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Abstract

This study examines the habits of playing and the reasons for not playing digital exercise games (i.e., exergames), concentrating particularly on the gender differences between the male and female players and non-players. Exergames can be considered an important and interesting research topic as they can be used to motivate people to do more exercise and, consequently, to improve their health and well-being. The study is based on analysing an online survey sample of 3,036 Finnish consumers through contingency tables, the Pearson's χ^2 tests of independence, and the Cramér's V coefficients. The results of the analysis reveal 11 main reasons for not playing exergames as well as several gender differences both in the habits of playing and in the reasons for not playing exergames. Based on these results, exergames still seem to have a long way to go before they are perceived as interesting enough in terms of the game experience as well as useful enough in terms of their effects on physical fitness.

Keywords: Exergames, habits of playing, reasons for not playing, gender differences

1 Introduction

Physical activity has been shown to have a positive impact on people's well-being. According to WHO (2012a), regular physical activity can, among others, reduce the risk of diabetes, cardiovascular diseases, depression, breast cancer, and colon. It can also improve bone and functional health (WHO, 2012b) and have other important health benefits. Physical inactivity, in contrast, is a severe public health problem. It has been identified as the fourth most significant risk factor for global mortality (WHO, 2012b). It has also been found as a major risk factor for chronic diseases, such as type two diabetes and cardiovascular diseases, which are the single most significant causes of death in Western countries (Ermes et al., 2008). According to WHO (2012c), 28 % of men and 34 % of women were insufficiently physically active in 2008. This means that physical inactivity is not just an individual problem but also a societal problem (WHO, 2012b). The reasons for the present levels of physical inactivity are partly related to increased sedentary behaviour at home and work, insufficient participation in physical activities during leisure time, and increased use of passive modes of transport. Also many environmental factors that have resulted from increased urbanisation can promote physical inactivity. (WHO, 2012c.)

For example, in the context of Finland, where this study was conducted, the changes in work and everyday life have had significant effects on physical activity and exercise habits. The physical activity of Finns has dropped drastically during the past 20 years (Juutinen-Finni, 2010; Koivumäki, 2003). Intentional exercise and sports began to become more common along with urbanisation and the shifts in time allocation patterns that took place in the 1960s. The field of exercise and sports became more versatile in the 1980s, and since the 1990s, commercialisation and the strengthened role of technology have been the two dominating trends in this area. As work as such has changed, more and more Finns work sedentary and even leisure time is dominated by sitting: one often spends time sitting in front of a television or a computer. Researchers have begun to talk about a sedentary lifestyle, which is associated with several severe health risks. It has also been suggested that the high levels of screen time can further promote the sedentary lifestyle, particularly among young people (Daley, 2009). The sedentary lifestyle has affected the physical fitness of Finns as well. In several extensive population studies, it has been found to decline considerably (Heiskanen et al., 2011; Santtila et al., 2006; Vaara et al., 2009).

Along with the sedentary lifestyle, intentional exercise and sports have become more common. Guidelines based on epidemiological studies have been suggested for the desired amount of exercise and sports, and the adherence of the Finnish population to these guidelines is being examined regularly. In terms of these guidelines, less than half of Finns take enough exercise for their health. If the physical activity of Finns remains at its present level and the decline of their physical fitness continues to follow its current trend, the physical fitness, particularly the aerobic fitness, of the Finnish population will decline drastically during the next 25 years (Heiskanen et al., 2011; Hirvensalo et al., 2011; Finnish Sports Federation, 2011). Therefore, it is of utmost importance to find new measures to motivate people to do more exercise and sports.

