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# THE HABITS OF PLAYING AND THE REASONS FOR NOT PLAYING EXERGAMES: AGE DIFFERENCES IN FINLAND

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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 especially on the differences between four different age groups of 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. There are also potentially significant age differences in how these games are perceived. The study is based on analysing an online survey sample of 3,036 Finnish consumers by using contingency tables, the Pearson's  $\chi^2$  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 age differences especially in the reasons for not playing exergames but also in the habits of playing exergames. Based on these results, the exergaming industry still seems to have a long way to go before exergames are perceived interesting enough in terms of the gaming experience and useful enough in terms of their effects on physical fitness. The findings of the study should be taken into account in the design and marketing of exergames.

## KEYWORDS

Exergames, habits of playing, reasons for not playing, age 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 (Erme 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 a substantial effect on the physical activity and exercise habits. Intentional fitness training started to become more common along with urbanisation and shifts in time use in the 1960s. The field of exercise and sport became more versatile in the 1980s, and since the 1990s, commercialisation and the strengthened role of technology have been dominating trends in this field. Sport and exercise has developed into a social world of its own, where individual preferences have a remarkable impact: nowadays sport and exercise are important forms of self-expression as well.

The physical activity level of Finns has dropped drastically in the past twenty years (Juutinen-Finni, 2010; Koivumäki, 2003). As work as such has changed, increasing number of Finns work sedentary and even leisure time is dominated by sitting: one is often spending time sitting in front of television or computer leading to high amounts of screen time. Researchers have started to talk about a sedentary lifestyle, which is associated with many health risks. The changes in the way of life can be seen in the physical fitness of Finns as well. In numerous extensive population studies, it has been found to decrease substantially (Heiskanen et al., 2011; Santtila et al., 2006; Vaara et al., 2009).

Along with the sedentary lifestyle, intentional sport and exercise have become more common. General guidelines based on epidemiological studies are given on the desired amount of sport and exercise, and the adherence of the Finnish population into these guidelines is examined regularly. From the point of view of these guidelines, less than half of Finns take enough exercise for their health. If the physical activity of Finns remains on its current level and the decrease in the physical fitness continues to follow the perceived trend, the general physical fitness of Finns, the aerobic fitness in particular, will dramatically deteriorate during the coming 25 years (Heiskanen et al., 2011; Hirvensalo et al., 2011; Finnish Sports Federation, 2011). Especially alarming is the situation of 25–39-year-old men, who are the most eager users of different kinds of technological products and gadgets. Therefore, it is of utmost importance to find new measures to motivate people to do more exercise.

Prior research has shown that the usage of sports and wellness technologies can have positive effects on the motivation towards exercise (e.g., Ahtinen et al., 2008; Bravata et al., 2007). In recent years, these technologies have become a part of everyday life for more and more people. A heart rate monitor is already a common training partner for many physically active people, and also the use and demand for many other kinds of technological applications in the field is rapidly increasing. One example of these are digital exercise games or exergames, which require some sort of physical activity from the player in order to play the game. However, the habits of playing these games and the reasons why they either are or are not played remain a relatively unexplored area.

The purpose of this study is to address this shortcoming by examining the habits of playing and the reasons for not playing exergames, concentrating especially on differences between four different age groups of players and non-players. The effect of age on the adoption of innovations is a controversial issue (Rogers, 2003), especially when the adoption is examined on a general or global levels, but also when it is examined on the context of some specific domains, such as 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 examination is based on analysing an online survey sample of 3,036 Finnish consumers by using contingency tables, the Pearson's  $\chi^2$  tests of independence, and the Cramér's V coefficients.

The paper consists of six sections. After the introductory section, in section 2, the concept of exergames is discussed. Section 3 describes the methodology and section 4 presents the results of the study. Section 5 covers the conclusion and discussion of the results. Finally, in section 6, the limitations of the study and future research are considered.

Based on the same data we have also made another research on the same topic, but from a gender point of view. These two studies share parts of the same theoretical background.

