	6	1	
		1	1	10	8	4	1	
1				9	8	8	1	
		1	1	10	10	6	2	
1			1	6	10	5	9	
			1	9	10	2	1	
			1	8	7	9	3	
		1	1	7	7	9	2	1 weekly session (á 30 min)
		1	1	1	1	9	9	
		1	1	9	10	8	1	
		1		10	10	10	1	
		1		5	4	8	8	
			1	8	9	8	1	
		1	1	8	10	9	1	
			1	9	1	10	3	
				1	1	7	10	
			1	8	9	7	2	
		1		10	9	4	1	
		1	1	8	8	8	1	
		1	1	9	6	3	1	
		1		10	10	1	1	
			1	10	10	1	1	
		1	1	9	7	10	1	
		1		7	9	8	5	
	1	1		7	10	7	3	
	1	1	1	8	8	6	1	
4,00	3,00	26,00	30,00	8,10	7,55	5,95	3,05	

Table 40: Actual time of usage during the scenario experiment (Source: Own diagram)

No	Gender	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Min p Session	Av	Sum
1	F	14	12	15	6	10	13	15	19	8	12		12,4	124
2	F	12	18	17	15	13	11	10	17	18	13		14,4	144
3	M	15	12	12	10	14	15	12	11	10	17		12,8	128
4	M	10	19	11	8	12	10	19	14	14	11		12,8	128
5	M	16	12	11	18	10	12	13	10	19	12		13,3	133
6	F	17	10	7	7	18	15	19	9	13	14		12,9	129
6	M	9	10	19	17	10	7	7	15	12			11,7	106
6	M	6	16	8	15	18	8	13	16	12			12,4	112
7	M	6	12	18	8	8	11	15	12	12	17		11,9	119
8	M	15	18	8	13	10	15	11	14	13	10	7	12,1	134
8	F	9	11	14	10	8	12	14	12	13			11,4	103
8	M	13	10	14	19	13	12	7	11	11			12,2	110
9	M	14	14	13	14	6	19	15	14	8	12		12,9	129
9	M	15	12	19	13	19	15	15	18	14			15,5	140
10	M	13	8	16	15	6	10	13	18	10	11		12,0	120
11	F	13	10	19	17	6	15	11	17	9	11		12,8	128
12	M	19	9	13	10	12	18	10	19	17	10	13	13,6	150
13	M	15	12	12	7	18	8	8	8	6	12		10,6	106
14	M	15	14	7	7	19	13	17	8	15	11		12,4	112
15	M	18	12	11	15	10	16	17	9	15	10	7	11,7	106
16	F	14	13	11	12	19	12	10	12	11	6		11,7	106
17	M	8	14	15	12	11	11	7	18	17	6		13,3	133
18	M	11	13	13	11	10	10	8	16	14			11,7	106
19	M	10	16	17	14	14	19	8	8	13			13,3	133
24	M	15	8	8	6	12	18	9	10	19			11,6	105
26	M	6	9	10	19	16	16	7	12	16			12,3	111
27	M	9	14	10	18	12	11	15	14	18			13,4	121
28	M	10	14	14	18	14	9	10	9				12,2	98,
29	M	15	11	17	8	13	16	19	13				14,0	112
30	M	10	19	8	15	10	12	15	9				12,2	98,
31	F	12	14	16	11	19	13	13	19				14,6	117
32	F	15	13	18	17	8	16	17	18				15,2	122
33	M	9	19	18	13	8	9	14	13				12,8	103
34	M	15	16	12	11	13	8	15	13				12,8	103
35	M	15	16	11	10	8	7	13	16				12,0	96,
36	M	12	8	15	8	10	9	12	14				11,0	88,
37	M	16	12	14	17	19	13	12	7				13,7	110
38	M	14	16	18	15	17	10	7	7				13,0	104
39	M	17	12	12	6	6	12						10,8	65,
40	M	6	12	10	10	17	18						12,1	73,
41	F	13	11	10	12	16							12,4	62,
42	M	8	13	7	14	18							12,0	60,
43	M	9	19	7	15	11							12,2	61,
44	M	14	15	13	14	12							13,6	68,
45	M	13	13	16									14,0	42,
46	M	13	11	12									12,0	36,
47	M	19	16										17,5	35,
48	M	16	12										14,0	28,
49	M	16											16,0	16,
50	M	18											18,0	18,
51	F	14											14,0	14,
52	F	6											6,00	6,0
Av	F=11	12,73	13,13	12,96	12,50	12,57	12,60	12,42	13,13	13,22	11,47	9,00	12,34	
Sum		662	630	596	550	553	504	472	499	357	195	27		5011

8.3.3 Motivation experiment

Table 41: Questionnaire of the motivation experiment (Source: cf. (Markland, 2011))

QUESTIONNAIRE

Age: _____ years **Sex: male female (please circle)**

WHY DO YOU ENGAGE IN EXERCISING EXERGAMES?

We are interested in the reasons underlying peoples' decisions to engage, or not engage in exergames. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about exercising exergames. Your responses will be held in confidence and only used for our research purposes.