Prior research has revealed that the usage of sports and wellness technologies can promote the motivation towards exercise and sports (e.g., Ahtinen et al., 2008; Bravata

et al., 2007). In the past years, these technologies have become an essential part of the everyday life of many people. A heart rate monitor is already a common training partner for many physically active people, and also the usage of other kinds of information and communication technology (ICT) based devices and services is becoming increasingly common. One example of these are *digital exercise games* or *exergames*, that require some sort of physical activity from the player in order to play the game. Prior research has demonstrated that exergames can promote the motivation towards physical activity and exercise (e.g., Bailey & McInnis, 2011; Berkovsky et al., 2010; Sallis, 2011), can have physiological benefits (e.g., Daley, 2009; Maddison et al., 2011), and can be utilised as a part of a more extensive aerobic exercise program (Siegel et al., 2009). Naturally, this depends on the type of the exergame and the physical exertion level at which the exergame is played. It has also been suggested that exergames are able to promote the motivation towards other forms of physical activity and, therefore, are also able to act as an incentive for an active lifestyle (Trout & Christie, 2007). Exergaming has also been suggested as a potential method for promoting the physical activity levels of those whose screen time is high (Daley, 2009). However, the research on exergames has, so far, been limited and the results mixed. Particularly the habits of playing these games and the reasons why they either are or are not played remain a relatively unexplored area. Therefore, there is a demand for more research on exergames, particularly on the habits of playing and reasons for playing and not playing them, as most of the prior research on exergames has concentrated on the physiological and motivational aspects of exergaming.

Concerning the gender differences in video game participation, relatively much prior research has been conducted, and men have often been found as more active players than females (e.g., Greenberg et al., 2010; Lucas, 2004; Ogletree & Drake, 2007). But this research has mostly concentrated on video games at a general level, and research in the context of exergames is lacking.

The purpose of this study is to address these shortcomings by examining the habits of playing and the reasons for not playing exergames, concentrating particularly on the gender differences between the male and female players and non-players. The explicit research questions that the study aims at answering can be formulated as follows: 1) what kinds of gender differences exist in the habits of playing exergames, and 2) what kinds of gender differences exist in the reasons for not playing exergames? The answers to these questions can be considered critical, among others, for the design and marketing of exergames. Of the different types of exergames, we concentrate on the games that are based on some sort of digital interface, be it a game console, a computer, or a mobile device, such as a mobile phone or a mobile music player. Because of the lack of prior research, the study is explorative in nature, meaning that habits of playing and the reasons for not playing exergames are examined at a descriptive level without utilising any prior theoretical framework. Methodologically, the study is based on analysing an online survey sample of 3,036 Finnish consumers through contingency tables, the Pearson's χ^2 tests of independence, and the Cramér's V coefficients.

The paper consists of six sections. After this introductory section, we discuss about the concept of exergames in Section 2. Sections 3 and 4 present the methodology and results of the study. The results are discussed in more detail in Section 5. Finally, Section 6 considers the limitations of the study and potential paths of future research.

2 Exergames

In the past years, different kinds of novel digital concepts that combine exercise and games have emerged. These have been called with different terms, such as exergames, exertainment, active-play video games, and active games (Lieberman et al., 2011). In the end, they all mean more or less the same thing: games that combine exercise and games by requiring some sort of physical activity from the player in order to play the game. Mueller et al. (2011, p. 2651) define exergames as "a digital game where the outcome of the game is predominantly determined by physical effort". In this study, we adhere to this definition.

In general, three types of exergames can be identified. First, there are the screen-based games, which are typically played on a game console at home. These include the games for Nintendo Wii and Xbox Kinect as well as arcade games. Second, there are the mobile games, which utilise mobile phones, mobile music players, and other types of mobile devices as a platform for the games and typically aim at combining real and virtual world elements through augmented reality. Third, there are the light-sensor-based games, which utilise light-sensors in tracking the player and playing the games. (Lieberman et al., 2011.)

One of the main advantages of exergames is that they can promote the physical activity of the players without the players having a profound understanding on physical training (Bogost, 2005). Another advantage is that they can be used in many different settings, such as homes, fitness centres, senior centres, as well as medical and community settings. They can also be adapted to serve people of different ages and with different kinds of physical abilities and disabilities, cognitive capabilities, and rehabilitation needs. Respectively, they can be equipped with assessment and coaching features as well as with features for estimating the effects of playing on physical fitness through, for example, heart rate or energy expenditure measurements. (Lieberman et al., 2011.)