## 2. EXERGAMING

In recent 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 the same thing: games that combine exercise and games by requiring the player to do some sort of physical activity in order to play the game. Mueller et al. (2011) define exergames as “a digital game where the outcome of the game is predominantly determined by physical effort”. 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 game consoles and in home settings. 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.) Prior research (e.g., Berkovsky et al., 2010) has suggested that exercise and games can be combined without adverse effects on the overall experience and enjoyment of playing, thus demonstrating the potential of exergames in motivating people to do more exercise.

One of the advantages of exergames is that they can promote the physical activity of the players without them having a thorough 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 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 the physical fitness of the players through, for example, heart rate or energy expenditure. (Lieberman et al., 2011.)

Prior research has demonstrated that exergames can promote the motivation towards physical activity and exercise (e.g., Berkovsky et al., 2010; Sallis, 2011), have physiological benefits (e.g., Daley, 2009; Maddison et al., 2011), and be utilised as a part of a more extensive aerobic exercise program (Siegel et al., 2009). Of course, this depends on the type of the exergame and the physical exertion level at which the exergame is played. Trout and Christie (2007) also suggest that exergames are able to promote the motivation towards other forms of physical activity and, thus, may act as an incentive for a more active lifestyle.

## 3. METHODOLOGY

To examine the habits of 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 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  $\chi^2$  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. Examining those 2,976 who had stated whether or not they play exergames and testing the matter with the Pearson's  $\chi^2$  test of independence, the dependency between age and the playing of exergames was statistically significant at the 0.05 level ( $\chi^2(3) = 99.873$ ,  $p < 0.001$ ). The playing of exergames was most common in the youngest examined age group of under 25 years (34.3 %), and got less common the older the age group got, with the playing of exergames being second most common in the age group of 25–34 years (27.2 %), third most common in the age group of 35–44 years (23.9 %), and least common in the oldest examined age group of 45 years or over (12.1 %). This is in line with the participation rates in other forms of physical activity and exercise in different age groups among Finnish adults aged 15–64, as they have been found to decrease with age (Finnish Sports Federation, 2011). It is also in line with the playing of digital games in general among Finnish population, as it has been found to be most popular among the youngest age groups and to decrease with age (Karvinen & Mäyrä, 2011).

Table 1. Descriptive statistics of the whole sample and the two sub-samples

Variable		All % (N = 3,036)	Players % (N = 723)	Non-players % (N = 2,253)
Gender	Male	35.6	32.6	36.6
	Female	64.4	67.4	63.4
Age	–24 years	22.2	30.7	18.9
	25–34 years	32.0	36.1	31.0
	35–44 years	21.0	20.9	21.3
	45– years	24.8	12.3	28.8
Yearly income	–14,999 €	34.1	39.2	31.9
	15,000–29,999 €	25.1	21.8	26.3
	30,000–44,999 €	25.5	24.9	25.9
	45,000– €	15.3	14.1	15.9
	N/A (N)	375	77	281
Socioeconomic group	Student	25.3	31.5	23.1
	Employed	59.2	56.7	60.7
	Unemployed	6.9	6.4	6.9

Pensioner	4.0	1.2	4.7
Other	4.6	4.1	4.6

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 different age groups. Table 3 summarises the results of the Pearson's  $\chi^2$  tests of independence that were used to examine the statistical significance and strength of the dependencies between age 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. Age was found to have no statistically significant dependency with the playing on game consoles ( $\chi^2(9) = 11.150$ ,  $p = 0.266$ ) nor with the playing on computers ( $\chi^2(9) = 14.338$ ,  $p = 0.111$ ), but it was found to have a statistically significant dependency with the playing on mobile devices ( $\chi^2(9) = 19.681$ ,  $p = 0.020$ ,  $V = 0.097$ ). In the case of mobile devices, the respondents belonging to the youngest age group were found to be more frequent players than others.

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. Age was found to have no statistically significant dependency with the reason of playing ( $\chi^2(3) = 5.232$ ,  $p = 0.156$ ).

