

Recommendations for the Implementation of Exergames in the Context of Workplace Health Promotion: Results From Expert Interviews

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Abstract—Exergames are digital games which promote or assist physical activity that is more than sedentary activity. Positive health effects have been reported by several studies. Because exergames have become a popular tool for health promotion it can be assumed that it could be a new promising tool for workplace health promotion. For this purpose, 23 semi-standardized interviews with experts of a financial and insurance company were conducted. The analysis of the collected data identified influence factors for the implementation of exergames in a workplace environment. Out of these, five recommendations for the implementation process were deducted, e.g., the ease of use, the target group, and the acceptance of exergames.

Keywords- exergames; expert interview; workplace; health promotion.

I. INTRODUCTION

For health promotion in the context of workplace environment currently major changes can be observed due to the advancing introduction of IT-supported programs. Mainly behavioral adjustments of the participants are further fostered through IT-supported developments such as: initial motivation barriers, long-term motivation or home vs. public environment problematic [1]. Products that adapt these topics arise from different businesses areas like sporting goods manufactures, smartphone applications, and gaming consoles [2]. Latter should be further investigated in this article.

Exergames started to develop out of the motion sensor based gaming consoles environment and beginning to touch areas outside the living rooms. Nintendo started in the year 2006 with their Wii console the bandwagon of sport activities combined with classical console gaming [3]. Soon after, Sony and Microsoft adapted these concepts with their respective gaming devices.

For a long time, digital games (the generic term for computer, video, and mobile games) have been associated with predominantly negative health impacts (e.g., obesity) [4, 5, 6, 7]. In contrast of this view, a new type of digital games was developed in recent years.

Serious games are "games or game-like applications that are using technology and design developed from the entertainment software industry and are not primarily or

solely for entertainment" [8]. They differ from traditional digital games with its serious purpose [4]. While traditional digital games are primarily created for leisure time and serve exclusively as entertainment, serious games should facilitate knowledge acquisition and behavioral change [9]. These games must be designed with a balance of entertainment and information or education values [8].

Digital games "that promote or assist in user engagement in some form of body exercise" are known in literature typically as exergames [10]. The term exergame (also exergaming) is a combination of the English words "exercise" and "game" or "gaming". Terms such as "Motivating Physical Activity Games" [11], "games for health" [4] or "Active video games" [12, 13] are used interchangeably in the field of exergames. The paper is structured as follows: The next part covers the definitions of the relevant topics as well as a rough overview about the current state of research in this area. In the third part the method of expert interviews is explained and the application details for the research topic are shown. Following, the results of the interviews are presented, separated by qualitative and quantitative findings by the expert interviews. Finally, we discuss the research results and formulate requirements for the successful implementation of exergames into a workplace environment and give a short outlook of future research following from the gained knowledge for exergames. The conclusion pinpoints the most important insights of the conducted expert interviews.

II. BACKGROUND

Exergames differ from classical computer, video, and mobile games in the intensity of physical movements that must be exerted in order to play the games. While traditional video games train the manual dexterity and / or fine motor skills of the players (for example by moving and clicking the computer mouse), exergames require the usage of large muscle groups, resulting in a state of physical exhaustion comparable to sport activities [14, 15, 7]. Many well-known exergames include strength, balance, and flexibility exercises disguised in sports games like tennis, boxing, and aerobics in which players have to realistically simulate the typical athletic movements to move his avatar on screen [14].

In this way, athletic movements are embedded in a playful context and motivate the players by having fun to a higher incidence of physical activity [16]. Depending on the nature of the game and intensity of the execution of the movements, an increase in heart rate and energy consumption over the basal metabolic rate can be achieved [14]. This effect blurs the boundary between health-promoting sporting activities that have a deliberate, planned, and continued improvement of physical fitness for purpose and exergames.

In recent years, the interest in research on the health-promoting effects of exergames has increased greatly. The effects on physical activity and energy consumption were analyzed most frequently. But a general statement about the physical effects of exergames can not derived as they strongly vary with the various consoles, games, skills of the users and movement techniques. However, all studies meet the joint statement that exergames are able to stimulate the cardiovascular system and the musculoskeletal system and increase the energy consumption above the level of inactivity [17, 18, 19, 20]. Nevertheless, it is repeatedly stressed that exergames cannot be a substitute for real sporting activities but is better than no physical activity at all.

Although exergames have become a popular tool for health promotion, there are no studies on its use in workplace context. It can be assumed that the positive effects of exergames can be transferred to the field of workplace health promotion.

Workplace Health Promotion is a modern corporate strategy to reduce impacts on employees health and increase health-promoting resources by interventions in private and public companies [21, 22]. The workplace poses numerous health risks to employees but at the same time opportunities for self-fulfillment, personal development and well-being [23]. In addition to direct influences, work also indirectly affects one's health including health behavior or lifestyle [24]. The workplace is a major influence factor for one's health with the possible range from adverse health or debilitating factors to health sustaining or promoting conditions [25].

Being such a huge success in the private sector the question aroused if the potential of an accessible, little time consuming and comparably cheap solution can be used for workplace health promotion. However, one has to consider that in such an environment much more regulations and rules are applied than at home. The article serves to answer the following research question:

RQ: "Which factors influence the implementation of exergames into a workplace environment?"

III. METHODE

During September 2011 until April 2012 a series of semi-structured interviews with experts from different departments and business areas was conducted regarding the introduction of exergames into the setting of a company.

