Utilitarian and Hedonic Motivations and Social Influence of Gamified Fitness Applications

Daniel Alb / N00147745

Supervised by Hannah Barton

Thesis submitted as a requirement for the degree of MSc in Cyberpsychology,

Dún Laoghaire Institute of Art, Design and Technology, 2016

Declaration

This Thesis is entirely my own work, and has not been previously submitted to this or any other third level institution.

Daniel Alb Date: 22.04.2016

_____

Word Count: 6,055

Acknowledgements

I would like to express my gratitude to the outstanding and kind lecturers and staff at IADT, to thank them for their support in the learning process. I would especially like to thank my supervisor, Hannah Barton, for her challenging insights, and for providing me with incredible guidance and structure. Her support and encouragement throughout the process of writing this thesis were invaluable.

My dear classmates, I wouldn't have managed to complete this journey without you. Thank you for your amazing support and encouragement.

Special thanks to my brilliant teammates at Monsoon Consulting for supporting me with their genuine interest, challenging ideas and feedback. This work is better because of them.

This research project is dedicated to my wife Roze, who put our family dreams on hold to support and encourage me through this process. Thank you for your patience, inspiration and love that helped me achieve this goal. For this and everything else, I am grateful.

Table of Contents

List of Tables and Figures

List of Appendices

Abstract

Utilitarian and Hedonic Motivations and Social Influence of Gamified Fitness Applications

The current research used an extended Technology Acceptance Model (TAM) in conjunction with social influence to understand utilitarian and hedonic motivations of gamified applications used to record and improve fitness activity. The study was conducted using a convenience sample of 40 participants, users of gamified fitness technology. The results showed that usefulness, ease of use and enjoyment positively influence participants' behavioural intentions to use gamified applications. Additionally, social influence has been positively correlated to attitudes towards use, with attitudes and behavioural intentions as determinants of the actual behaviour. This study contributes to the literature suggesting that TAM framework should be extended to include social influence as a predictor for technology adoption. From a practical standpoint, this study aims to help developers create better applications that sustain long-term fitness behaviour.

Introduction

Smart mobile devices are designed to give people access to gamified applications aimed to improve their health by helping them keep up with an exercise routine, lose weight or manage their calorie intake (Werbach & Hunter 2012). A report from September 2015 released by the IMS Institute for Healthcare Informatics found that there were more than 165,000 healthcare applications on the market, with nearly half of them focusing on fitness and diet (Satish Misra, 2015). This trend has been nicknamed “the gamification of health care” and implies that game elements and game design concepts are applied to health contexts (Werbach & Hunter, 2012), using motivational techniques to create engaging experiences.

It is common for gamification to be applied to health and fitness programs. Baranowski, Buday, Thompson and Baranowski (2008) reviewed multiple research and pilot studies that were looking to improve health (diet, physical activity and self-management skills). All reviewed research concluded that the outcomes were improved, but several studies failed to report sustainability and continuity (Morford, Witts, Killingsworth & Alavosius, 2014). Gamified systems targeting physical health are designed around rules and actions aimed to optimise the benefits for people, while minimising the risks. Gamified solutions that integrate mobile devices and GPS trackers to record and promote physical health, such as Fitbit, MyfitnessPal, Pacer or RunKeeper have become popular and have a world-wide user base (McCallum, 2012; Gordon, 2010).

The present study aims to serve as a guideline to understand what motivates people to use gamified fitness technologies. It has the potential to contribute to physical education literature by providing motivational background for using gamified applications.

From a practical standpoint, this study sets out to reveal compelling insights in terms of users' motivation and behaviour patterns, which developers could use to enhance people's engagement with gamified fitness applications and help them improve their fitness routine. With a better understanding of factors affecting motivation, development companies could potentially create better products that sustain long-term fitness behaviour.

Gamification

At its core, gamification can be understood as the application of game-inspired design elements, namely badges and points, challenges or leaderboards – outside of game contexts, and it has been successfully employed in e-commerce, human resources or health contexts (Deterding, Khaled, Nacke, & Dixon, 2011). The key goal of gamification is to increase motivation and maintain positive behaviour change over time, by using game elements paired with engaging experiences, targeting exploration, contextual awareness or social connectivity. In this context, achievements have to be relevant, and badges have to have real-world meaning (Jensen, 2012). Simply put, gamification aims to make users' tasks feel more like a game, which in turn reduces the stress produced by the progress toward a goal.

Mobile phone technologies have become an important medium for helping people engage with health applications (Lister, West, Cannon, Sax, & Brodegard, 2014). Gamified applications such as Nike+, Pacer and Fitbit indicate that systems associated with a lifestyle change create higher engagement rates among adopters (Paredes, Tewari & Canny, 2013).

In the context of gamified fitness and healthcare, previous studies (Baranowski, Buday, Thompson & Baranowski, 2008) indicated that it had a positive impact on physical activity and people's willingness to continue using a gamified application. However, Biddiss and Irwin (2010) research pinpointed the perceived benefits from gamification to the element of novelty and reported that the results regarding the

increase of physical activity due to gamified systems were inconclusive. Short-term interventions showed an increased impact on physical activity, when compared to long-term interventions, indicating that benefits may be derived from the application's novelty. At the same time, gamification has received criticism from researchers, implying that it relies heavily on gaming concepts such as autonomy, mastery and flow, rather than using relevant content or incentives to create enjoyable experiences (Jensen, 2012).

In the context of such conflicting research results, the current study aims to gain a deeper understanding on how gamification impacts motivation of people using fitness applications.

Motivation

Motivation is a key concept when discussing gamified fitness applications. Research around healthcare gamification needs to address motivational issues, not only during the use of the gamified application, but afterwards as well.

Gamification systems are based on providing extrinsic motivation for behaviour change. Deci, Koestner and Ryan (1999) analysis of multiple gamification studies suggested that extrinsic motivations could undermine intrinsic motivators, which might negatively impact long-term behaviour changes, after the gamified application is no longer in use. However, if the game design elements are made relevant to the user through comprehensive communication, internal motivation could potentially be improved, as external rewards become less important (Nicholson, 2015).

When considering the theoretical background for motivation in the context of game design, researchers argued that intrinsic motivation was key to initiating and sustaining specific behaviour (Baranowski, Buday, Thompson and Baranowski, 2008). Games are primarily designed for entertainment and personal enjoyment. Gamification uses game design concepts for that reason, thus interactivity,

challenges, the sense of control and rewards contribute to users' enjoyment of a gamified technology. Game concepts have the ability to enhance behaviour change through goal-setting, which appeals to a user's extrinsic motivation, and by adding an element of fun, eliciting a person's intrinsic motivation. Baranowski, Buday, Thompson and Baranowski (2008) research proved that entertainment and fun positively influenced motivation, which indicates that a gamified application could sustain positive behaviour.

Motivation and Technology Acceptance Model

Self-determination is a key motivational theory (Ryan & Deci, 2000) and it differentiates between extrinsic motivation, which implies that an activity is performed because it is key in allowing an individual to achieve a goal, and intrinsic motivation, which implies that an individual is engaged in a specific behaviour for the pure reason that they find the activity interesting and enjoyable.

Technology Acceptance Model (*Figure 1*) is a widely recognised adoption theory and points out that perceived usefulness in conjunction with perceived ease of use influence behavioural intentions and in turn the behaviour itself (Davis, 1993). Perceived usefulness has been defined as a user's expectation to achieve a particular goal as a result of using technology. In turn, ease of use, described as a person's perception of his or her own ability to achieve a particular task without effort, was identified as a precursor of perceived usefulness (Fagan, Neill, & Wooldridge, 2008). Perceived usefulness has been used as an instrumental construct to measure extrinsic motivation (Venkatesh, 2000).

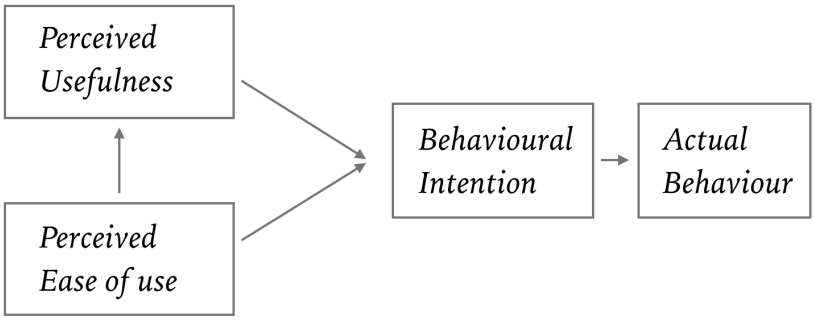


Figure 1. The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a theoretical framework that pinpoints the adoption of utilitarian systems to an individual's perceived usefulness and perceived ease of use. TAM relies on building a causal chain that connects external factors to the use of technology. The model proposes a relationship of cause and effect between the intentions to use the technology and the use of a system itself. The perceived usefulness and the perceived ease of use of information technology directly impact the behavioural intentions, with perceived usefulness acting as a moderator for perceived ease of use.

Despite the initial utilitarian focus, an extended Technology Acceptance Model was required to study the adoption of hedonic technologies, due to the inability of perceived usefulness and perceived ease of use alone to successfully predict the adoption of such systems (Ernst, Pfeiffer & Rothlauf, 2013). A user's perceived enjoyment, described as the degree to which a person perceives technology as enjoyable and fun, supports the adoption of hedonic technologies (Van der Heijden, 2004).

While previous research usually split information technologies into hedonic or utilitarian systems, Venkatesh (2000) proposed an integrated model to include both, hedonic and utilitarian motivations. Intrinsic motivation relates to pleasure and satisfaction as a result of performing an activity, thus perceived enjoyment was used as an instrumental construct in relation to intrinsic motivation (Venkatesh, 2000).

Venkatesh (2000) uses technology playfulness to conceptualise a system's intrinsic motivation and argues that users tend to disregard the difficulties of using technology simply because they enjoy the process. It is therefore implied that there's a relationship between a system's playfulness and its perceived ease of use. At the same time, research suggests that increased intrinsic motivation determines users' willingness to spend more time engaged in particular behaviour (Venkatesh, 2000). TAM was therefore extended to include the concept of perceived enjoyment, as a construct that accurately reflects the intrinsic motivation of hedonic technologies (*Figure 2*).

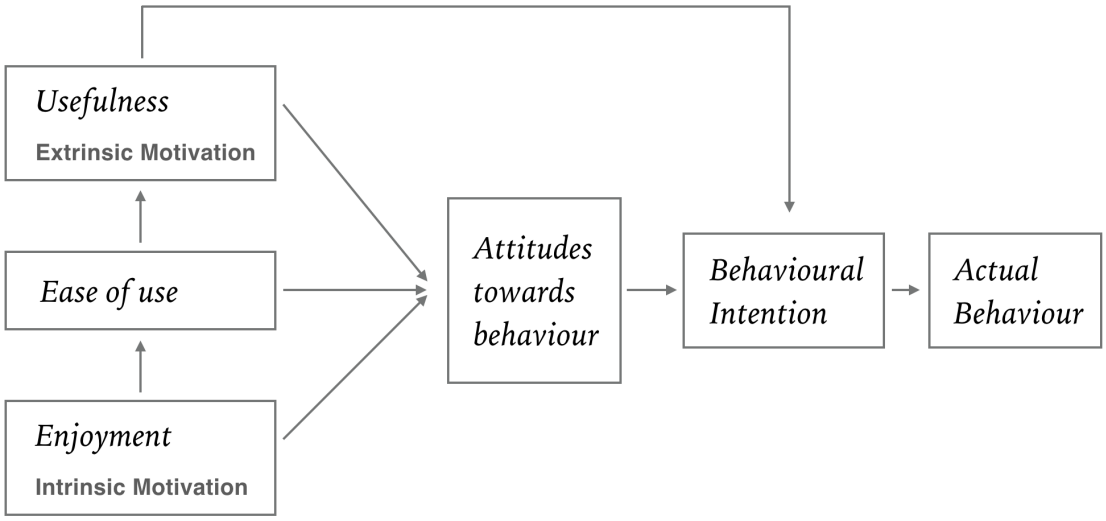


Figure 2. The Extended Technology Acceptance Model

The extended TAM framework affirms that perceived ease of use and perceived usefulness control attitudes towards the use antecedents (Venkatesh, Morris, Davis, & Davis, 2003). A combined study looking into hedonic and utilitarian systems, researchers have demonstrated that, even if usefulness and performance are important, ease of use and enjoyment were the primary predicting factors over usefulness (Codish & Ravid, 2014), concluding that hedonic motivation had an important impact on behavioural intentions.