Table 2. The habits of playing exergames among the players

		All % (N = 723)	-24 yrs. % (N = 222)	25-34 yrs. % (N = 261)	35-44 yrs. % (N = 151)	45- yrs. % (N = 89)
Playing on game consoles	At least weekly	16.9	20.5	15.8	16.6	16.9
	At least monthly	26.6	25.0	26.3	29.8	26.6
	Less than monthly	54.4	53.2	56.4	51.7	54.4
	Has never played	2.1	1.4	1.5	2.0	2.1
	N/A (N)	6	2	2	0	2
Playing on computers	At least weekly	3.0	3.8	2.3	0.7	7.1
	At least monthly	4.0	5.2	3.5	3.4	3.5
	Less than monthly	21.7	26.3	19.5	19.7	20.0
	Has never played	71.3	64.8	74.6	76.2	69.4
	N/A (N)	22	9	5	4	4
Playing on mobile devices	At least weekly	1.6	4.2	0.0	1.4	0.0
	At least monthly	1.7	2.8	1.2	1.4	1.2
	Less than monthly	11.9	12.3	9.9	14.2	12.9
	Has never played	84.8	80.7	88.9	83.1	85.9
	N/A (N)	26	10	9	3	4
Reasons of playing	Fun	85.3	83.4	84.9	90.7	81.4

	Exercise	14.7	16.6	15.1	9.3	18.6
	N/A (N)	17	5	9	0	3
Setting of playing	Individual	22.1	25.0	22.4	16.0	25.0
	Group	77.9	75.0	77.6	84.0	75.0
	N/A (N)	14	6	6	1	1
Exertion of playing	Light	34.3	30.7	34.8	35.1	40.7
	Moderate	61.1	65.1	60.0	60.1	55.8
	Vigorous	4.6	4.2	5.2	4.7	3.5
	N/A (N)	27	10	11	3	3
Effects of playing	Negative	0.6	1.0	0.0	0.7	1.3
	No effects	81.5	79.2	80.8	87.0	80.0
	Positive	17.9	19.8	19.2	12.3	18.8
	N/A (N)	74	25	27	13	9

Table 3. Age dependencies in the habits of playing exergames among the players

	N	$\chi^2$	df	p	V
Playing on game consoles	717	11.150	9	0.266	0.072
Playing on computers	701	14.338	9	0.111	0.083
Playing on mobile devices	697	19.681	9	<b>0.020</b>	<b>0.097</b>
Reasons of playing	706	5.232	3	0.156	0.086
Setting of playing	709	10.815	6	0.094	0.087
Exertion of playing	696	3.401	6	0.757	0.049
Effects of playing	649	6.235	6	0.397	0.069

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. Age was found to have no statistically significant dependency with the setting of playing ( $\chi^2(6) = 10.815$ ,  $p = 0.094$ ).

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 (4.6 %) at a vigorous level. Age was found to have no statistically significant dependency with the exertion of playing ( $\chi^2(6) = 3.401$ ,  $p = 0.757$ ). According to Finnish Sports Federation (2011), of those Finnish adults aged 19–65 who participate in physical activity, 62 % do so at a moderate level, 16 % at a light level, and 22 % at a vigorous level. These numbers include all forms of physical activity and exercise, not just exergames. When compared, we can see that the habit of playing exergames at a moderate level exertion is in correspondence with the exertion levels of other forms of physical activity. However, other forms of physical activity are done substantially more at a vigorous level, and exergames are played substantially more at a light 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. Age was found to have no statistically significant dependency with the effects of playing ( $\chi^2(6) = 6.235$ ,  $p = 0.397$ ).

## 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 %), or four (0.1 %) reasons. The total number of stated reasons was 2,438. By classifying these into broader categories, 11 main reasons for not playing exergames were identified. These were: *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.

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

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

The number and percentage of the non-players that stated the above-mentioned 11 reasons as their reason for not playing exergames are presented in Table 5, first for all the non-players and then for different age groups of non-players. Table 6 summarises the results of the Pearson's  $\chi^2$  tests of independence that were used to examine the statistical significance and strength of their dependencies between age and the statement of the reasons.