A. Recruitment

Several ways were chosen in the recruitment process for the expert interviews. First, a list of important stakeholders

was created to obtain the knowledge of well-know experts within the company. This list contained C-Level Management, executives, members of the workers council, company doctors, as well as employees. Experts were recruited in meetings to the topics such as occupational health and safety. During these meetings, recommendations from the participants for further experts were solicited, which could help to broaden the view on the topic of exergames. Secondly, additional interviewees were recruited through the network of contacts from the authors within the company. During the selection process of interview candidates a strong focus was to ensure 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.

A total of 23 experts were recruited, which were either responsible in 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 unadulterated information and therefore the best possible data anonymity was ensured to all participants for all statements made during the interview process. Table I provides an overview about the different stakeholders and their roles in the company.

TABLE I. ROLES OF INTERVIEWED EXPERTS

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 experiences, 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. For example, 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 quiet homogenous regarding the discussed topic, suggesting that an overall sufficient number of important criteria were received.

B. Interview

All interviews were conducted with a semi-standardized interview protocol [26]. This method allows the creation of comparable responses from the participants, while enabling

the interviewer to flexibly ask further questions on 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, beginning each with the question about a short background description of the responsibilities of the interviewee, following a short set of open-ended questions. Afterwards the participants were asked to specifically name Strengths, Weaknesses, Opportunities and Treats for the implementation of exergames into a workplace environment. The experts filled the categories with their recommendations and provided additional feedback to them. At the end of each interview the experts were asked about the single most important criterion in their view for the successful implementation and application of exergames in a workplace environment. This allowed the creation of a prioritized ranking of influence factors for the analyses.

C. Analyses

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

D. Limitations

Our results are subject to a number of limitations: Firstly, all of the experts were from Germany, therefore a international representative statement cannot be drawn from the results, and a german-centred view is presented. Secondly, all experts were employed for the same large financial and insurance company, so all statements made are situational for a specific company.

The findings show how our predefined set of stakeholders describes their thoughts about 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 of the experts. At every possible occasion a cross-check of statements were made between the information provided to us by participants with public available data, such as announcements, surveys, and research publications. Furthermore, the status “expert” of the interviewees holds not for all areas and explains certain biases. E.g., while 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.

IV. RESULTS

A. Qualitative analyses

The examination of the interview documentation indicated a qualitative difference between the experts

answers. Some experts provided more elaborate 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 Strengths, Weaknesses, Opportunities, and Threats. A commonly made statement for example by one of the experts was:

...The idea of a gaming console for a team room sounds very interesting,...it's an innovative approach to be active and surely could 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...

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

Another participant responded to the same questions during the interview with the following:

...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...

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 the tendency to put arguments forward mostly for one or two of the designated areas: strength/opportunity, weakness/opportunity, strength/threat, and weakness/threat. This was mostly regarded 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/treat arguments were mentioned in the interviews.

TABLE II. OVERVIEW ABOUT THE INTERVIEW RESULTS

	Strengths	Weaknesses
Opportunities	<ul style="list-style-type: none"> • Innovative • Ease of use • Cost-efficiency 	<ul style="list-style-type: none"> • (Health)Effects • Place/ time • Clear rules
Threats	<ul style="list-style-type: none"> • Time efficient • Target group • Employee satisfaction 	<ul style="list-style-type: none"> • Missing long-term development / experience • Acceptance • Target group

B. Quantitative analyses

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 this aggregated interview result an overview of the most important factors was created in Table II.

The overview depicts 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), the unclear

resulting (health) effects were the frequently mentioned weakness/opportunity (10). For the possible strength/threats the time efficiency received the largest reference with 11 mentioning and the missing or unclear long-term development of the topic exergames (8) was especially seen as a weakness/threat.

TABLE III. OVERVIEW MOST IMPORTANT CRITERION BY STAKEHOLDER

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 factors by the stakeholder groups were analyzed. In Table III an overview is presented by the different roles of the experts and their mainly mentioned success factor for the implementation of exergames in a workplace environment. C-Level Management named cost-effectiveness as the most important factor for the application of exergames in the workplace environment. Executives regarded the effect of 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, concluded by the employees the ease of use and the innovative character of exergames were the most important criteria. 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 about the general and background interests of the participating experts.

V. DISCUSSION

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 results were observed for the acceptance and the fitting target group and the measure pose a potential risk in the success of exergames in a workplace environment. 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, our 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: Our expert interviews revealed information on the 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.

A. *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.

B. *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.

C. *The introduction of exergames need to be properly announced to every employee in the company*

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

D. *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 to make reliable forecasts.

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

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

VI. CONCLUSION AND FUTURE WORK

This article reported 12 factors in four categories (see summarized in Table II) and five recommendations that were drawn from 23 semi-structured interviews with experts from a large company. Our findings suggest that exergames have the potential to develop into a new form of health promotion in a workplace environment. Due to the innovative character,

the general easy to use devices and the comparable cost-efficiency of exergames they have the potential to blend in and 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, further study of these points is needed to correct, improve and verify our findings.

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 companies, which is not emphasized enough. However, to make exergames a fully accepted way of health promotion in the context of a company health promotion program, more experience and additional studies regarding the actual use must be conducted. This is why field experiments with different sets of gaming consoles should evaluate the suitability of the measure and document the success in terms of health and employee satisfaction.

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