Gamified fitness applications are dual, utilitarian and hedonic systems, as they aim to help users achieve their goals, while adding a layer of fun and enjoyment on top of the target oriented features. This extended Technology Acceptance Model is used in the current study as a framework that allows a deeper understanding of how utilitarian and hedonic motivations influence the use of gamified fitness applications.

Social Influence and Gamified Fitness Applications

Social influence refers to a person's understanding of how other people consider a particular behaviour and whether one is expected to engage in that activity. In a gamified context, social influence reflects an individual's perception of how others view their use of a system (Hsu & Lu, 2004; Hamari & Koivisto, 2013). Recognition, in the form of "likes" and comments in the context of gamified applications, show users how well they have conformed to the expectations of others.

In a study linking social motivations and gamification, Hamari and Koivisto (2013) investigated the social elements connected to networking outcomes, social influence, recognition and reciprocal benefits, which act as predictors for an individual's attitudes towards gamified applications, their desire to continue to use the system, and their likelihood to recommend it to others. The research showed there was a positive correlation between social influence and recognition. Simply put, the more a person believed that others expected them to engage in a specific behaviour, the better they felt about confirming these expectations. Furthermore, social influence positively affects attitudes toward the use of a system, when the respective behaviour is accepted and promoted within their social group.

Within a community, individuals will be affected by the social influence of others (Hamari & Koivisto, 2015), and they will accept the social influence if they wish to be part of the community. Based on the individual acceptance of the norms, the community will provide feedback on the person's behaviour (Hamari & Koivisto, 2015). Based on the fact that social influence is accepted, in conjunction with

receiving positive feedback from the group, individuals will get satisfaction as they comply with the group norms.

Theories on group formation point out that social influence include an affective element emerging from receiving recognition as a result of conforming to community expectations. The need to relate is key to eliciting intrinsic motivation and requires a context in which an individual feels accepted. Positive attitudes between the members of a social community will encourage the members to conform to group standards (Hamari & Koivisto, 2015). In a gamified contexts, social influence features could be used to influence users' extrinsic motivation, by compelling them to engage in a behaviour to receive in return acceptance from the social group using the application.

Chen and Pu (2014) showed that social conditions, such as cooperation and competition, applied in the context of a gamified system also increased physical activity. They concluded that social elements and primarily supportive social interactions are key in motivating individuals within a gamified context (Chen & Pu, 2014). This study will use social support as a concept to operationalise and measure social influence in a gamified fitness context.

Gamified fitness applications employ social influence elements, such as receiving recognition from other users, by allowing people to collect points, receive badges and appear on a leaderboard (Hamari, 2013; Klosowski, 2013). Social influence is a powerful extrinsic motivator (Ryan & Deci, 2000; Hsu & Lu, 2004) that impacts people's decision to sustain fitness behaviour and continue using a gamified technology. The current study considers social influence as an important component in the context of the extended TAM, seeking to understand the motivational factors that impact users' behavioural intentions towards a gamified fitness application.

Social Influence and Technology Adoption

Social influence is a key predictor for behavioural intention within applied theories related to information system adoption, use and attitudes towards technology. The theories of reasoned action (TRA) and planned behaviour (TPB) investigate the behavioural intentions by measuring subjective norms and attitudes toward behaviour. Subjective norms refer to the understanding of how important people who are significant to an individual perceive a certain behaviour, and whether they expect that person to perform it. The attitudes towards behaviour are pointed towards the expected results that an individual attributes to a particular behaviour. Expectations and their evaluation constitute the attitude, be it positive or negative, which a person assigns to the behaviour itself. Simply put, people adopt fitness behaviour because they expect results that will put them in a good light in front of others, and because people that are important to them expect them to exercise.

Gamified technologies are designed to compel users to change their behaviour by employing persuasive techniques, aiming to help individuals to develop and maintain specific behaviour (Llagostera, 2012). The principle of commitment and consistency, developed by Cialdini (2007), states that individuals are more likely to undertake a behaviour after they have previously agreed to it. People also prefer to behave consistently with their attitudes, values or previous actions. This would imply that if people have made a public statement that they are using a specific technology, or if they have invested in the application having purchased additional features, users would be more likely to keep using the gamified system. These statements are consistent with research on subjective norms (Hamari & Koivisto, 2015) and this study employs commitment as a secondary concept, in addition to subjective norms, to operationalise social influence.

Hamari and Koivisto (2015) theorised that social influence also refers to the outcomes of an individual being affected by subjective norms. The researchers extended social influence to include the benefits a person might get from the community, in the form of supportive social interactions, encouragement and

competition (Codish & Ravid, 2014). Feedback in the form of recognition from the group, mutually accepted social benefits and community size have been identified as key social influence factors (Hamari & Koivisto, 2015).

A limitation of Hamari and Koivisto (2015) research was to understand how social influence factored in with utilitarian and hedonic motivation to influence and help sustain fitness behaviour as a result of using a gamified fitness application. The current research employs an extended Technology Acceptance Model in conjunction with social influence, proposing a framework for predicting behaviour, in which utilitarian and hedonic motivations impact behavioural intentions, while social influence guide behavioural attitudes towards the use of a gamified fitness application.

The Present Study

The current research seeks to get a deeper understanding of participants' utilitarian and hedonic motivations, when using a gamified fitness application. The study aims to find out whether a rewards-based achievement system (in terms of points, levels, badges or challenges) paired with social influence elements (supportive social interactions, recognition, competition) could successfully motivate users of gamified fitness applications.

The present study builds upon previous research on gamified fitness applications (Hamari & Koivisto, 2015) and, using an extended TAM framework, aims to measure the perceived usefulness, perceived ease of use, perceived enjoyment and social influence factors of gamified fitness applications, to understand the systems' employment of utilitarian and hedonic motivational cues to record and sustain physical activity. Based on the previous study showing a positive correlation between variables, this research aims to understand what is the relationship between perceived usefulness, perceived ease of use and perceived enjoyment and the behavioural intentions to use a gamified fitness application (GFA). Thus, the

following research questions have been proposed:

Research Question 1. What is the relationship between perceived usefulness, perceived ease of use and perceived enjoyment and the behavioural intentions to use a gamified fitness application?

H1. A user's perceived usefulness will positively influence the intention to use a gamified fitness application (GFA).
H2. A user's perceived ease of use will positively influence the intention to use a GFA.
H3. A user's perceived enjoyment will positively influence the intention to use a GFA.

At the same time, this study is looking to further develop the understanding around social influence (operationalised through subjective norms and commitment) and physical activity within the context of gamified fitness applications, by measuring the relationship between social influence and a user's attitudes towards use of a GFA. This study aims to contribute to literature suggesting an extended TAM to include social influence as a key predictor for attitudes towards the use of a GFA.

Research Question 2. What is the relationship between the social influence and users' attitudes towards use of a gamified fitness application?

H4. Social influence will positively impact a user's attitudes towards using a GFA.

Research Question 3. What is the relationship between behavioural intentions and the users' attitudes towards use of a gamified fitness application?

H5. A user's attitudes towards use will positively influence the intention to use a GFA.

Methods

Design

A correlation study has been designed using an online questionnaire encompassing 31 questions, to examine the relationship between utilitarian and hedonic motivations, social influence and behavioural intentions and attitudes towards use of gamified fitness applications (*Figure 3*).

The online survey (*Appendix A*) recorded data around independent variables, namely perceived usefulness, perceived ease of use, perceived enjoyment and social influence, and dependent variables such as behavioural intentions and attitudes towards use. The survey also looked at the frequency with which users exercised, how often they used the gamified fitness application, the number and type of fitness applications they used.

To measure the variables, a Likert scale was employed based on a standardised questionnaire developed by Davis (1993), aimed to measure the variables within the Technology Acceptance Model. Participants were asked to respond to multiple statements in terms of their own degree of agreement or disagreement, ranging from strongly disagree (1) to strongly agree (7).

Perceived ease of use was measured using summative results of seven-point Likert scales, operationalised via statements on the following criteria: easy to learn, clear & understandable, controllable, skillful and easy to use. Similarly, usefulness was measured in terms of control, effectiveness, performance, ease and usefulness. Enjoyment was measured in terms of curiosity, fun, appeal, leisure, and enjoyment. Social influence was measured in terms of subjective norms (3 statements) and commitment.

Behavioural intentions were measured on seven-point Likert scales, in terms of intention to use the technology in the future and the degree to which the users envisaged themselves using the technology. Attitudes towards behaviour collected scores on 3 statements in terms of technology recommendation, positive feelings towards the technology and the degree to which the users liked using the gamified fitness application.

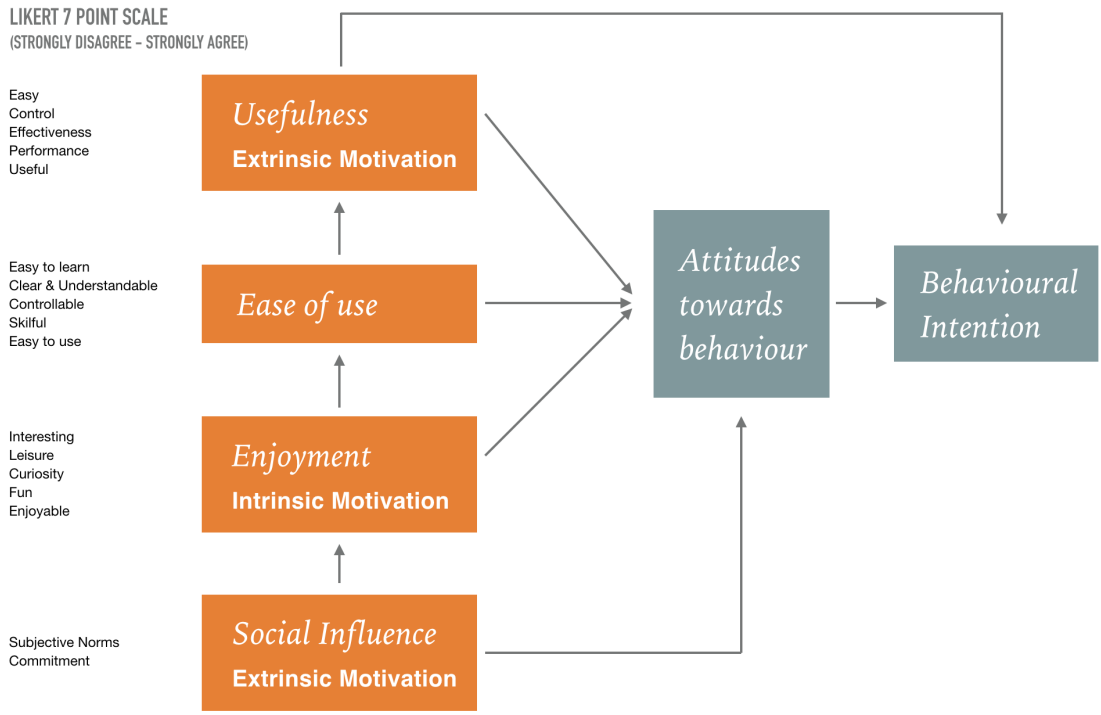


Figure 3. The Extended Technology Acceptance Model with Social Influence

Reliability and Validity

The items were chosen based on previous empirical research and proved high reliability and validity properties (Moon and Kim, 2001; van der Heijden, 2003). Cronbach's Alpha was chosen to analyse the degree of consistency among the items in the construct. All the variables in this study scored above the general rule of thumb of .70 (Hair, Black, Babin, Anderson & Tatham, 2006).

Factors	Chronbach's Alpha
Perceived Usefulness	.873
Perceived Ease of Use	.841
Perceived Enjoyment	.785
Social Influence	.747
Behavioural Intentions	.816
Attitudes towards Use	.851

Table 1. Research Variables Reliability & Validity Properties (Chronbach's Alpha)

Participants

A convenience sample was recruited by posting a link to the online survey on Facebook, Twitter and Fitocracy networks. The dataset was composed of 40 participants. The demographic profile of the participants show that 37.5% of the respondents were female while 62.5% were male, from a wide range of age groups (under 20 years old to over 50 years of age), with half of the participants (50%) belonging to the 31-40 age group.

Materials and Procedure

An online survey entitled "Motivation of the gamified fitness applications" (*Appendix A*), constructed with Google forms, was shared with the participants by inviting them to access the survey's URL from their Facebook, Twitter and Fitocracy newsfeed.

The survey was kept active for one month and was re-shared a few times during that period, to re-surface in the Facebook, Twitter and Fitocracy newsfeed. A total of 40 participants successfully filled in the survey and the data was recorded using Google sheets online software and processed using SPSS.