Prior research (e.g., Berkovsky et al., 2010) has suggested that exercise and games can be combined without adverse effects on the overall playing experience and enjoyment, demonstrating the potential of exergames to motivate people to do more exercise.

3 Methodology

To examine the habits playing and the reasons for not playing exergames, we conducted an online survey among Finnish consumers. The survey was created by using the LimeSurvey 1.91+ software, and before launching it online, we pre-tested it qualitatively with two postgraduate students and quantitatively with 56 undergraduate students. The survey was online for about one and a half months from 14 December 2011 to 31 January 2012. During this time, we actively promoted the survey link by posting it to several Finnish discussion forums focusing on a variety of topics as well as by sending several invitation e-mails through the internal communication channels of our university and an e-mail list provided by a Finnish company specialising in the testing of exercise devices. To raise the response rate, we also raffled 26 gift cards with a total worth of 750 € among the respondents.

The survey questionnaire consisted of several sections, and the total number of questionnaire items presented to each respondent varied from 46 to 130, depending on

their responses. One of the sections was used to survey the respondents on their habits of playing and reasons for not playing exergames. The items in this section (translated from Finnish to English) are presented in Appendix. The section began by asking the respondents whether or not they played exergames. Those that stated to be playing, were classified as *players* and asked descriptive questions about their habits of playing, whereas those that stated not to be playing, were classified as *non-players* and asked about the reasons for this. Of course, a respondent also had an option to not answer this question at all, in which case no further questions were asked from him or her.

The descriptive questions about the habits of playing exergames that were included in this study were all closed-ended multiple choice questions and concerned the frequency of playing exergames on game consoles, computers, and mobile devices (at least weekly, at least monthly, less frequently than monthly, or has never played), the reason of playing (mainly for fun or mainly for exercise), the setting of playing (mainly in an individual setting or mainly in a group setting), the physical exertion level of playing (light, moderate, or vigorous), and the perceived effects of playing on physical fitness (negative, no effects, or positive). All the questions were optional, meaning that a respondent had the option to skip one or more of them. The reasons for not playing exergames were surveyed by using one open-ended question. Also this question was optional, so a respondent had the option to state one, multiple, or no reasons.

The collected data was analysed by using the IBM SPSS Statistics 19 software. The statistical significance and strength of the dependencies between the responses and gender were analysed through contingency tables, the Pearson's χ^2 tests of independence, and the Cramér's V coefficients. These enabled us to examine not only the linear but also the non-linear dependencies, which suited very well the explorative nature of the study.

The stated reasons for not playing exergames were analysed qualitatively by using inductive content analysis (Patton, 1990). First, all the reasons were read several times and preliminary categories were formed. Then, each reason was given a code that classified it under one of the categories. Similar reasons were classified under the same category. If a reason did not fit into any of the formed categories, a new category was formed. After all the reasons were classified, similar categories were combined into broader categories. The categories that consisted of only a few reasons were combined into a category called *other reasons*.

4 Results

In total, we received 3,036 valid responses to our survey. Of the 2,976 respondents who had stated whether or not they played exergames, 723 (24.3 %) were players and 2,253 (75.7 %) were non-players. Perhaps a bit surprisingly, the playing of exergames was slightly more common among women than among men. Of the 1,060 male respondents who had stated whether or not they played exergames, 236 (22.3 %) were players and 824 (77.7 %) were non-players. In contrast, of the 1,916 female respondents who had stated whether or not they played exergames, 487 (25.4 %) were players and 1,429 (74.6 %) were non-players. However, when tested with the Pearson's χ^2 test of independence, the dependency between gender and the playing of exergames was not quite statistically significant at the 0.05 level ($\chi^2(1) = 3.690$, $p = 0.055$).