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

	All % (N = 2,253)	-24 yrs. % (N = 425)	25-34 yrs. % (N = 698)	35-44 yrs. % (N = 481)	45- yrs. % (N = 649)
No interest	23.7	16.0	21.1	26.0	29.7
Prefers other forms of exercise	21.7	18.1	26.4	23.1	18.2
Ownership	18.2	19.8	17.8	19.5	16.5
No money	12.4	24.5	16.0	5.6	5.5
Not useful enough	12.0	15.8	14.9	7.1	10.2
Not a gamer	7.2	4.0	9.5	8.1	6.3
No time	5.7	4.2	6.4	8.1	4.0
Not familiar	2.8	1.9	2.3	1.5	4.9
Home restrictions	2.2	1.4	4.0	1.7	1.2
Personal restrictions	1.2	0.0	0.7	0.6	2.8
Other reasons	1.2	0.7	1.6	0.8	1.2

Table 6. Age dependencies in the reasons for not playing exergames among the non-players

	N	$\chi^2$	df	p	V
No interest	2,253	31.138	3	< <b>0.001</b>	<b>0.118</b>
Prefers other forms of exercise	2,253	17.368	3	<b>0.001</b>	<b>0.088</b>
Ownership	2,253	2.651	3	0.449	0.034
No money	2,253	114.132	3	< <b>0.001</b>	<b>0.225</b>
Not useful enough	2,253	24.347	3	< <b>0.001</b>	<b>0.104</b>
Not a gamer	2,253	13.116	3	<b>0.004</b>	<b>0.076</b>
No time	2,253	11.107	3	<b>0.011</b>	<b>0.070</b>
Not familiar	2,253	16.018	3	<b>0.001</b>	<b>0.084</b>
Home restrictions	2,253	15.205	3	<b>0.002</b>	<b>0.082</b>
Personal restrictions	2,253	22.242	3	< <b>0.001</b>	<b>0.099</b>
Other reasons	2,253	2.311	3	0.510	0.032

As can be seen, the five 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 %), *no money* (12.4 %), and *not useful enough* (12.0 %). Out of the 11 reasons, 9 reasons had a statistically significant dependency with age. The strongest dependency ( $V = 0.225$ ) was in the reason *no money*, which was stated by 24.5 % of the non-players aged under 25 years, 16.0 % of the non-players aged at 25-34 years, 5.6 % of the non-players aged at 35-44 years, and 5.5 % of the non-players aged 45 years or over. The second strongest dependency ( $V = 0.118$ ) was in the reason *no interest*, which was stated by 16.0 % of the non-



players aged under 25 years, 21.1 % of the non-players aged at 25–34 years, 26.0 % of the non-players aged at 35–44 years, and 29.7 % of the non-players aged 45 years or over. The third strongest dependency ( $V = 0.104$ ) was in the reason *not useful enough*, which was stated by 15.8 % of the non-players aged under 25 years, 14.9 % of the non-players aged at 25–34 years, 7.1 % of the non-players aged at 35–44 years, and 10.2 % of the non-players aged 45 years or over. The fourth strongest dependency ( $V = 0.099$ ) was in the reason *personal restrictions*, which was stated by 0.0 % of the non-players aged under 25 years, 0.7 % of the non-players aged at 25–34 years, 0.6 % of the non-players aged at 35–44 years, and 2.8 % of the non-players aged 45 years or over. The fifth strongest dependency ( $V = 0.088$ ) was in the reason *prefers other forms of exercise*, which was stated by 18.1 % of the non-players aged under 25 years, 26.4 % of the non-players aged at 25–34 years, 23.1 % of the non-players aged at 35–44 years, and 18.2 % of the non-players aged 45 years or over. The sixth strongest dependency ( $V = 0.084$ ) was in the reason *not familiar*, which was stated by 1.9 % of the non-players aged under 25 years, 2.3 % of the non-players aged at 25–34 years, 1.5 % of the non-players aged at 35–44 years, and 4.9 % of the non-players aged years 45 or over. The seventh strongest dependency ( $V = 0.082$ ) was in the reason *home restrictions*, which was stated by 1.4 % of the non-players aged under 25 years, 4.0 % of the non-players aged at 25–34 years, 1.7 % of the non-players aged at 35–44 years, and 1.2 % of the non-players aged 45 years or over. The eighth strongest dependency ( $V = 0.076$ ) was in the reason *not a gamer*, which was stated by 4.0 % of the non-players aged under 25 years, 9.5 % of the non-players aged at 25–34 years, 8.1 % of the non-players aged at 35–44 years, and 6.3 % of the non-players aged 45 years or over. Finally, the ninth strongest dependency ( $V = 0.070$ ) was in the reason *no time*, which was stated by 4.2 % of the non-players aged under 25 years, 6.4 % of the non-players aged at 25–34 years, 8.1 % of the non-players aged at 35–44 years, and 4.0 % of the non-players aged 45 years or over. In the case of remaining two reasons, *ownership* (stated by 18.2 % of all the non-players) and *other reasons* (1.2 %), there was no statistically significant dependency with age.