The online survey was composed of a total of 5 screens, with the first screen explaining the objective of the study, and obtaining their consent to participate in research (*Appendix A.1*). The second screen of the survey recorded the demographic profile of the participants (gender and age group), the number and type of gamified fitness applications they used, and how frequently they exercised and how frequently they checked the fitness application for progress and updates ("once a day" / "few times a day" / "once a week" / "few times a week" / "once a month" / "few times a month") (*Appendix A.2*). The following screens presented participants with Likert scales to record participants' scores in terms of usefulness (*Appendix A.3*), ease of use (*Appendix A.4*), perceived enjoyment (*Appendix A.5*), social influence (*Appendix A.6*), behavioural intention and attitudes towards use of gamified fitness applications (*Appendix A.7*). The last screen presented a "Thank You" note, a confirmation that the data was successfully submitted, a research debrief, and options to contact the researcher (*Appendix A.8*).

Ethics

The sample group was self-selected and all participants were informed that their participation in the study was completely voluntary. The survey's landing page described the objective of the study and screened the participants ensuring they were users of gamified fitness applications (*Appendix A.1*). The participants were assured of the anonymity of the data submitted. The participants were not identifiable, as all of them have had created a Participant ID prior to answering any questions in the survey. The participants were informed that they were free to cease participation or withdraw their data from the study at any time before a certain date. Ethical approval has been granted to this study, as there were no further ethical issues.

The Pilot Study

The pilot study conducted prior to this research has revealed a series of issues around the format and the language of the online survey. Key findings from the pilot study included the fact that people were using multiple fitness applications at the same time, to serve multiple purposes (fitness workout versus social interaction). Also, the description of the study and the length of the questionnaire have been reduced, as participants felt that the survey was taking too long to complete and questions were repeating. Based on these findings, the questionnaire has been amended before the updated survey went live.

Results

Descriptive Statistics

The majority of the sample group (80%) exercised at least a few times every week and 40% of the participants used more than one gamified fitness application to record and track their fitness progress.

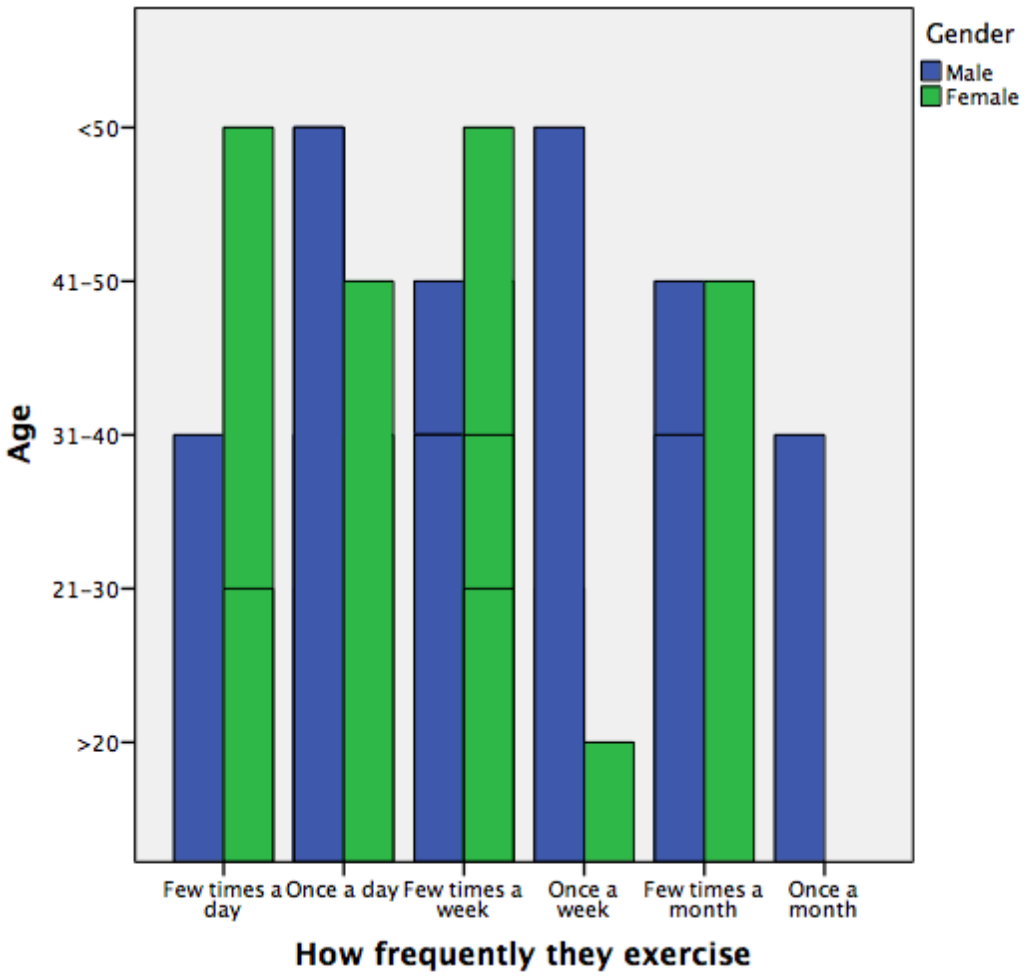


Figure 4. Exercising Patterns by Users Age and Gender

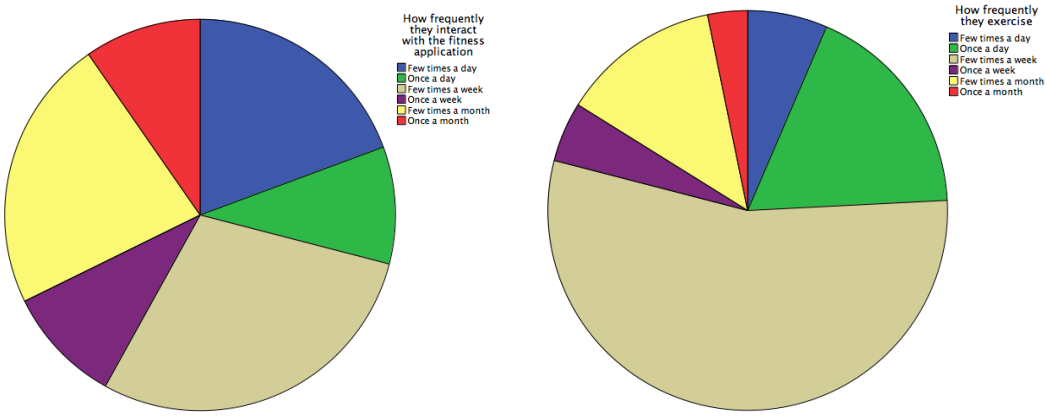


Figure 5. Frequency of User Interaction with the Fitness Application vs Frequency of User Exercising

Walking applications were the most popular (50%) with the sample group, followed by running apps (37.5%), general fitness (37.5%) and calorie tracker (32.5%) applications. Social networking and coaching applications were always used in conjunction with one or multiple other types of gamified fitness applications.

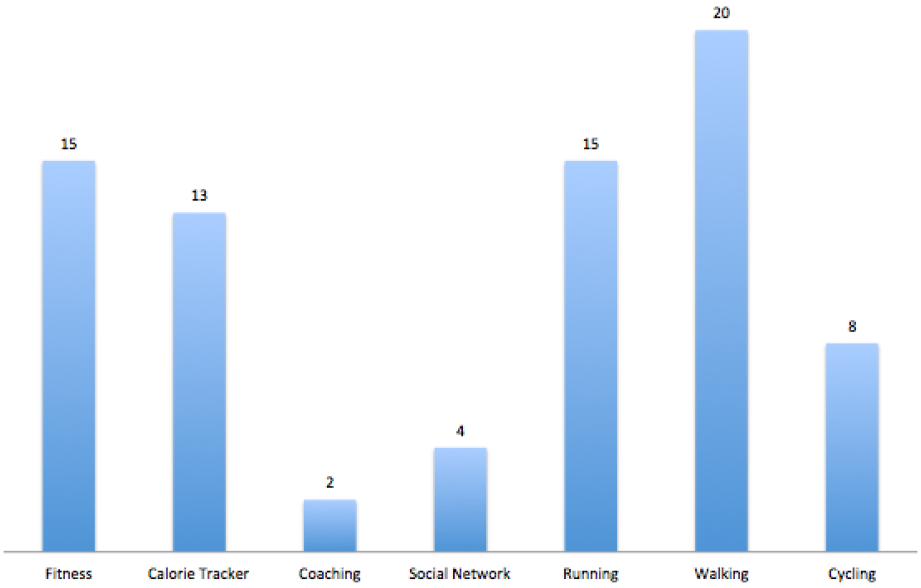


Figure 6. Popularity and Type of Fitness Application Used

Perceived enjoyment factors, such as finding an application interesting and enjoying the application, scored higher on the average Likert scale results than other factors, namely curiosity and leisure.

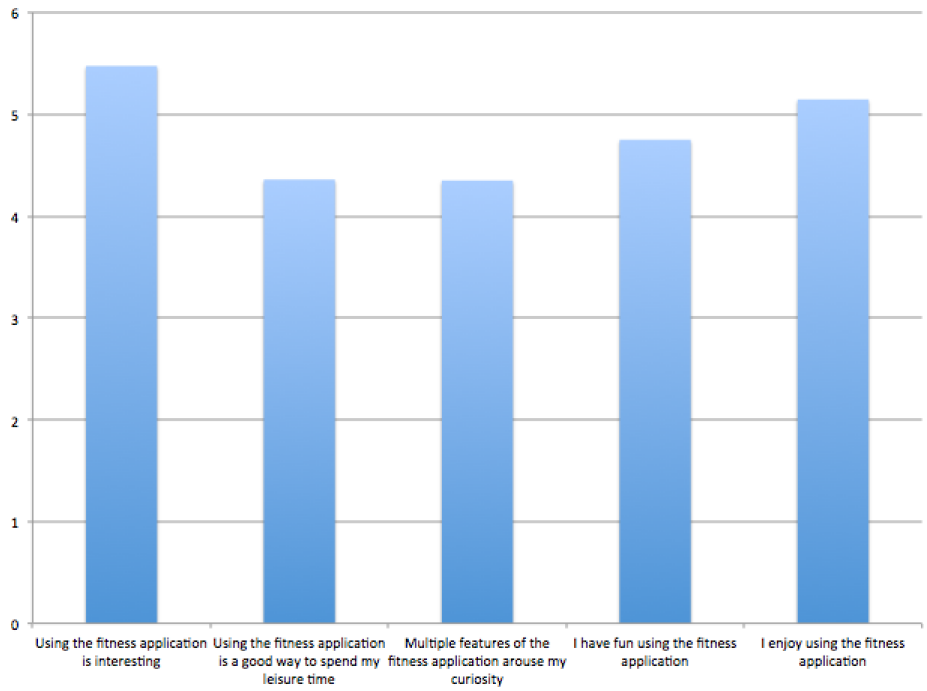


Figure 7. Mean Results for Perceived Enjoyment factors

Variables	**Male**		**Female**		**Total**	
	M	SD	M	SD	M	SD
Utilitarian Motivation (Extrinsic)						
Usefulness	23.84	6.43	27.53	2.66	25.22	5.59
Ease of Use	26.88	5.00	30.53	3.64	28.25	4.83
Hedonic motivation (Intrinsic)						
Enjoyment	22.64	5.71	25.73	4.96	23.80	5.58

Table 2. Descriptive Statistics for Utilitarian and Hedonic Motivations variables

Variables	Male		Female		Total	
	M	SD	M	SD	M	SD
Social Influence (Extrinsic)						
Subjective Norms	9.92	4.48	11.46	3.60	10.50	4.20
Commitment	3.04	1.42	2.33	1.49	2.77	1.47

Table 3. Descriptive Statistics for Social Influence variables

Variables	Male		Female		Total	
	M	SD	M	SD	M	SD
Behaviour Intentions	15.60	3.52	17.80	1.82	16.42	3.16
Attitudes	10.56	2.34	12.20	1.37	11.17	2.17

Table 4. Descriptive Statistics for Behaviour Intentions and Attitudes variables

Inferential Statistics

A Shapiro-Wilk's test ($p>.05$) (Shapiro & Wilk, 1965) and an inspection of the bell shape histograms, normal Q-Q plots and box plots indicated that the sample was not normally distributed.

The Durbin-Watson test has been employed to identify whether any autocorrelation of error terms was present (Durbin & Watson, 1971). The statistical value for this test was 1.992, which is within the acceptance range (1.5-2.5), and close to the ideal

value (2) for the test. The Durbin-Watson test score revealed that there were no autocorrelation of prediction errors.