	All (N = 3,036)		Players (N = 723)		Non-players (N = 2,253)	
	N	**%**	**N**	**%**	**N**	**%**
Gender						
Male	1,082	35.6	236	32.6	824	36.6
Female	1,954	64.4	487	67.4	1,429	63.4
Age						
–29 yrs.	1,204	39.7	384	53.1	785	34.8
30–39 yrs.	789	26.0	175	24.2	606	26.9
40–49 yrs.	593	19.5	127	17.6	457	20.3
50– yrs.	450	14.8	37	5.1	405	18.0
Yearly income						
–14,999 €	908	34.1	253	39.2	629	31.9
15,000–29,999 €	668	25.1	141	21.8	518	26.3
30,000–44,999 €	678	25.5	161	24.9	511	25.9
45,000– €	407	15.3	91	14.1	314	15.9
N/A	375	–	77	–	281	–
Socioeconomic group						
Student	768	25.3	228	31.5	520	23.1
Employed	1,797	59.2	410	56.7	1,367	60.7
Unemployed	210	6.9	46	6.4	156	6.9
Pensioner	121	4.0	9	1.2	107	4.7
Other	140	4.6	30	4.1	103	4.6

Table 1: Descriptive statistics of the entire sample and the two sub-samples

Descriptive statistics of the entire sample as well as the sub-samples of players and non-players are presented in Table 1. Overall, the gender, age, and income distributions of the entire sample correspondent very well the gender and age distributions of the Finnish Internet population as well as the income distribution of the Finnish income recipients in 2010 (Statistics Finland, 2012). Women and the youngest age group were slightly overrepresented, whereas men and the two oldest age groups were slightly underrepresented. However, there were no indications of severe non-response bias in terms of the three variables. The entire sample can also be characterised very heterogeneous in terms of the socioeconomic group of the respondents.

In the next two subsections, the habits of playing exergames among the players and the reasons for not playing exergames among the non-players are examined in more detail.

4.1 Habits of Playing Exergames

The responses to the seven descriptive questions about the habits of playing exergames are summarised in Table 2, first for all the players and then for the male and female players. Table 3 summarises the results of the Pearson's χ^2 tests of independence that were used to examine the statistical significance and strength of the dependencies between gender and the responses.

In terms of the devices of playing, the responses suggest that exergames are most frequently played on game consoles and relatively infrequently on computers and mobile devices. Of the players who responded these questions, 312 (43.2 %) stated that they were playing exergames on game consoles at least monthly, 49 (6.8 %) stated that they were playing them on computers at least monthly, and 23 (3.2 %) stated that they were playing them on mobile devices at least monthly. Gender was found to have no

	All players (N = 723)		Male players (N = 236)		Female players (N = 487)	
	N	**%**	**N**	**%**	**N**	**%**
Playing on game consoles						
At least weekly At	121	16.9	38	16.3	83	17.1
least monthly	191	26.6	77	33.0	114	23.6
Less than monthly	390	54.4	114	48.9	276	57.0
Has never played	15	2.1	4	1.7	11	2.3
N/A	6	–	3	–	3	–
Playing on computers						
At least weekly At	21	3.0	10	4.3	11	2.3
least monthly	28	4.0	17	7.4	11	2.3
Less than monthly	152	21.7	67	29.0	85	18.1
Has never played	500	71.3	137	59.3	363	77.2
N/A	22	–	5	–	17	–
Playing on mobile devices						
At least weekly At	11	1.6	7	3.0	4	0.9
least monthly	12	1.7	6	2.6	6	1.3
Less than monthly	83	11.9	46	19.9	37	7.9
Has never played	591	84.8	172	74.5	419	89.9
N/A	26	–	5	–	21	–
Reason of playing						
Fun	602	85.3	211	92.1	391	82.0
Exercise	104	14.7	18	7.9	86	18.0
N/A	17	–	7	–	10	–
Setting of playing						
Individual	157	22.1	47	20.2	110	23.1
Group	552	77.9	186	79.8	366	76.9
N/A	14	–	3	–	11	–
Exertion of playing						
Light	239	34.3	101	45.3	138	29.2
Moderate	425	61.1	115	51.6	310	65.5
Vigorous	32	4.6	7	3.1	25	5.3
N/A	27	–	13	–	14	–
Effects of playing						
Negative	4	0.6	4	1.8	0	0.0
No effects	529	81.5	187	85.0	342	79.7
Positive	116	17.9	29	13.2	87	20.3
N/A	74	–	16	–	58	–

