Understanding how gamification influences behaviour in social marketing

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ABSTRACT

Purpose: In Australia and many other nations the prevalence of overweight and obesity is increasing, while physical activity declines. This paper investigates the effect of gamification on consumers' motivation and behaviour to engage in physical activity over time from a social marketing perspective.
Design/methodology/approach: An experimental design was used to determine the effect of a popular gamified fitness application (app) on both intrinsic motivation and walking behaviour over four weeks.
Findings: While the study found that gamification supported behaviour change and maintenance, there was no significant change to intrinsic motivation as a result of using the app. This finding suggests there may be an alternative mechanism underlying how gamification achieves behavioural outcomes.
Research limitations/implications: Future research is recommended to further explore the manner in which gamification influences behaviours.
Originality/value: This paper addresses the call for longitudinal studies of gamification and for studies examining both the motivational and behavioural outcomes of gamification.

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1. Introduction

Social marketing is called upon to "sell" much behaviour that is inherently disagreeable to consumers. Behaviours targeted by social marketing are more difficult to perform and frequently have less obvious benefits that also take longer to accumulate than competing behaviours (Dibb and Carrigan, 2013; Hastings, 2003). Exercising, for example, can be challenging and may not deliver immediate health or other benefits, which negatively impact consumers' motivation to perform the behaviour (Binney et al., 2003; Rothschild, 1999). Gamification is defined as "a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation" (Huotari and Hamari, 2012, p. 19), accomplished through the use of game design elements, such as scoring systems, in non-gaming contexts (Deterding et al., 2011). Social marketers have employed gamification as a means to increase consumers' motivation to engage in pro-social behaviour through value exchange. This study thus investigates the effect of gamification on consumers' motivation and behaviour from a social marketing perspective.

It is proposed that gamification enables social marketers to draw on consumers' intrinsic motivation to play games (Ryan et al., 2006) in order to foster intrinsic motivation in non-game behaviour such as exercise (Flatla et al., 2011). Intrinsic motivation, or motivation derived from the intrinsic benefits of the task itself, such as enjoyment or interest (Reeve, 1989), has been found to significantly predict the maintenance of behaviour change comparative to extrinsic motivation, derived from externally-derived rewards or punishments, which can even diminish behavioural maintenance (Bénabou and Tirole, 2006; Binney et al., 2006; Deci et al., 1999; Grant, 2008). However, the ease with which external rewards can be applied (Lynagh et al., 2013) together with their capacity to create short-term behavioural change (Bénabou and Tirole, 2006) has resulted in a proliferation of pay-for-performance and similar extrinsic approaches (Volpp et al., 2009). A greater focus on creating and supporting low-cost increases to consumers' intrinsic motivation to engage in behaviours targeted by social marketing is thus necessary and called for in the literature (Binney et al., 2003, 2006; Grant, 2008; Hagger et al., 2014).

There is considerable theoretical and conceptual support for the premise that gamification can serve as an ideal tool for social marketers seeking to support intrinsic motivation in their interventions (see Francisco-Aparicio et al., 2013 and Flatla et al., 2011 for examples). However, recent studies investigating the impact of gamification on motivation have failed to show increases in intrinsic motivation (Lewis et al., 2016; Mekler et al., 2015) despite the practice's demonstrated impact on behaviour across a variety of contexts (see Hamari et al., 2014). Mekler et al. (2015) suggest game elements commonly employed in gamification, such as points, leaderboards and badges, may act as contributors to extrinsic, rather than intrinsic motivation. While this would explain the lack of impact on intrinsic motivation, research on digital games shows these

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elements can foster intrinsic motivation (Cruz et al., 2015; Ryan et al., 2006). This contradiction of findings between gamification and entertainment focused game research may stem from gamification studies' focus on interventions that utilise individual game elements (e.g., leaderboards), and may fail to realise the intrinsically motivating benefits of a mechanically rich product that integrates a variety of gameplay mechanisms, as in the case of digital games (Deterding, 2011; Przybylski et al., 2010). Notably, past studies of gamification that have investigated behavioural outcomes of mechanically rich interventions have not examined behavioural determinates such as motivation (see Hamari et al., 2014; Seaborn and Fels, 2015).

Accordingly, this research seeks to address this contradiction and understand the impact of gamification, using multiple game elements, on both motivational and behavioural outcomes. It addresses the current gap in the literature and the call by Deterding (2014) for gamification research to move beyond a focus on the application of specific game elements towards examining the holistic motivational experience of the user. The research employs an experimental design to test the effect of a popular mechanically rich commercial exercise gamification product on motivational and behavioural outcomes over a four-week period. Better understanding of the theoretical underpinnings of gamification has significant implications for social marketing given the call for greater use of theory in program design (Buyucek et al., 2016). This investigation into the potential of gamification to augment consumers' intrinsic motivation also addresses calls for research into intrinsic motivation in the social marketing literature (Binney et al., 2003, 2006; Grant, 2008; Hagger et al., 2014). In particular, it will improve understanding of the mechanism of gamification's effect on behaviour in a physical activity context – a priority for social marketing in Australia and many other nations where the prevalence of overweight and obesity has been growing progressively, while physical activity has declined (Bassett et al., 2008).