Multiple regression analysis has been employed to explore the relationship between behaviour intentions as the dependent variable and usefulness, ease of use and enjoyment as independent variables. Hypothesis 1, stating that a user's perceived usefulness will positively influence the intention to use a gamified fitness application, Hypothesis 2 (A user's perceived ease of use will positively influence the intention to use a GFA), and Hypothesis 3 (A user's perceived enjoyment will positively influence the intention to use a GFA) were tested using this model.

Perceived usefulness, perceived ease of use, perceived enjoyment variables correlated with behaviour intentions variable were entered as predictors into a multiple regression using the standard method. A significant model emerged F (3,36) = 37.466, p<.0005. The model explains 73.7% of the variance in the behaviour intentions variable (Adjusted R^2 = .737). The table below gives more information about regression coefficients for the variables entered into the model. Perceived usefulness, perceived ease of use and perceived enjoyment were significant predictors, with a positive relationship to behaviour intentions.

Variable	**B**	**SE B**	**β**	**p**
Usefulness	.250	.062	.443	.000
Ease of Use	.165	.070	.252	.025
Enjoyment	.186	0.60	.328	.004

Table 5. Gamified Fitness Applications Usefulness, Ease of Use and Enjoyment Regression Coefficients

H1, H2 and H3 were supported at a p value lower than 0.05.

To determine the relationship between social influence and attitudes towards use of gamified fitness applications (H4), a series of Spearman's rank-order correlation analyses were run. A one-tailed test of significance indicated the there was a significant positive relationship between social influence and attitudes towards use r_s (40) = .520, p < .05. The more social influence has been exercised, the more attitudes towards use of a gamified fitness application are improved. A similar one-tailed test of significance indicated that subjective norms were significantly correlated to attitudes towards use $r_S(40) = .447$, $p < .05$, commitment had a moderately positive relationship with attitudes towards use, which were statistically significant $r_S(40) = .339$, $p < .05$, and that commitment was moderately correlated to subjective norms $r_S(40) = .273$, $p < .05$.

Hypothesis 4, stating that social influence will positively impact a user's attitudes towards using a GFA has been supported.

A separate Spearman's rank-order correlation was conducted in order to determine the relationship between behaviour intentions and attitudes towards use of gamified fitness applications (H5). A one-tailed test of significance indicated the there was a strong, positive correlation between behaviour intentions and attitudes towards use r_s (40) = .860, p < .05.

Hypothesis 5, stating that attitudes towards use will positively influence a user's intention to use a GFA has been supported.

Discussion

Overview of Findings

The current study employs the extended Technology Acceptance Model in conjunction with social influence to explore the utilitarian and hedonic motivations of gamified fitness applications. The results of this study support the research hypotheses, proving that perceived usefulness, perceived ease of use, perceived enjoyment are positively correlated with the behaviour intentions to use a gamified fitness application and that social influence is positively correlated to attitudes towards use of a gamified fitness application. In turn, the attitudes towards use positively influence behavioural intentions.

The results reiterated the reliability and validity of the research framework, proving its efficacy for measuring the utilitarian and hedonic motivations of gamified fitness applications.

The results are consistent with previous research using extended Technology Acceptance Model to explore both utilitarian and hedonic motivation within the context of technology adoption (Venkatesh, 2000). Unlike previous research (Codish & Ravid, 2014), usefulness has proven to be more dominant (B = .250) than enjoyment (B = .186) or ease of use (B = .165), suggesting that utilitarian motives, such as progress towards a goal, are slightly more important in this context. Hedonic motives (enjoyment) and familiarity with the technology (ease of use) positively influence behaviour intentions without overtaking gamified technology usefulness. The results are somewhat surprising as ease of use is considered a precursor of perceived usefulness (Fagan, Neill, & Wooldridge, 2008). The decreased importance placed on perceived ease of use would suggest that participants were familiar with

the technology, being able to learn and master the gamified application without effort, therefore attributing ease of use a lower score.

Gamified application developers tend to build systems targeted at a particular type of fitness exercise (walking, running, cycling, etc.) for various reasons, from pricing to design and marketing opportunities (Gordon, 2010). The collected data has revealed that participants use multiple types of fitness applications, assumingly to achieve different goals. This assumption is supported by the results of this study, as usefulness is a prime factor influencing users' behaviour. Based on these results, it would be safe to conclude that participants used different gamified applications to track and improve various types of fitness workouts that they engage in. However, it is unclear whether this is a direct result of individuals exploring different types of fitness exercise to understand which one is more suitable for them, whether it is contextual (e.g. walking to the workplace and running in the spare time) or whether they enjoy engaging in different types of fitness workouts.

Perceived enjoyment is an important factor that influences intrinsic motivation in the context of gamified applications, for the very reason that gamification aims to add a games-inspired layer of playfulness to goal-oriented tasks (Deterding, Khaled, Nacke, & Dixon, 2011). The results of this study have proven that perceived enjoyment positively influence behaviour intentions, which is consistent with previous research stating that entertainment and fun have a positive impact on users' behaviour (Baranowski, Buday, Thompson & Baranowski, 2008). The current research has shown that perceived enjoyment factors, such as considering the application interesting and enjoying the application, scored higher with the participants, while individuals felt more indifferent towards other factors, namely curiosity and leisure. These results suggest that participants will continue using the gamified application for as long as they find it interesting. With curiosity factor receiving a lower score, it would be safe to conclude that people need to find an application interesting enough to continue using it, once they are past the initial curiosity stage.

Social influence, operationalised through subjective norms and commitment, has been proven to positively influence attitudes towards use. The positive correlation of subjective norms and attitudes towards use of gamified fitness applications is consistent with previous research (Hamari & Koivisto, 2015), while commitment has been added as an additional variable to explore participants' investment with the gamified technology. The data have proven that commitment will positively influence users' attitudes towards use, even if it is not as strong a predictor as subjective norms. The results would suggest that other people's opinion as well as the investment with the application positively influence participants towards the use of gamified fitness technology.

The positive correlation between commitment and attitudes towards use, corroborated with the positive correlation between attitudes and behavioural intentions suggest that individuals are more likely to use gamified fitness applications if they have downloaded the application to their device, have used it previously or have purchased additional features. This behaviour is consistent with Cialdini's (2007) principle of Commitment and Consistency, which states that people are more likely to engage in a behaviour they are familiar with, or publicly declared that they would do so. However, the positive correlation between subjective norms and commitment suggest that social group feedback influences the way users think about their investment in the application. This allows us to conclude that meaningful social interactions in the context of the application could drive an individual's commitment to the gamified application.

The positive correlation between attitudes towards use and a user's intention to use a gamified application is consistent with the extended TAM (Venkatesh, 2000) and implies that participants who feel strongly about using a gamified application are more likely to use it. However, in this case, as the results prove that social influence strongly impact attitudes towards use, it is suggested that behaviour intentions and the actual behaviour are influenced by social factors. This statement opens up the discussion to include social influence as a determinant factor within the extended TAM to measure gamified technology utilitarian and hedonic motivations.

Most popular fitness applications involve a social influence component as a key motivator for people to sustain fitness behaviour (Klosowski, 2013). The data collected during this study also revealed that 10% of the participants used dedicated social networking fitness applications in addition to engaging with walking, running or cycling focused fitness apps. Previous studies researching social influence in the context of online gaming have proven a positive correlation between subjective norms and behaviour intentions (Hsu & Lu, 2004; Hamari & Koivisto, 2015), with the current study re-enforcing the positive correlation in the context of gamified fitness applications and the extended TAM. Traditionally, Technology Acceptance Model did not include social influence as a predictor for behavioural attitudes. However, consistent with research into online gaming using TAM (Hsu & Lu, 2004), this study suggests that social influence, operationalised through subjective norms, should be considered as a key component, when an extended TAM framework is discussed.

Strengths and Limitations

The results of the current study bring compelling proofs to the discussion around extending TAM to include social influence as a key factor that impacts users' behaviour in the context of gamified technology.

This study has several limitations. The sample size was relatively small and concentrated within the 31 - 40 age group (50% of the participants). The research could have benefited from a more consistent sample size with an increased number of participants coming from fitness focus social networks. The data used may suffer from a self-selection bias, as only user-inputted data was available, without access to their actual fitness workout pattern.

While participants have declared that they used multiple fitness applications, this study collected data specifically in relation to a single fitness application. This is a limitation of the current project and an opportunity for future research to

investigate the reasons why participants use multiple applications to sustain their fitness routine.

Future Research

Previous research (Zichermann & Cunningham, 2011) argued that implementing external motivational cues would in turn trigger intrinsic motivation to create a sustainable long-term behaviour, which contradicts analysis of multiple gamification studies by Deci, Koestner and Ryan (1999) suggesting that extrinsic motivations could undermine intrinsic motivators, having a negative impact on long-term behaviour. The current research supports the idea that as long as gamified fitness applications are in use, the fitness behaviour is sustained and users are motivated to keep using the technology to positively impact their fitness activity. Even though some of the participants have declared they have been using fitness applications over a multiple year period, this study does not respond to whether a gamified fitness application could sustain fitness behaviour over time. Future research on the matter should seek to understand whether gamified fitness applications sustain long-term behaviour change and whether the fitness activity is sustained after the gamified application is removed from current use.

Another avenue for future research concerning gamified fitness applications should be habit formation and whether gamified fitness applications could help users develop sustainable long-term fitness habits.

Conclusion

This study set out to examine utilitarian and hedonic motivations and social influence of gamified fitness applications. The current research used an extended TAM framework with social influence to understand what motivates individuals to use gamified applications to track and improve fitness activity. The results supported the hypotheses, showing that usefulness, ease of use and enjoyment positively influence participants' behaviour intentions to use gamified fitness applications. Additionally, social influence, operationalised through subjective norms and commitment, has been positively correlated to attitudes towards use, with attitudes and behavioural intentions as determinants of actual behaviour.

The research results proved that goal-oriented, utilitarian motivations are the dominant predictor for behavioural intentions in the context of gamified fitness applications, with hedonic motivations (enjoyment) being secondary, while still significantly relevant.

Social influence is a key factor in the context of gamified technology, proven to positively impact users' attitudes towards use. Individuals might feel socially compelled to use gamified technology in order to adhere to and be accepted as part of a specific community. This study contributes to literature suggesting that TAM framework should be extended to include social influence as a predictor for technology adoption.

From a practical standpoint, this study sets out to contribute to physical education literature to offer a better understanding of the factors affecting motivation, for development companies to create better products that sustain long-term fitness behaviour.

References

Ahola, R., Pyky, R., Jämsä, T., Mäntysaari, M., Koskimäki, H., & Ikäheimo, T. et al. (2013). Gamified physical activation of young men – a Multidisciplinary Population-Based Randomized Controlled Trial (MOPO study). *BMC Public Health*, *13*(1), 32. doi:10.1186/1471-2458-13-32

Baranowski, T., Buday, R., Thompson, D. I., & Baranowski, J. (2008). Playing for real: video games and stories for health-related behaviour change. *American journal of preventive medicine*, *34*(1), 74-82.

Biddiss, E., & Irwin, J. (2010). Active video games to promote physical activity in children and youth: A systematic review. *Archives of Pediatrics and Adolescent Medicine, 164*(7), 664–672.

Chen, Y., & Pu, P. (2014). HealthyTogether: Exploring social incentives for mobile fitness applications. In Proceedings of Chinese CHI '14, Toronto, ON, Canada, April 26–27 (pp. 25–34).

Cialdini, R. B. (2007). *Influence: The psychology of persuasion.* New York: Collins.

Codish, D., & Ravid, G. (2014). Personality Based Gamification: How Different Personalities Perceive Gamification. In *ECIS Proceedings*

Cugelman, B. (2013). Gamification: What It Is and Why It Matters to Digital Health Behaviour Change Developers. *JMIR Serious Games*, *1*(1), e3. doi:10.2196/games.3139

Davis, F. D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioural impacts. *International journal of man-machine studies*, *38*(3), 475-487.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological bulletin*, *125*(6), 627.

Deterding, S., Khaled, R., Nacke, L. E., & Dixon, D. (2011). Gamification: Toward a definition. In *CHI 2011 Gamification Workshop Proceedings* (pp. 12-15).

Durbin, J., & Watson, G. (1971). Testing for Serial Correlation in Least Squares Regression. III. *Biometrika, 58*(1), 1. http://dx.doi.org/10.2307/2334313

Ernst, C. P. H., Pfeiffer, J., & Rothlauf, F. (2013). Hedonic and utilitarian motivations of social network site adoption. *Johannes Gutenberg University Mainz: Working Papers in Information Systems and Business Administration*.