Table 2: The habits of playing exergames among the players

	N	χ^2	df	p	V
Playing on game consoles	717	7.516	3	0.057	0.102
Playing on computers	701	27.306	3	**< 0.001**	**0.197**
Playing on mobile devices	697	29.100	3	**< 0.001**	**0.204**
Reason of playing	706	12.738	1	**< 0.001**	**0.134**
Setting of playing	709	0.783	1	0.376	0.033
Exertion of playing	696	17.825	2	**< 0.001**	**0.160**
Effects of playing	649	12.396	2	**0.002**	**0.138**

Table 3: Gender dependencies in the habits of playing exergames among the players

statistically significant dependency with the playing on game consoles ($\chi^2(3) = 7.516$, $p = 0.057$), but it was found to have a statistically significant dependency with the playing on both computers ($\chi^2(3) = 27.306$, $p < 0.001$, $V = 0.197$) and mobile devices ($\chi^2(3) = 29.100$, $p < 0.001$, $V = 0.204$). In the case of both computers and mobile devices, men were found to be more frequent players than women.

In terms of the reason of playing, the responses suggest that exergames are played mostly for fun. Of the 706 players who responded this question, 602 (85.3 %) stated that they were playing exergames mainly for fun related reasons and 104 (14.7 %) stated that they were playing exergames mainly for exercise related reasons. Gender was found to have a statistically significant dependency with the reason of playing ($\chi^2(1) = 12.738$, $p < 0.001$, $V = 0.134$), with men playing exergames more for fun and women more for exercise. Of the 229 male players who responded this question, 211 (92.1 %) stated to be playing mainly for fun and 18 (7.9 %) stated to be playing mainly for exercise. In contrast, of the 477 female players who responded this question, 391 (82.0 %) stated to be playing mainly for fun and 86 (18.0 %) stated to be playing mainly for exercise.

In terms of the setting of playing, the responses suggest that exergames are played mainly in a group setting. Of the 709 players who responded this question, 552 (77.9 %) stated that they were playing exergames mainly in a group setting and 157 (22.1 %) stated they were playing exergames mainly in an individual setting. Perhaps a bit surprisingly, gender was found to have no statistically significant dependency with the setting of playing ($\chi^2(1) = 0.783$, $p = 0.376$).

In terms of the physical exertion of playing, the responses suggest that exergames are played mainly at moderate or light exertion levels. Of the 696 players who responded this question, 425 (61.1 %) stated to be playing mainly at a moderate level, 239 (34.3 %) at a light level, and only 32 (4.4 %) at a vigorous level. Gender was found to have a statistically significant dependency with the physical exertion of playing ($\chi^2(2) = 17.825$, $p < 0.001$, $V = 0.160$), with women playing at more vigorous exertion levels. Of the 223 male players who responded this question, 115 (51.6 %) stated to be playing mainly at a moderate level, 101 (45.3 %) at a light level, and 7 (3.1 %) at a vigorous level. In contrast, of the 473 female players who responded this question, 310 (65.5 %) stated to be playing mainly at a moderate level, 138 (29.2 %) at a light level, and 25 (5.3 %) at a vigorous level.