2. Literature review

2.1. Social marketing and gamification

Consumers often face limited motivation to perform social marketing behaviours, such as exercise, owing to common inherent difficulties in performing the behaviours and benefits that may accumulate more slowly and less obviously than competing behaviours (Dibb and Carrigan, 2013; Hastings, 2003). This lack of positive exchange for the consumer presents a significant barrier to achieving behavioural outcomes (Binney et al., 2003; Rothschild, 1999). While some social marketers have focused on changing attitudes towards the behaviour to address this barrier, Rothschild (2009) argues that social marketers should adopt practices different from those of regulatory and education approaches, and focus on the provision of actual goods and services to provide real value to consumers and create positive exchange (see also Binney et al., 2003; Smith, 2009).

While emerging digital goods and services can negatively impact socially-critical behaviours (see Thaichon and Quach, 2016), they are increasingly being used in positive ways (Bernhardt et al., 2012). Owing to their cost efficiency (Lefebvre, 2009), and consumers' positive attachments to personal technology (Whittaker, 2012), mobile phone-based interventions, and particularly the practice of gamification, have been used to support behavioural change. Gustafsson et al. (2009) found that their gamified energy-saving app reduced consumers' energy use, while Hamari and Koivisto (2013) established that the 'Fitocracy' app improved attitudes and intentions towards exercise. Further, a recent meta-analysis by Hamari et al. (2014) showed support for the use of gamification to foster behaviour change across a variety of contexts.

Various researchers (see Deterding et al., 2011, Flatla et al., 2011 and Huotari and Hamari, 2012) have proposed that gamifications' demonstrated behavioural impact is due to the creation of positive value for consumers with more motivating and rewarding experiences provided by the game design elements. In a social marketing context, this added value may address the inherent negative exchange of many social marketing behaviours (Binney et al., 2003; Rothschild, 1999). While the support for the behavioural impact of gamification is well founded, Hamari et al. (2014) argue that an understanding of the mechanism through which gamification achieves the proposed motivating experience is still unclear. They specifically highlight methodological issues common to many gamification studies such as research lacking comparison groups or validated measures and comprising short treatments and single time-point measurements. Hamari et al. (2014) concluded that the current literature cannot discount the possibility of a novelty effect (short-term behavioural impact due to the novelty of exposure). On this basis, it is hypothesised:

H1. Gamification will significantly increase the performance of targeted pro-social behaviour over a short term period.

2.2. Gamification and intrinsic motivation

Research suggests that gamification's success as a behaviour change tool stems from the ability of game mechanics to tap into the inherent motivational appeal of commercial entertainment gaming (Ryan et al., 2006). It is proposed that gamification adds value to the behaviour through increasing the enjoyment consumers experience when performing the behaviour, thus increasing intrinsic motivation (Jung et al., 2010). This perspective originates from research examining the potential for game elements to produce intrinsic motivational pull in digital games for entertainment (Ryan et al., 2006) and is based on Self-Determination Theory (SDT).

SDT is a macro theory of motivation and an established framework in both gaming and gamification studies (Deterding, 2015; Seaborn and Fels, 2015). A key tenet of SDT is the differentiation between intrinsic and extrinsic motivation (Deci and Ryan, 2004). Further, according to SDT, there are three key psychological needs that all individuals seek to satisfy: autonomy (agency), competence (ability to meaningfully affect outcome) and relatedness (involvement with others and the need to represent oneself accurately) (Deci and Ryan, 2004). Cognitive evaluation theory (CET), a sub-theory of SDT, proposes that situations that facilitate an internal perceived locus of causality through satisfaction of the autonomy and competence needs increase intrinsic motivation (Deci and Ryan, 1985). While this theory has its critics (see Boal and Cummings, 1981; Harackiewicz et al., 1984 for notable counter-findings), it is well supported by empirical findings in both gaming and gamification contexts.

In the digital gaming context, competence and autonomy needs satisfaction has been positively associated with intrinsic motivation (Pe-Than et al., 2014; Przybylski et al., 2010) and both SDT and CET are widely accepted as a theoretical basis for explaining the behavioural effects of digital games (Ryan et al., 2006) and thus, conceptually, the behavioural effects of gamification (Jung et al., 2010). Peng et al. (2012) demonstrated the potential for gamification to increase intrinsic motivation through needs satisfaction via the use of a variety of autonomy-supporting game features, such as avatar customisation, and competence-supportive features, such as variable difficulty and performance indicators. On this basis, it is hypothesised that for a gamification product that is mechanically rich:

H2. Gamification will significantly increase intrinsic motivation to perform a behaviour.