		Not true for me		**Sometimes true for me**		**Very true for me**
1	I exercise because other people say I should	0	1	2	3	4
2	I feel guilty when I don't exercise	0	1	2	3	4
3	I value the benefits of exercise	0	1	2	3	4
4	I exercise because it's fun	0	1	2	3	4
5	I don't see why I should have to exercise	0	1	2	3	4
6	I take part in exercise because my friends/family/partner say I should	0	1	2	3	4
7	I feel ashamed when I miss an exercise session	0	1	2	3	4
8	It's important to me to exercise regularly	0	1	2	3	4
9	I can't see why I should bother exercising	0	1	2	3	4

		Not true for me				Very true for me
10	I enjoy my exercise sessions	0	1	2	3	4
11	I exercise because others will not be pleased with me if I don't	0	1	2	3	4
12	I don't see the point in exercising	0	1	2	3	4
13	I feel like a failure when I haven't exercised in a while	0	1	2	3	4
14	I think it is important to make the effort to exercise regularly	0	1	2	3	4
15	I find exercise a pleasurable activity	0	1	2	3	4
16	I feel under pressure from my friends/family to exercise	0	1	2	3	4
17	I get restless if I don't exercise regularly	0	1	2	3	4
18	I get pleasure and satisfaction from participating in exercise	0	1	2	3	4
19	I think exercising is a waste of time	0	1	2	3	4

Thank you for taking part in our research

Table 42: Desciptive statistics of the components of the OIT in the motivation experiment (Source: Own diagram)

Descriptive Statistics

		Minimum	Maximum	Mean	Std. Deviation
Amotivation		,50	2,50	1,44	,58
External regulation		1,50	4,00	2,87	,58
Introjected regulation		2,00	4,00	2,85	,41
Identified regulation		2,00	3,75	2,63	,37
Intrinsic regulation		1,00	4,00	2,91	,68
Relative Autonmy Index		-4,17	7,92	1,06	2,78
Valid N (listwise)	62				

Table 43: Correlations of the motivation experiment (Source: Own diagram)

Correlations

		Amotivation	External regulation	Introjected regulation	Identified regulation	Intrinsic regulation	Relative Autonmy Index
Amotivation	Pearson Correlation	1	-,596**	-,246	-,134	-,249	-,554**
	Sig. (2-tailed)		,000	,054	,299	,051	,000
External regulation	Pearson Correlation		1	,087	-,049	,119	,014
	Sig. (2-tailed)			,501	,703	,357	,914
Introjected regulation	Pearson Correlation			1	,159	,223	,174
	Sig. (2-tailed)				,216	,082	,177
Identified regulation	Pearson Correlation				1	,017	,361**
	Sig. (2-tailed)					,894	,004
Intrinsic regulation	Pearson Correlation					1	,808**
	Sig. (2-tailed)						,000
Relative Autonmy Index	Pearson Correlation						1
	Sig. (2-tailed)						

**. Correlation is significant at the 0.01 level (2-tailed).

Table 44: Mean values of OIT components by gender (Source: Own diagram)

	Gender	
	Female	Male
	Mean	Mean
Amotivation	1,41	1,46
External regulation	2,62	2,95
Introjected regulation	3,12	2,75
Identified regulation	2,58	2,65
Intrinsic regulation	3,23	2,79
Relative Autonmy Index	2,27	,64

Table 45: Mean values of OIT components by age categories (Source: Own diagram)

	Age Categories				
	<30	31-40	41-50	51-60	>61
	Mean	Mean	Mean	Mean	Mean
Amotivation	1,42	1,49	1,45	1,42	.
External regulation	2,87	2,88	2,77	3,13	.
Introjected regulation	2,96	2,78	2,76	3,00	.
Identified regulation	2,49	2,59	2,70	2,96	.
Intrinsic regulation	2,97	2,91	2,90	2,71	.
Relative Autonmy Index	,93	,91	1,45	,54	.

Table 46: Mean values of OIT components by treatment (Source: Own diagram)

	Treatment Group	
	Control treatment	Device change treatment
	Mean	Mean
Amotivation	1.98	1.04
External regulation	2.46	3.18
Introjected regulation	2.70	2.96
Identified regulation	2.56	2.69
Intrinsic regulation	2.74	3.04
Relative Autonmy Index	-0.22	2.05

Table 47: Shapiro-Wilk test of the OIT components (Source: Own diagram)

Tests of Normality

	Shapiro-Wilk		
	Statistic	df	Sig.
Amotivation	,936	62	,003
External regulation	,965	62	,076
Introjected regulation	,926	62	,001
Identified regulation	,917	62	,000
Intrinsic regulation	,953	62	,020
Relative Autonmy Index	,984	62	,604

Tests of Normality

	Shapiro-Wilk		
	Statistic	df	Sig.
Amotivation	,936	62	,003
External regulation	,965	62	,076
Introjected regulation	,926	62	,001
Identified regulation	,917	62	,000
Intrinsic regulation	,953	62	,020
Relative Autonmy Index	,984	62	,604

8.3.3.1 Reliability of the motivation experiment scales

Amotivation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,614	,611	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 5	4,32	3,009	,441	,211	,506
Item 9	4,42	3,657	,302	,099	,609
Item 12	4,19	3,798	,342	,153	,580
Item 19	4,44	3,037	,502	,272	,457

External regulation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,706	,711	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 1	8,74	3,342	,408	,255	,701
Item 6	8,53	3,269	,558	,331	,604
Item 11	8,55	3,006	,668	,448	,532
Item 16	8,58	3,723	,365	,212	,716

Introjected regulation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,130	,153	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 2	5,77	,801	,282	,084	-,474[a]
Item 7	5,66	1,113	-,009	,097	,260
Item 13	5,66	1,015	-,030	,076	,350

Identified regulation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,472	,472	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 3	7,87	1,491	,253	,105	,418
Item 8	7,89	1,413	,309	,129	,364
Item 14	7,92	1,518	,253	,114	,418
Item 17	7,92	1,452	,269	,095	,403

Intrinsic regulation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,844	,844	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 4	8,76	4,514	,647	,546	,815
Item 10	8,74	4,326	,675	,585	,804
Item 15	8,68	4,157	,729	,626	,780
Item 18	8,71	4,406	,666	,519	,808