Fagan, M. H., Neill, S., & Wooldridge, B. R. (2008). Exploring the intention to use computers: An empirical investigation of the role of intrinsic motivation, extrinsic motivation, and perceived ease of use. *Journal of Computer Information Systems*, *48*(3), 31-37.

Ferrara, J. (2013). Games for Persuasion: Argumentation, Procedurality, and the Lie of Gamification. *Games And Culture*, *8*(4), 289-304. doi:10.1177/1555412013496891

Gordon, J. (2010). Understanding Your App's Target Audience. Code Envato Tuts+. Retrieved 17 April 2016, from http://code.tutsplus.com/tutorials/understanding-your-apps-target-audience--mobile-3968

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.

Hamari, J. (2013). Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service. *Electronic Commerce Research and Applications, 12*(4), 236–245.

Hamari, J., & Koivisto, J. (2013, June). Social Motivations To Use Gamification: An Empirical Study Of Gamifying Exercise. In *ECIS* (p. 105).

Hamari, J., & Koivisto, J. (2015). "Working out for likes": An empirical study on social influence in exercise gamification. *Computers In Human Behavior*, *50*, 333-347. http://dx.doi.org/10.1016/j.chb.2015.04.018

Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?--a literature review of empirical studies on gamification. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on* (pp. 3025-3034). IEEE.

Hsu, C., & Lu, H. (2004). Why do people play on-line games? An extended TAM with social influences and flow experience. Information & Management, 41(7), 853-868. http://dx.doi.org/10.1016/j.im.2003.08.014

Jensen, M. (2012). Engaging the learner: gamification strives to keep the user's interest. *T+ D*, *66*(1), 41-43.

Klosowski, T. (2013). Lifehacker.com. Retrieved 17 April 2016, from http://lifehacker.com/the-best-fitness-tracking-apps-for-every-type-of-exerci-1482693352

Koivisto, J., & Hamari, J. (2014). Demographic differences in perceived benefits from gamification. *Computers in Human Behaviour*, *35*, 179-188.

Llagostera, E. (2012). On gamification and persuasion. *Proceedings of the SBGames, Rio de Janeiro, Brazil*, 2-4.

Lister, C., West, J., Cannon, B., Sax, T., & Brodegard, D. (2014). Just a Fad? Gamification in Health and Fitness Apps. *JMIR Serious Games*, *2*(2), e9. doi:10.2196/games.3413

McCallum, S. (2012). Gamification and serious games for personalized health. *Stud Health Technol Inform*, *177*, 85-96.

Morford, Z. H., Witts, B. N., Killingsworth, K. J., & Alavosius, M. P. (2014). Gamification: the intersection between behaviour analysis and game design technologies. *The Behaviour Analyst*, *37*(1), 25-40.

Nicholson, S. (2015). A recipe for meaningful gamification. In *Gamification in education and business* (pp. 1-20). Springer International Publishing.

Paredes, P., Tewari, A., & Canny, J. (2013). Design Principles for the Conceptualization of Games for Health Behaviour Change. *CHI 2013*.

Ryan, R., & Deci, E. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology, 25*(1), 54-67. http://dx.doi.org/10.1006/ceps.1999.1020

Satish Misra, M. (2015). *More than 165,000 mobile health apps now available - iMedicalApps*.*iMedicalApps*. Retrieved 13 March 2016, from http://www.imedicalapps.com/2015/09/ims-health-apps-report/

Shapiro, S., & Wilk, M. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, *52*(3-4), 591-611. http://dx.doi.org/10.1093/biomet/52.3-4.591

Thompson, D., Baranowski, T., Buday, R., Baranowski, J., Thompson, V., Jago, R., & Griffith, M. (2008). Serious Video Games for Health: How Behavioural Science Guided the Development of a Serious Video Game. *Simulation & Gaming*, *41*(4), 587-606. doi:10.1177/1046878108328087

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS quarterly*, *MIS Quarterly, 28*(4), 695-704.

Venkatesh, V. (2000). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. *Information Systems Research, 11*(4), 342-365. http://dx.doi.org/10.1287/isre.11.4.342.11872

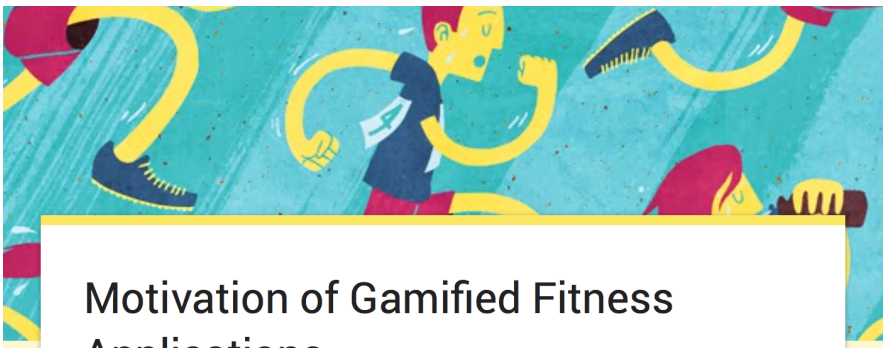
Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478.

Werbach, K. & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business.* Philadelphia: Wharton.

Wortley, D. (2014, June). Gamification and geospatial health management. In *IOP Conference Series: Earth and Environmental Science (Vol. 20*, No. 1, p. 012039). IOP Publishing.

Zichermann, G. & Cunningham, C. (2011). *Gamification by design: Implementing game mechanics in web and mobile apps.* Sebastopol, Calif.: O'Reilly Media.

Appendix A.1 Online Survey – Information Sheet and Consent Form



Motivation of Gamified Fitness Applications

Smart mobile devices are designed to give people access to gamified applications aimed to make them healthier, helping them keep up with an exercise routine, loose weight or manage a chronic health issue. This study, conducted by Daniel Alb as part of a postgraduate research project, aims to understand what motivates people to use gamified fitness applications.

Should you wish to participate in the study you will be invited to complete a demographic profile questionnaire, a perceived usefulness and ease of use questionnaire, a perceived enjoyment questionnaire, a social influence questionnaire followed by a questionnaire that will measure the behavioural intentions and the attitudes towards gamified fitness applications. The survey encompasses 33 questions and it will take you only few minutes to complete.

There are no psychological or physical risks to taking part in this survey.

Your participation in this study is completely voluntary. The data will be collected on the information provided by you, it will be retained for at least one year and then it will be disposed of in an appropriate manner. Your data will not be identifiable, as all participants will have a Participant ID. Please feel free to cease participation or withdraw your answers from the study at any time before 12th March 2016.

Should you have any queries, please do contact the researcher via email at daniad@gmail.com, or the research supervisor at hannah.barton@iadt.ie. We appreciate and thank you for taking the time to participate in this study.

*Required

Participant ID *

Please use your initials and year of birth to create your Participant ID (e.g Daniel Alb, 1977 = Participant ID: DA77)

Your answer

Please read the following points, and tick each checkbox if you are ready to proceed. *

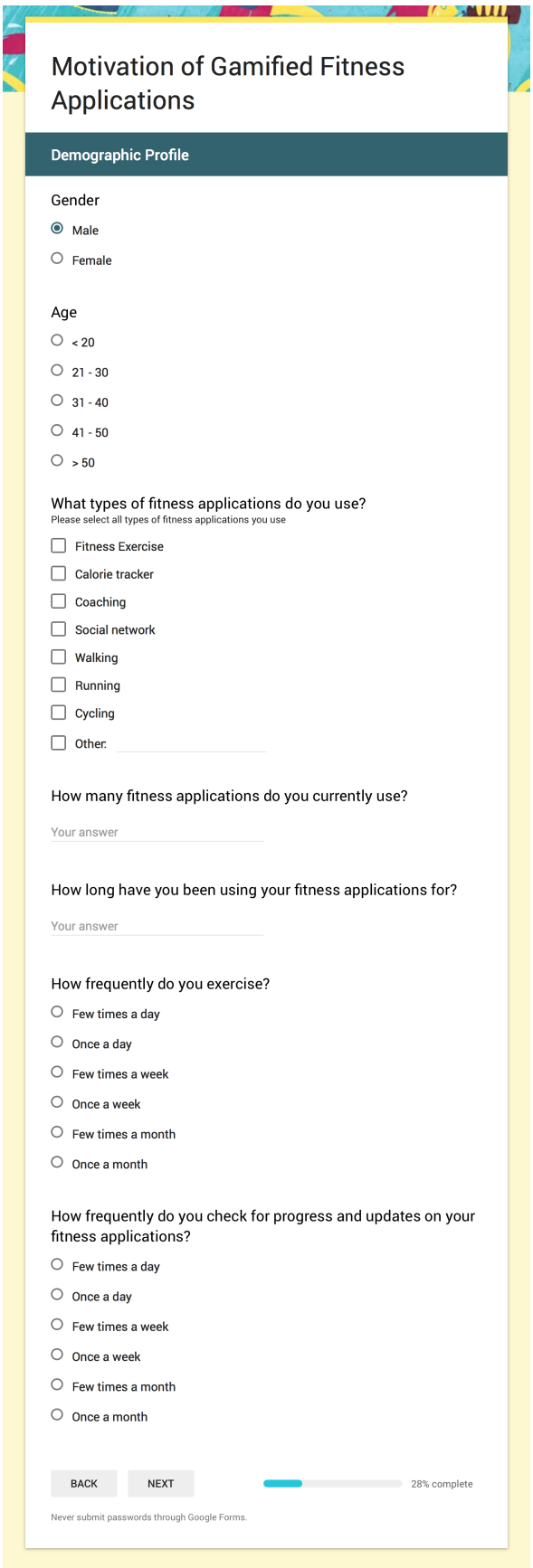
- [ ] I confirm that I use mobile fitness applications to exercise
- [ ] I confirm that I have read and fully understand the information regarding this study, and have had the opportunity to ask questions.
- [ ] I understand that my participation in this study is voluntary and that I am free to withdraw at any time to the date outlined above.
- [ ] I understand that the data collected through this survey will be anonymised before it is used in the study.
- [ ] I agree to participate in this study.

NEXT

14% complete

Never submit passwords through Google Forms.

Appendix A.2 Online Survey – Demographics



Motivation of Gamified Fitness Applications

Demographic Profile

Gender

- (•) Male
- ( ) Female

Age

- ( ) < 20
- ( ) 21 - 30
- ( ) 31 - 40
- ( ) 41 - 50
- ( ) > 50

What types of fitness applications do you use?
Please select all types of fitness applications you use

- [ ] Fitness Exercise
- [ ] Calorie tracker
- [ ] Coaching
- [ ] Social network
- [ ] Walking
- [ ] Running
- [ ] Cycling
- [ ] Other:

How many fitness applications do you currently use?

Your answer

How long have you been using your fitness applications for?

Your answer

How frequently do you exercise?