In terms of the perceived effects of playing, the responses suggest that the playing of exergames is not perceived as having significant effects on physical fitness. Of the 649 players who responded this question, 529 (81.5 %) stated to have perceived no effects, 116 (17.9 %) stated to have perceived positive effects, and 4 (0.6 %) stated to have perceived negative effects. Gender was found to have a statistically significant dependency with the perceived effects of playing ($\chi^2(2) = 12.396$, $p = 0.002$, $V = 0.138$), with women perceiving more positive effects on their physical fitness. Of the 220 male players who responded this question, 187 (85.0 %) stated to have perceived no effects, 29 (13.2 %) stated to have perceived positive effects, and 4 (1.8 %) stated to have perceived negative effects. In contrast, of the 429 female players who responded this question, 342 (79.7 %) stated to have perceived no effects and 87 (20.3 %) stated to have perceived positive effects. None of the female players who responded this question stated to have perceived negative effects.

4.2 Reasons for not Playing Exergames

Of the 2,253 non-players, 1,855 (82.3 %) stated one or multiple reasons for not playing exergames. Most (73.0 %) stated just one reason, but some stated two (22.6 %), three (4.3 %), and four (0.1 %) reasons. The total number of stated reasons was 2,438. By classifying these into broader categories, we identified 11 main reasons for not playing exergames: *no interest*, *prefers other forms of exercise*, *ownership*, *no money*, *not useful enough*, *not a gamer*, *no time*, *not familiar*, *home restrictions*, *personal restrictions*, and *other reasons*. Examples of the stated reasons that were classified into each category, translated from Finnish to English, are presented in Table 4.

Reason for not playing	**Examples of stated reasons**
No interest	Not interested, does not motivate, do not like, do not care
Prefers other forms of exercise	Prefers exercising outside / in a group / other forms of exercise
Ownership	Does not own, has not bought
No money	The price, too expensive, can not afford
Not useful enough	Does not perceive useful, not demanding enough physically, no need
Not a gamer	Does not play any digital games, never played digital games
No time	Lack of time, not enough time, no free time for exergaming
Not familiar	Not familiar, has not even heard, unknown
Home restrictions	No space for exergaming / devices, neighbours
Personal restrictions	Age (too old), crippled, weight, physical / bodily restrictions
Other reasons	Too much screen time as it is, kids, other

Table 4: The reasons for not playing exergames and examples of the stated reasons

The number and the percentage of the non-players that stated the aforementioned 11 reasons as their reason for not playing exergames are presented in Table 5, first for all the non-players and then for the male and female non-players. Table 6 summarises the results of the Pearson's χ^2 tests of independence that were used to examine the statistical significance and strength of their dependencies between gender and the statement of the reasons.

	All non-players (N = 2,253)		**Male non-players (N = 824)**		**Female non-players (N = 1,429)**	
	N	**%**	**N**	**%**	**N**	**%**
No interest	533	23.7	229	27.8	304	21.3
Prefers other forms of exercise	490	21.7	157	19.1	333	23.3
Ownership	409	18.2	125	15.2	284	19.9
No money	279	12.4	47	5.7	232	16.2
Not useful enough	271	12.0	101	12.3	170	11.9
Not a gamer	163	7.2	51	6.2	112	7.8
No time	128	5.7	55	6.7	73	5.1
Not familiar	63	2.8	16	1.9	47	3.3
Home restrictions	50	2.2	15	1.8	35	2.4
Personal restrictions	26	1.2	12	1.5	14	1.0
Other reasons	26	1.2	5	0.6	21	1.5

Table 5: The reasons for not playing exergames among the non-players

	N	χ^2	df	p	V
No interest	2,253	21.293	1	**< 0.001**	**0.074**
Prefers other forms of exercise	2,253	5.546	1	**0.019**	**0.050**
Ownership	2,253	7.784	1	**0.005**	**0.059**
No money	2,253	53.423	1	**< 0.001**	**0.154**
Not useful enough	2,253	0.064	1	0.800	0.005
Not a gamer	2,253	2.116	1	0.146	0.031
No time	2,253	2.393	1	0.122	0.033
Not familiar	2,253	3.490	1	0.062	0.039
Home restrictions	2,253	0.953	1	0.329	0.021
Personal restrictions	2,253	1.041	1	0.308	0.021
Other reasons	2,253	3.410	1	0.065	0.039