## 5. CONCLUSION

The study examined the habits of playing and the reasons for not playing exergames, concentrating especially on age differences between four different age groups of players and non-players. In terms of the habits of playing exergames, the results suggest that by far the most common platform for playing exergames are game consoles, and only a few play them on computers or mobile devices. This is not surprising, considering that the majority of exergames are designed and released only for game consoles. However, at the same time, it also highlights the market potential of the other platforms, particularly the 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 include multiplayer features to them.

In terms of the age differences in the habits of playing exergames, the results suggest that playing of exergames is more common the younger the person is and that the commonness decreases with age. When examining the frequency of playing with different devices, age was found to have no dependency with playing on game consoles or computers, but on mobile devices the people in the youngest age group were found to be more frequent players than those in the other age groups. There seems to be relatively small differences in the reasons for playing exergames between different age groups as age was found to have no dependency with the reasons, setting, exertion, or the effects of playing.

In terms of the reasons of not playing exergames, the 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* over exergames. The lack of *ownership* was the third most significant reason. However, the significance of different reasons was found to vary between different age groups. In the youngest age group of under 25 years, the three most significant reasons were 1) *no money*, 2) *ownership*, and 3) *prefers other forms of exercise*. In the age group of 25–34 years, the three most significant reasons were 1) *prefers other forms of exercise*, 2) *no interest*, and 3) *ownership*. In the two oldest age groups of 35–44 years and 45 years or over, the three most significant reasons were 1) *no interest*, 2) *prefers other forms of exercise*, and 3) *ownership*. As can be seen, the reasons *prefers other forms of exercise* and *ownership* were among the three most significant reasons in each of the age groups, and, apart from the youngest age group, the reason *no interest* also. In the youngest age group, the reason *no money* was the most significant one. The

most significant differences between age groups were in the reasons *no money* and *no interest*. *No money* was more significant the younger the age group was. The main explanation for this lies most probably in the fact that according to Statistics Finland (2012), in Finland, the degree of low income is highest in the age group of under 25 years. On the contrary, the reason *no interest* was more significant the older the age group was. Thus, when marketing exergames, taking marketing activities aimed also at older age groups could perhaps wake more interest towards exergames among these age groups. One such marketing activity could be to use older and regular people in the commercials instead of athletes. Marketing activities aimed at older age groups could also be beneficial because in them the reason *no money* plays a less significant role.

Based on these results, it seems that the exergaming industry still has a long way to go before exergames are perceived interesting enough in terms of the gaming experience and useful enough in terms of their effects on physical fitness. Therefore, it is critical that the exergaming industry concentrates on addressing these issues both in the game design and marketing of exergames. Ways that might aid in addressing these issues could be to design exergames that are more physically demanding, as this could result in them being perceived as more useful and, at the same time, also as more interesting. But they should not be designed physically too demanding as this might result in the games not being perceived fun enough. It might also be worthy to bring out the potential physical benefits of playing exergames in their marketing. Overall, finding the equilibrium between the hedonic and utilitarian aspects of playing exergames and delivering this message to potential customers seem to be the main challenges facing the exergame designers and the exergaming industry today and most probably also in the future.

## 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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