- ( ) Few times a day
- ( ) Once a day
- ( ) Few times a week
- ( ) Once a week
- ( ) Few times a month
- ( ) Once a month

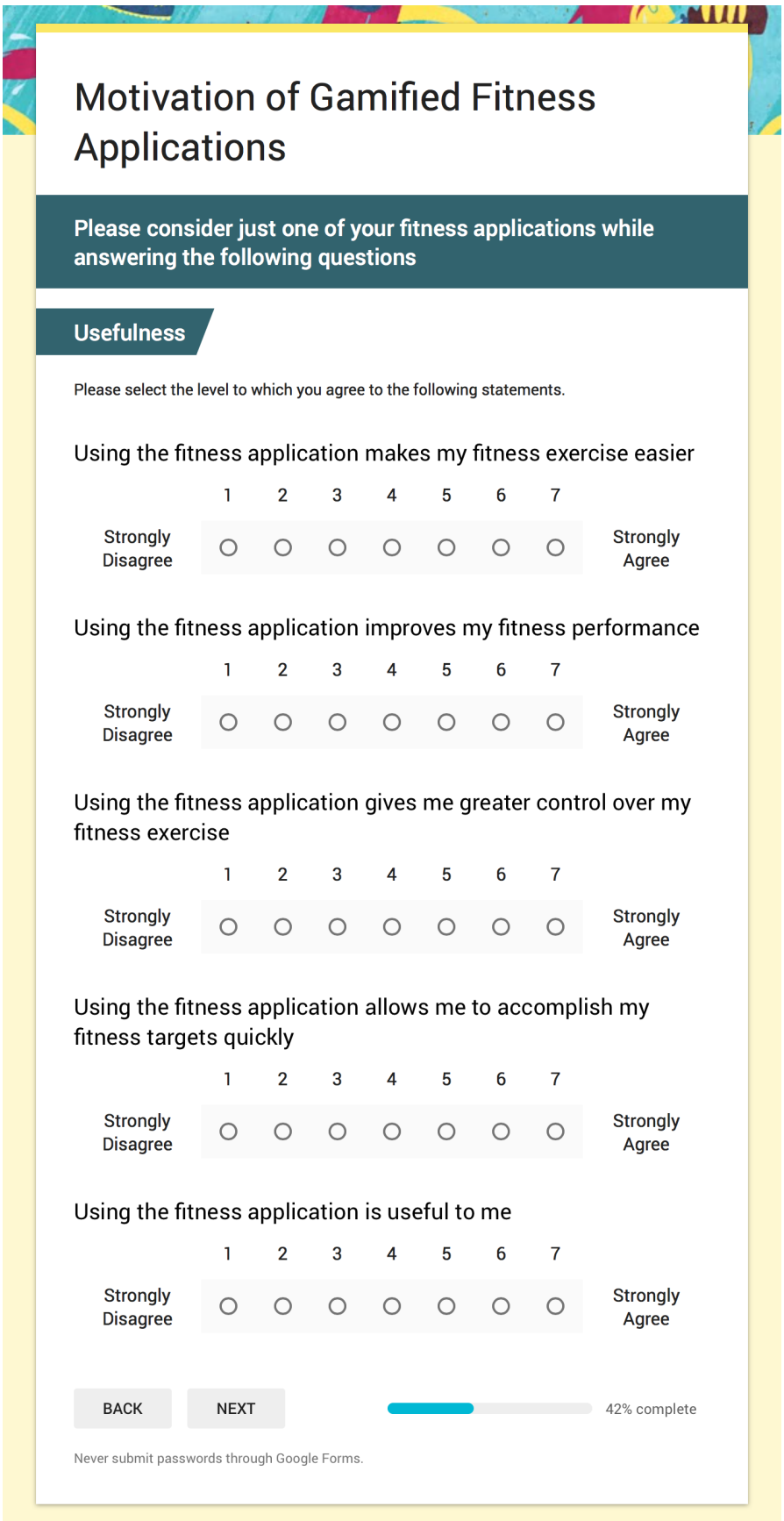
How frequently do you check for progress and updates on your fitness applications?

- ( ) Few times a day
- ( ) Once a day
- ( ) Few times a week
- ( ) Once a week
- ( ) Few times a month
- ( ) Once a month

BACK NEXT 28% complete

Never submit passwords through Google Forms.

Appendix A.3 Online Survey – Usefulness



Motivation of Gamified Fitness Applications

Please consider just one of your fitness applications while answering the following questions

Usefulness

Please select the level to which you agree to the following statements.

Using the fitness application makes my fitness exercise easier

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Using the fitness application improves my fitness performance

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Using the fitness application gives me greater control over my fitness exercise

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Using the fitness application allows me to accomplish my fitness targets quickly

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

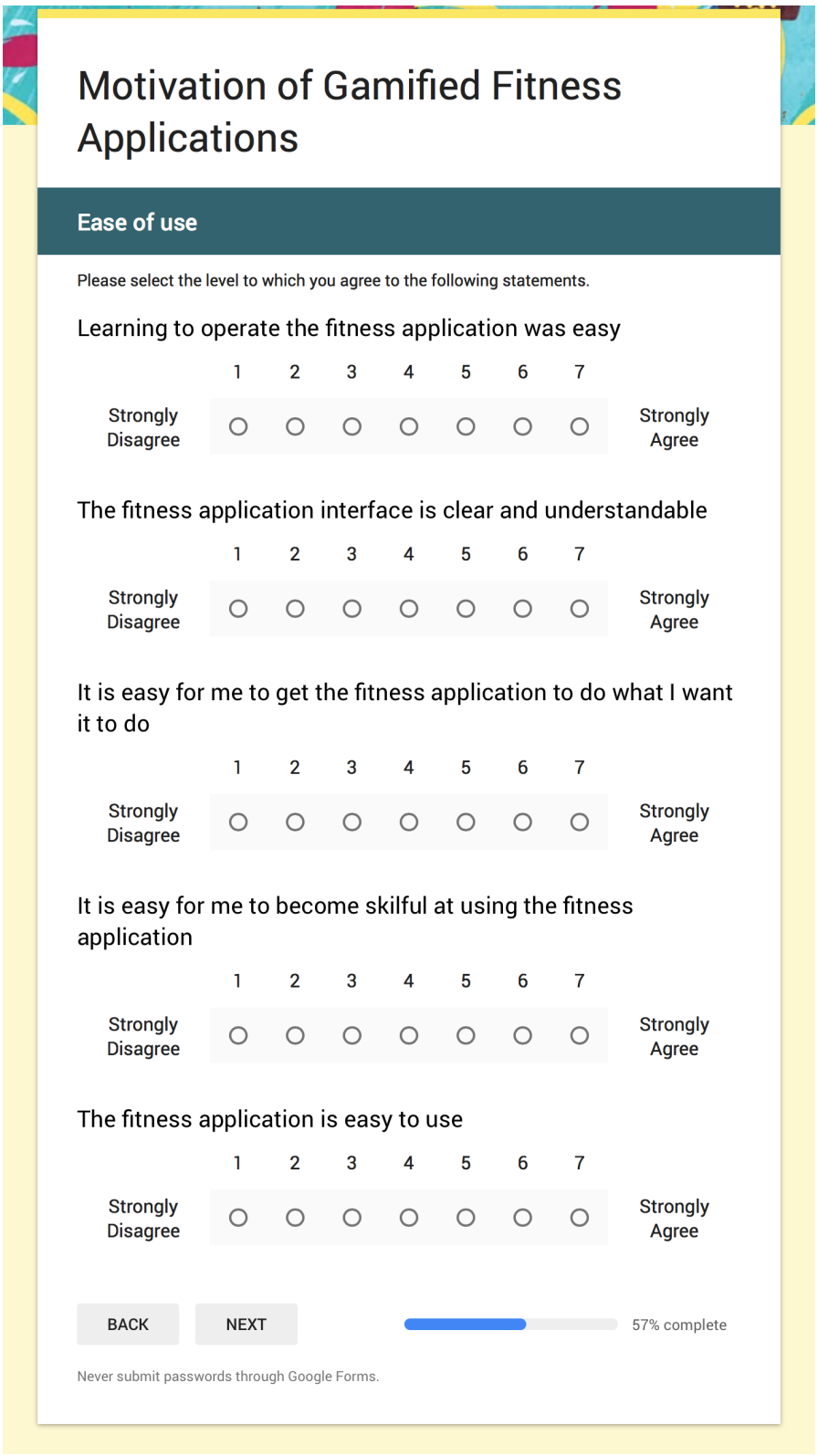
Using the fitness application is useful to me

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

BACK NEXT 42% complete

Never submit passwords through Google Forms.

Appendix A.4 Online Survey – Ease of Use



Motivation of Gamified Fitness Applications

Ease of use

Please select the level to which you agree to the following statements.

Learning to operate the fitness application was easy

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

The fitness application interface is clear and understandable

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

It is easy for me to get the fitness application to do what I want it to do

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

It is easy for me to become skilful at using the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

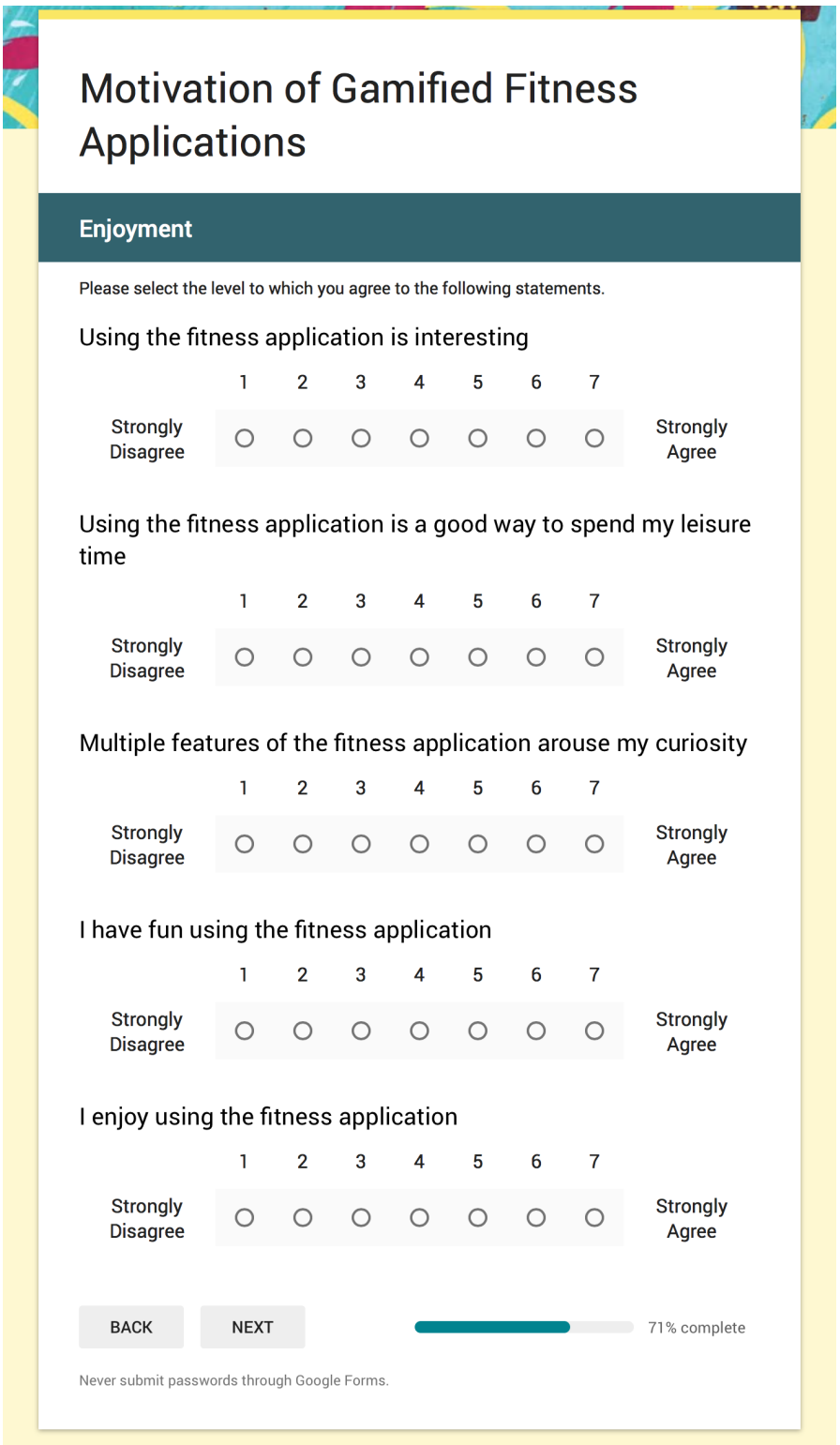
The fitness application is easy to use

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

BACK NEXT 57% complete

Never submit passwords through Google Forms.

Appendix A.5 Online Survey – Enjoyment



Motivation of Gamified Fitness Applications

Enjoyment

Please select the level to which you agree to the following statements.