Table 6: Gender dependencies in the reasons for not playing exergames among the non-players

As can be seen, the four most significant reasons for not playing exergames were the *no interest* (stated by 23.7 % of all the non-players), *prefers other forms of exercise* (21.7 %), *ownership* (18.2 %), and *no money* (12.4 %). These were also the only reasons in which there was a statistically significant dependency with gender. The strongest dependency (V = 0.154) was in the reason *no money*, which was stated by 16.2 % of the female non-players and 5.7 % of the male non-players. The second strongest dependency (V = 0.074) was in the reason *no interest*, which was stated by 27.8 % of the male non-players and 21.3 % of the female non-players. The third strongest dependency (V = 0.059) was in the reason *ownership*, which was stated by 15.2 % of the male non-players and 19.9 % of the female non-players. Finally, the fourth strongest dependency (V = 0.050) was in the reason *prefers other forms of exercise*, which was stated by 19.1 % of the male non-players and 23.3 % of the female non-players. In the case of the remaining seven reasons, *not useful enough* (stated by 12.0 % of all the non-players), *not a gamer* (7.2 %), *no time* (5.7 %), *not familiar* (2.8 %), *home restrictions* (2.2 %), *personal restrictions* (1.2 %), and *other reasons* (1.2 %), there was no statistically significant dependency with gender.

5 Discussion and Conclusions

In this study, we examined the habits of playing and the reasons for not playing exergames, concentrating particularly on the gender differences between the male and female players and non-players. In terms of the habits of playing exergames, our results suggest that by far the most popular platform for playing exergames are game consoles, and very few people play them with computers or mobile devices. This is not surprising when considering that a majority of exergames are released only for game consoles. However, at the same time, it also highlights the market potential of other platforms, particularly mobile devices, in which the penetration rates are still very low. The results also suggest that exergames are mainly played for fun and in a group setting. Therefore, when designing the games, it is important to make them as entertaining as possible and, if reasonable, to equip them with good multiplayer features.

In terms of the gender differences in the habits of playing exergames, our results suggest no difference in the popularity of playing exergames between men and women. However, there seems to be differences in the reasons of playing exergames between

men and women. Although both men and women were found to play exergames mainly for the hedonic reason of having fun, the utilitarian exercise related reasons were more popular among women than among men. This is in line with the finding that women also played exergames at more vigorous exertion levels and perceived the effects of playing on their physical fitness more positively than men. Thus, if exergames are marketed more as a means for exercising than as a means of having fun, women can perhaps be considered more potential targets for these kinds of marketing messages.

In terms of the reasons of not playing exergames, our results suggest that the most significant reason for not playing exergames was the *lack of interest* towards them. The second most significant reason was that a person *prefers other forms of exercise* to exergames. The lack of *ownership* was the third most significant reason. Also some differences between men and women were found. Among men, the three most significant reasons for not playing were 1) *lack of interest*, 2) *prefers other forms of exercise*, and 3) *ownership*. Among women, the three most significant reasons for not playing were 1) *prefers other forms of exercise*, 2) *lack of interest*, and 3) *ownership*. In other words, the same reasons but in a different order. The reasons that were stated more frequently by women than by men were *prefers other forms of exercise*, *ownership*, and *no money*. The only reason that was stated more frequently by men than by women was *lack of interest*. The most significant difference between men and women was in the reason *no money*. As the income differences between men and women in Finland are relatively insignificant and the prices of exergames are relatively low, perhaps the main explanation for this finding is that women are less aware of the actual prices of exergames than men. However, this requires further research.