Using the fitness application is interesting

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Using the fitness application is a good way to spend my leisure time

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Multiple features of the fitness application arouse my curiosity

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

I have fun using the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

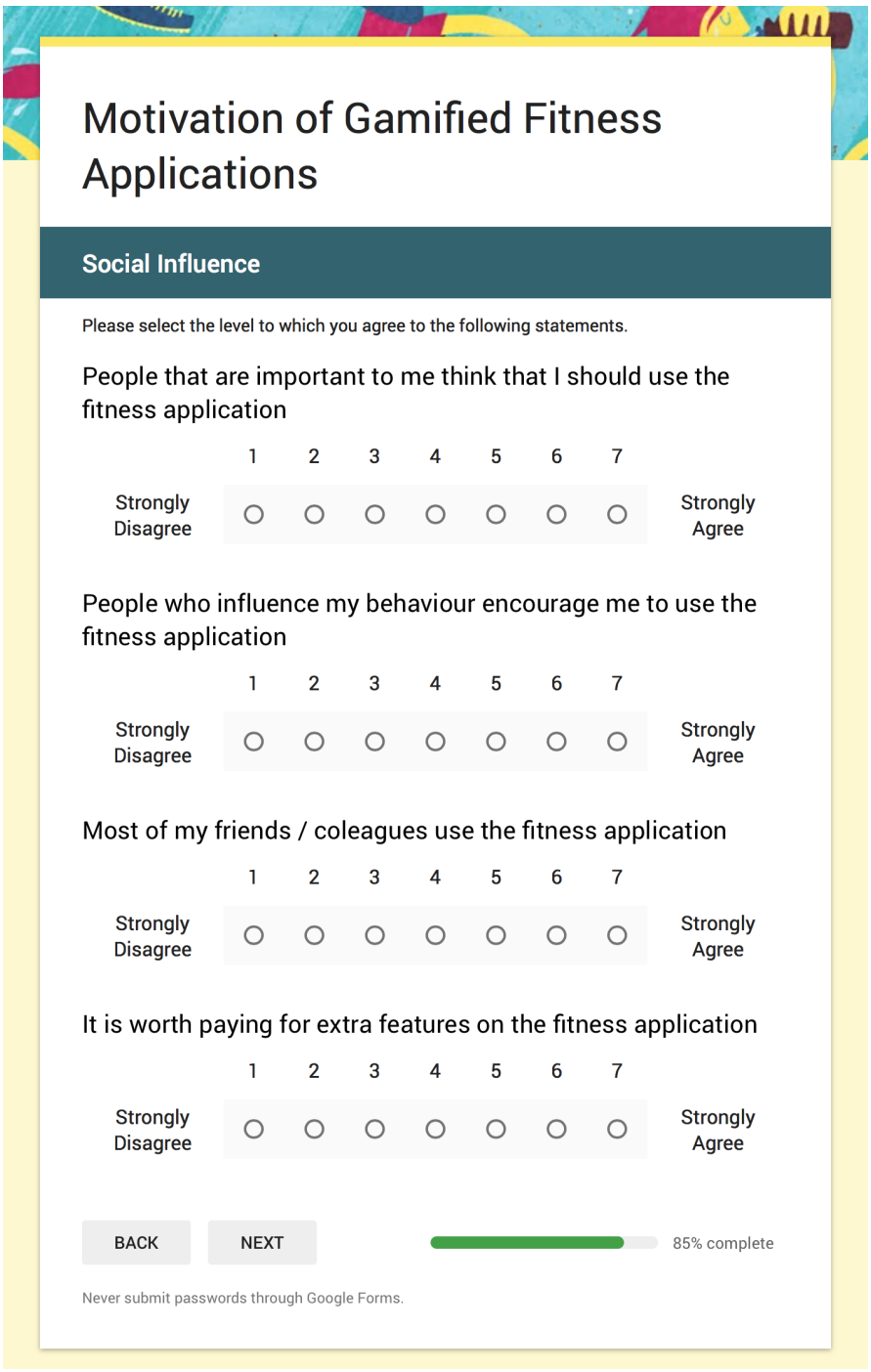
I enjoy using the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

BACK NEXT 71% complete

Never submit passwords through Google Forms.

Appendix A.6 Online Survey – Social Influence



Motivation of Gamified Fitness Applications

Social Influence

Please select the level to which you agree to the following statements.

People that are important to me think that I should use the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

People who influence my behaviour encourage me to use the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

Most of my friends / coleagues use the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

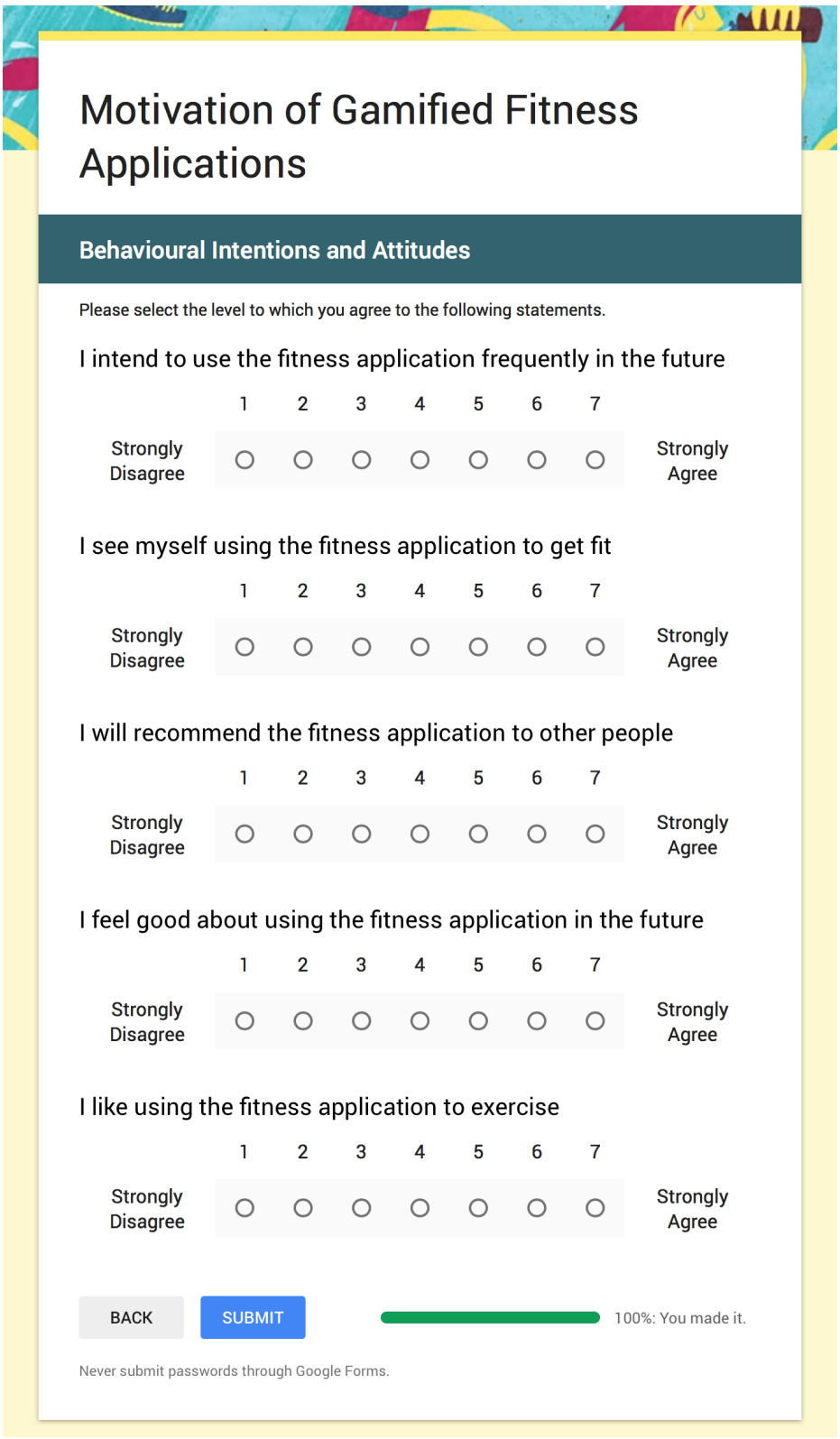
It is worth paying for extra features on the fitness application

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

BACK NEXT 85% complete

Never submit passwords through Google Forms.

Appendix A.7 Online Survey – Behavioural Intentions and Attitudes



Motivation of Gamified Fitness Applications

Behavioural Intentions and Attitudes

Please select the level to which you agree to the following statements.

I intend to use the fitness application frequently in the future

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

I see myself using the fitness application to get fit

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

I will recommend the fitness application to other people

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

I feel good about using the fitness application in the future

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

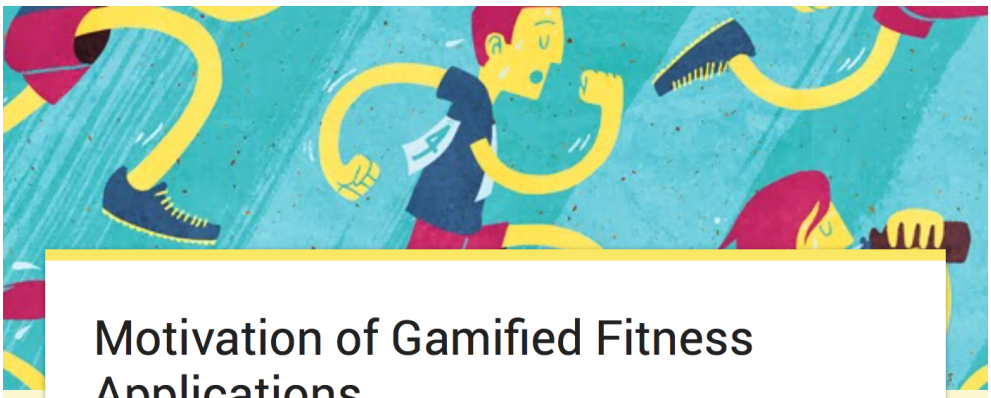
I like using the fitness application to exercise

	1	2	3	4	5	6	7	
Strongly Disagree	○	○	○	○	○	○	○	Strongly Agree

BACK SUBMIT 100%: You made it.

Never submit passwords through Google Forms.

Appendix A.8 Online Survey – Debrief



Motivation of Gamified Fitness Applications

Thank you for taking the time to participate in this research study.

The present study aims to investigate the hedonic and utilitarian motivations of gamified fitness applications.

Please note that any data collected from your participation in this study will be treated with the strictest confidentiality. Your completion of this survey does not affect your right to withdraw at any time before 12th March 2016.

If you have any questions or queries, wish to request more information about the study or have your data withdrawn, please do not hesitate to contact the researcher or the research supervisor by using the contact details listed below.

Many thanks,
Researcher
Daniel Alb
daniad@gmail.com

Research Supervisor
Hannah Barton
hannah.barton@iadt.ie

Appendix B Variables Coding

Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
Gender	Numeric	8	2		{1.00, Male}...	999.00	8	Right	Nominal	Input
Age	Numeric	8	2		{1.00, >20}...	999.00	8	Right	Nominal	Input
ExercicePattern	Numeric	8	2	How frequentl...	{1.00, Few t...	999.00	8	Right	Nominal	Input
AppsUsed	Numeric	8	2	Total number...	None	999.00	8	Right	Scale	Input
TimeUsed	Numeric	8	2	How long have...	None	999.00	8	Right	Scale	Input
AppFitness	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
AppCalorieTracker	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
AppCoach	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
AppSocialNetwork	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
AppRunning	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
AppWalking	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
AppCycling	Numeric	8	2		{1.00, Yes}...	999.00	8	Right	Nominal	Input
ApplicationInteraction	Numeric	8	2	How frequentl...	{1.00, Few t...	999.00	8	Right	Nominal	Input
Usefulness	Numeric	8	2		None	999.00	8	Right	Scale	Input
Usefulness_Mean	Numeric	8	2		None	999.00	8	Right	Scale	Input
Easy	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Performance	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Control	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Effective	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Useful	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
EaseOfUse	Numeric	8	2		None	999.00	8	Right	Scale	Input
EaseOfUse_Mean	Numeric	8	2		None	999.00	8	Right	Scale	Input
EasytoLearn	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Understandable	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Controlable	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Skillful	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
EasytoUse	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Enjoyment	Numeric	8	2		None	999.00	8	Right	Scale	Input
Enjoyment_Mean	Numeric	8	2		None	999.00	8	Right	Scale	Input
Interesting	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Leisure	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Curiosity	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Fun	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Enjoyable	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
SocialInfluence	Numeric	8	2		None	999.00	8	Right	Scale	Input
SocialInfluence_Mean	Numeric	8	2		None	999.00	8	Right	Scale	Input
SubjectiveNorms	Numeric	8	2		None	999.00	8	Right	Scale	Input
ImportantPeople	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
InfluentialPeople	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
FriendsColleagues	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Loyalty	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
BehaviouralIntention	Numeric	8	2		None	999.00	8	Right	Scale	Input
BehaviouralIntention_M...	Numeric	8	2		None	999.00	8	Right	Scale	Input
Intend	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Envision	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Recommend	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Attitudes	Numeric	8	2		None	999.00	8	Right	Scale	Input
Attitudes_Mean	Numeric	8	2		None	999.00	8	Right	Scale	Input
FeelGood	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input
Like	Numeric	8	2		{1.00, Stron...	999.00	8	Right	Ordinal	Input

Appendix C Test of Normality

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Gender	Statistic	df	Sig.	Statistic	df	Sig.
EaseOfUse	Male	.110	25	.200*	.952	25	.273
	Female	.137	15	.200*	.936	15	.329
BehaviouralIntention	Male	.205	25	.008	.862	25	.003
	Female	.277	15	.003	.894	15	.076
Attitudes	Male	.246	25	.000	.861	25	.003
	Female	.225	15	.040	.883	15	.054
SocialInfluence	Male	.213	25	.005	.957	25	.351
	Female	.143	15	.200*	.976	15	.934
Enjoyment	Male	.205	25	.008	.874	25	.005
	Female	.103	15	.200*	.978	15	.957
Usefulness	Male	.110	25	.200*	.959	25	.402
	Female	.117	15	.200*	.955	15	.614

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Appendix D Reliability Test

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.869	.907	6

Item Statistics

	Mean	Std. Deviation	N
Usefulness	25.2250	5.59527	40
EaseOfUse	28.2500	4.83444	40
Enjoyment	23.8000	5.58937	40
SocialInfluence	13.2750	4.88319	40
BehaviouralIntention	16.4250	3.16137	40
Attitudes	11.1750	2.17076	40

Inter-Item Correlation Matrix

	Usefulness	EaseOfUse	Enjoyment	SocialInfluence	BehaviouralIntention	Attitudes
Usefulness	1.000	.595	.575	.487	.782	.778
EaseOfUse	.595	1.000	.545	.350	.694	.636
Enjoyment	.575	.545	1.000	.400	.720	.711
SocialInfluence	.487	.350	.400	1.000	.544	.528
BehaviouralIntention	.782	.694	.720	.544	1.000	.930
Attitudes	.778	.636	.711	.528	.930	1.000

Inter-Item Covariance Matrix

	Usefulness	EaseOfUse	Enjoyment	SocialInfluence	BehaviouralIntention	Attitudes
Usefulness	31.307	16.096	17.995	13.296	13.825	9.447
EaseOfUse	16.096	23.372	14.718	8.263	10.609	6.673
Enjoyment	17.995	14.718	31.241	10.928	12.728	8.626
SocialInfluence	13.296	8.263	10.928	23.846	8.393	5.592
BehaviouralIntention	13.825	10.609	12.728	8.393	9.994	6.385
Attitudes	9.447	6.673	8.626	5.592	6.385	4.712

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Usefulness	92.9250	278.994	.756	.641	.833
EaseOfUse	89.9000	315.528	.656	.498	.849
Enjoyment	94.3500	290.387	.682	.536	.849
SocialInfluence	104.8750	334.830	.520	.309	.874
BehaviouralIntention	101.7250	337.743	.894	.894	.826
Attitudes	106.9750	373.461	.875	.876	.849

Appendix E Fitness Applications Frequencies

Frequency Table

Total number of fitness apps used

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	24	60.0	60.0	60.0
	2.00	12	30.0	30.0	90.0
	3.00	3	7.5	7.5	97.5
	5.00	1	2.5	2.5	100.0
	Total	40	100.0	100.0	

AppFitness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	37.5	37.5	37.5
	No	25	62.5	62.5	100.0
	Total	40	100.0	100.0	

AppCalorieTracker

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	13	32.5	32.5	32.5
	No	27	67.5	67.5	100.0
	Total	40	100.0	100.0	

AppCoach

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	5.0	5.0	5.0
	No	38	95.0	95.0	100.0
	Total	40	100.0	100.0	

AppSocialNetwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	10.0	10.0	10.0
	No	36	90.0	90.0	100.0
	Total	40	100.0	100.0	

AppRunning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	37.5	37.5	37.5
	No	25	62.5	62.5	100.0
	Total	40	100.0	100.0	

AppWalking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	20	50.0	50.0	50.0
	No	20	50.0	50.0	100.0
	Total	40	100.0	100.0	

AppCycling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	8	20.0	20.0	20.0
	No	32	80.0	80.0	100.0
	Total	40	100.0	100.0	

Appendix F Descriptive Results

Descriptives

	Gender			Statistic	Std. Error
EaseOfUse	Male	Mean		26.8800	1.00053
		95% Confidence Interval for Mean	Lower Bound	24.8150	
			Upper Bound	28.9450	
		5% Trimmed Mean		27.1222	
		Median		28.0000	
		Variance		25.027	
		Std. Deviation		5.00267	
		Minimum		13.00	
		Maximum		35.00	
		Range		22.00	
		Interquartile Range		6.00	
		Skewness		-.706	.464
		Kurtosis		1.231	.902
	Female	Mean		30.5333	.94045
		95% Confidence Interval for Mean	Lower Bound	28.5163	
			Upper Bound	32.5504	
		5% Trimmed Mean		30.7037	
		Median		30.0000	
		Variance		13.267	
		Std. Deviation		3.64234	
		Minimum		23.00	
		Maximum		35.00	
		Range		12.00	
		Interquartile Range		5.00	
		Skewness		-.548	.580
		Kurtosis		-.207	1.121
BehaviouralIntention	Male	Mean		15.6000	.70475
		95% Confidence Interval for Mean	Lower Bound	14.1455	
			Upper Bound	17.0545	
		5% Trimmed Mean		15.8222	
		Median		17.0000	
		Variance		12.417	
		Std. Deviation		3.52373	
		Minimum		6.00	
		Maximum		21.00	
		Range		15.00	
		Interquartile Range		4.00	
		Skewness		-1.334	.464
		Kurtosis		1.861	.902
	Female	Mean		17.8000	.47006
		95% Confidence Interval for Mean	Lower Bound	16.7918	
			Upper Bound	18.8082	
		5% Trimmed Mean		17.7778	
		Median		18.0000	
		Variance		3.314	
		Std. Deviation		1.82052	
		Minimum		15.00	
		Maximum		21.00	
		Range		6.00	
		Interquartile Range		3.00	
		Skewness		-.315	.580
		Kurtosis		-.474	1.121

Appendix F Descriptive Results continued

Attitudes	Male	Mean		10.5600	.46933
		95% Confidence Interval for Mean	Lower Bound	9.5914	
			Upper Bound	11.5286	
		5% Trimmed Mean		10.6778	
		Median		11.0000	
		Variance		5.507	
		Std. Deviation		2.34663	
		Minimum		5.00	
		Maximum		14.00	
		Range		9.00	
		Interquartile Range		2.00	
		Skewness		-1.144	.464
		Kurtosis		1.344	.902
	Female	Mean		12.2000	.35456
		95% Confidence Interval for Mean	Lower Bound	11.4395	
			Upper Bound	12.9605	
		5% Trimmed Mean		12.2222	
		Median		12.0000	
		Variance		1.886	
		Std. Deviation		1.37321	
		Minimum		10.00	
		Maximum		14.00	
		Range		4.00	
		Interquartile Range		3.00	
		Skewness		-.031	.580
		Kurtosis		-.883	1.121
SocialInfluence	Male	Mean		12.9600	1.04957
		95% Confidence Interval for Mean	Lower Bound	10.7938	
			Upper Bound	15.1262	
		5% Trimmed Mean		12.8222	
		Median		12.0000	
		Variance		27.540	
		Std. Deviation		5.24786	
		Minimum		4.00	
		Maximum		25.00	
		Range		21.00	
		Interquartile Range		7.00	
		Skewness		.297	.464
		Kurtosis		.040	.902
	Female	Mean		13.8000	1.11782
		95% Confidence Interval for Mean	Lower Bound	11.4025	
			Upper Bound	16.1975	
		5% Trimmed Mean		13.8889	
		Median		15.0000	
		Variance		18.743	
		Std. Deviation		4.32930	
		Minimum		5.00	
		Maximum		21.00	
		Range		16.00	
		Interquartile Range		6.00	
		Skewness		-.361	.580
		Kurtosis		-.256	1.121

Appendix F Descriptive Results continued

SocialInfluence	Male	Mean		12.9600	1.04957
		95% Confidence Interval for Mean	Lower Bound	10.7938	
			Upper Bound	15.1262	
		5% Trimmed Mean		12.8222	
		Median		12.0000	
		Variance		27.540	
		Std. Deviation		5.24786	
		Minimum		4.00	
		Maximum		25.00	
		Range		21.00	
		Interquartile Range		7.00	
		Skewness		.297	.464
		Kurtosis		.040	.902
	Female	Mean		13.8000	1.11782
		95% Confidence Interval for Mean	Lower Bound	11.4025	
			Upper Bound	16.1975	
		5% Trimmed Mean		13.8889	
		Median		15.0000	
		Variance		18.743	
		Std. Deviation		4.32930	
		Minimum		5.00	
		Maximum		21.00	
		Range		16.00	
		Interquartile Range		6.00	
		Skewness		-.361	.580
		Kurtosis		-.256	1.121
Enjoyment	Male	Mean		22.6400	1.14292
		95% Confidence Interval for Mean	Lower Bound	20.2811	
			Upper Bound	24.9989	
		5% Trimmed Mean		23.1667	
		Median		24.0000	
		Variance		32.657	
		Std. Deviation		5.71460	
		Minimum		4.00	
		Maximum		30.00	
		Range		23.00	
		Interquartile Range		8.50	
		Skewness		-.287	.464
		Kurtosis		-.428	.902
	Female	Mean		27.5333	.68914
		95% Confidence Interval for Mean	Lower Bound	26.0553	
			Upper Bound	29.0114	
		5% Trimmed Mean		27.4259	
		Median		27.0000	
		Variance		7.124	
		Std. Deviation		2.66905	
		Minimum		24.00	
		Maximum		33.00	
		Range		9.00	
		Interquartile Range		5.00	
		Skewness		.477	.580
		Kurtosis		-.474	1.121

Appendix G Multiple Linear Regressions Results

Correlations

		BehaviouralIntention	Usefulness	EaseOfUse	Enjoyment
Pearson Correlation	BehaviouralIntention	1.000	.782	.694	.720
	Usefulness	.782	1.000	.595	.575
	EaseOfUse	.694	.595	1.000	.545
	Enjoyment	.720	.575	.545	1.000
Sig. (1-tailed)	BehaviouralIntention	.	.000	.000	.000
	Usefulness	.000	.	.000	.000
	EaseOfUse	.000	.000	.	.000
	Enjoyment	.000	.000	.000	.
N	BehaviouralIntention	40	40	40	40
	Usefulness	40	40	40	40
	EaseOfUse	40	40	40	40
	Enjoyment	40	40	40	40

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Enjoyment, EaseOfUse, Usefulness[b]	.	Enter

a. Dependent Variable: BehaviouralIntention

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.757	.737	1.62067

a. Predictors: (Constant), Enjoyment, EaseOfUse, Usefulness

b. Dependent Variable: BehaviouralIntention

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	295.219	3	98.406	37.466	.000[b]
	Residual	94.556	36	2.627		
	Total	389.775	39			

a. Dependent Variable: BehaviouralIntention

b. Predictors: (Constant), Enjoyment, EaseOfUse, Usefulness

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.042	1.590		.656	.516		
	Usefulness	.250	.062	.443	4.022	.000	.556	1.798
	EaseOfUse	.165	.070	.252	2.346	.025	.585	1.710
	Enjoyment	.186	.060	.328	3.113	.004	.606	1.651

a. Dependent Variable: BehaviouralIntention

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Usefulness	EaseOfUse	Enjoyment
1	1	3.941	1.000	.00	.00	.00	.00
	2	.027	12.058	.46	.06	.03	.47
	3	.020	13.967	.09	.76	.00	.49
	4	.012	18.311	.45	.18	.97	.03

a. Dependent Variable: BehaviouralIntention

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	7.1778	21.1335	16.4250	2.75131	40
Residual	-3.83097	3.17192	.00000	1.55709	40
Std. Predicted Value	-3.361	1.711	.000	1.000	40
Std. Residual	-2.364	1.957	.000	.961	40

a. Dependent Variable: BehaviouralIntention

Appendix H Nonparametric Correlations Results

Nonparametric Correlations

Correlations

			Attitudes	SocialInfluence	SubjectiveNorms	Loyalty
Spearman's rho	Attitudes	Correlation Coefficient	1.000	.520**	.447**	.339*
		Sig. (1-tailed)	.	.000	.002	.016
		N	40	40	40	40
	SocialInfluence	Correlation Coefficient	.520**	1.000	.941**	.542**
		Sig. (1-tailed)	.000	.	.000	.000
		N	40	40	40	40
	SubjectiveNorms	Correlation Coefficient	.447**	.941**	1.000	.273*
		Sig. (1-tailed)	.002	.000	.	.044
		N	40	40	40	40
	Loyalty	Correlation Coefficient	.339*	.542**	.273*	1.000
		Sig. (1-tailed)	.016	.000	.044	.
		N	40	40	40	40

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).

Correlations

			Attitudes	BehaviouralIntention
Spearman's rho	Attitudes	Correlation Coefficient	1.000	.860**
		Sig. (1-tailed)	.	.000
		N	40	40
	BehaviouralIntention	Correlation Coefficient	.860**	1.000
		Sig. (1-tailed)	.000	.
		N	40	40

**. Correlation is significant at the 0.01 level (1-tailed).