Based on these results, it seems that exergames still have a long way to go before they are perceived as interesting enough in terms of the gaming experience as well as useful enough in terms of their effects on physical fitness. Thus, it is critical that the game industry concentrates on addressing these issues in game design. One aspect that might aid in addressing both of these issues could be to design the games to be physically more demanding as this could result in them being perceived not only as more useful but also as more interesting. But, of course, the games should not be designed as physically too demanding as this could result in them not being perceived fun anymore. Overall, finding the equilibrium between the hedonic and utilitarian aspects of exergames seems to be the main challenge facing the game designers today and most probably also in the years to come.

6 Limitations and Future Research

In terms of the habits of playing exergames, the main limitations of this study relate to the operationalisation of some of the surveyed concepts, such as the reason, setting, exertion, and effects of playing, in a relatively simplistic manner, in which they were measured with only one question. This was due to the explorative nature of the study. However, future studies may benefit from more rigorous operationalisations in which the concepts are measured with multiple questions so that the reliability and validity of the measures can be evaluated. All the questions also concentrated on subjective rather than objective measures of the concepts (e.g., *perceived* exertion of playing and *perceived* effects of playing). In this study, we also did not examine the relationships between the concepts. In terms of the reasons for not playing, the main limitation of the

study relates to the usage of an online survey to collect the data, which obviously prevented us from asking any follow-up questions related to the reasons and may have caused some of the respondents to state the reasons in a rather simplistic manner or even leave some of the reasons unstated. Thus, future studies may benefit from the usage of other methods, such as personal or group interviews, to collect the data. Many of the reasons were also very closely related to each other, perhaps even through causal relations (e.g., some people may not be interested in exergames *because* they do not perceive them as useful enough). However, these relationships between the reasons were not examined in this study.

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Appendix

The questionnaire that was used to the respondents on their habits of playing and reasons for not playing exergames (translated from Finnish to English) is presented below. Questions 2, 3, 4, 5, 6, and 7 were asked if the respondent answered *Yes* to question 1. Question 8 was asked if the respondent answered *No* to question 1. If the respondent answered *Don't know* to question 1, no additional questions were asked from him or her.

Digital exercise games

By digital exercise games we mean to digital games in which the playing is mainly done by moving your own body. These include both game console and computer games (e.g., Nintendo Wii Fit and Sports, EA Sports Active, Your Shape, Zumba Fitness, and Dance Dance Revolution) and mobile games that can be played with mobile devices like mobile phones (e.g., Bjong, FlagHunt, TrezrHunt, and Lappset Mobile Playground).

1. Do you play digital exercise games?

- o Yes
- o No
- o Don't know

2. On average, how often do you play digital exercise games with the following devices?

	Daily	Weekly	Monthly	Less than monthly	Only tried once or twice	Never tried	Don't know
Game console	○	○	○	○	○	○	○
Computer	○	○	○	○	○	○	○
Mobile device	○	○	○	○	○	○	○
Other device	○	○	○	○	○	○	○

3. What digital exercise games do you play?

[*Open-ended question*]

4. Do you play digital exercise games mainly for fun or for exercise?

- ○ Mainly for fun
- ○ Mainly for exercise
- ○ Don't know

5. Do you play digital exercise games mainly alone or together with other people?

- ○ Mainly alone
- ○ Mainly together with other people physically in the same space
- ○ Mainly together with other people virtually over a network
- ○ Don't know

6. At what physical exertion level do you mainly play digital exercise games?

- ○ Light (no sweating or accelerated breathing)
- ○ Moderate (some sweating and accelerated breathing)
- ○ Vigorous (strong sweating and accelerated breathing)
- ○ Don't know

7. How do you perceive that the playing of digital exercise games has affected your physical fitness?

- ○ Significantly negatively
- ○ Somewhat negatively
- ○ No significant effect
- ○ Somewhat positively
- ○ Significantly positively
- ○ Don't know

8. Why do you not play digital exercise games or possibly own devices or games required to play them?

[*Open-ended question*]