2.3. Gamification and behaviour maintenance

Maintained behaviour change, or the sustaining of initial change rather than a one-off behavioural event, is important in many social marketing domains (Dibb and Carrigan, 2013). Social marketers must therefore focus on building a sustainable and long-term positive exchange (Gordon, 2012).

Many researchers have proposed gamification as a tool for building sustained value for consumers through the creation of gameplay (see Deterding et al., 2011, Flatla et al., 2011 and Huotari and Hamari, 2012) and this added value may go some way to addressing potential lack of positive exchange perceived by many consumers in pro-social contexts such as exercise (Dibb and Carrigan, 2013; Hastings, 2003). Importantly, Morford et al. (2014) suggest that the game elements utilised in the gamification process can be particularly effective in supporting behaviour maintenance. They argue that, as the player develops strategies and heuristics through gameplay, they experience growth in their perceived ability to control the game environment (locus of control). This growth in perceived self-efficacy can act as a powerful behavioural reinforcer (Bandura, 1977). Additionally, as gamification commonly distributes gameplay rewards after progressively increasing behavioural difficulty it is also argued that this progressive schedule of reinforcement will further support behavioural maintenance (Roane, 2008).

Importantly, however, Hamari et al. (2014) highlight the limited focus on longitudinal data in prior gamification studies as precluding a conclusion on the impact of gamification on the maintenance of behaviour. Indeed, a recent study by Hanus and Fox (2015) into the behavioural impact of gamification on behaviour in a classroom context found that gamification may even decrease maintenance over time when limited, competition-focused mechanisms are used. Given the importance of behavioural maintenance to social marketing (Dibb and Carrigan, 2013) testing for the impact of a mechanically rich intervention on behaviour change over time is vital. Given the above arguments H3 is proposed:

H3. Gamification will support maintained behavioural change over a medium-term period.

Additionally, given the theoretical support for H2 and the positive role that intrinsic motivation has been demonstrated to have on behavioural maintenance (Deci and Ryan, 2004; Vallerand, 1997) it is also proposed that:

H4. The impact of gamification on behavioural maintenance will be mediated by changes in intrinsic motivation.

3. Method

3.1. Context

In testing these hypotheses, a popular and mechanically rich gamified app designed to encourage walking was employed. Its features, such as variable difficulty levels, player choice and dynamic feedback, are game elements highlighted by Peng et al. (2012) as promoting needs satisfaction. Fifty-six per cent of Australians do not meet physical activity guidelines (AIHW, 2012) and while short-term changes in exercise behaviour can be accomplished through supervised interventions, they are high-cost and extend limited benefits beyond their implementation (Cox et al., 2003). Considering the health benefits of even moderate increases to physical activity through maintained behaviour change, such as increasing walking behaviour (Norton et al., 2010), investigating alternative means to facilitate this behaviour is important in social marketing (Yap et al., 2014). The target population of this study comprised males and females between the ages of 18 and 30 who are physically capable of exercise and comfortable using technological aids. This population is not likely to suffer any age-related health risks associated with physical exertion (Norton et al., 2010) and forms a technologically-savvy cohort (Squire, 2002) more likely to be targeted with interventions such as gamification by social marketers.

3.2. Study design

To test the hypotheses a between-group, repeated measures, experimental design was employed, as can be seen in Fig. 1. Specifically, a self-administered online survey was conducted at three time points over a period of four weeks. Participants in the intervention group were provided with the gamified app and were asked to use the app whenever they voluntarily engaged in walking for exercise, and to record how much they walked over the next week. The participants in the control group were asked to record how much they walked over the next week. Over the four week period some participants were excluded owing to attrition, suspiciously abnormal data and failing to meet inclusion criteria as discussed in section 3.4.

Participants were recruited via a variety of media channels, including social media posts, email invitations, physical flyers and through a university research participation project for course credit. Participants were assigned to either the intervention or control group once they had opted into the study by completing the first online survey. A free copy of the gamified app was offered to all participants as an inducement, but the control group received the app at the conclusion of the study to prevent unintentional app exposure contaminating the control group.

The first survey began with health screening and demographic questions before gathering baseline data on walking and intrinsic motivation levels. Participants were assigned to the control or intervention group via simple randomisation, shuffling the names of participants and then alternating between allocation to intervention and control. They were not, however, informed of the condition they had been assigned to or the hypotheses being tested. This single blind design limited the potential for demand characteristics to bias the results (Adams and Lawrence, 2014).

One week after participants completed the week one survey (time one) they were sent a link to the week two survey (time two) via email or SMS. Two weeks after the completion of the second survey they were sent a link to the final week four survey (time three). The time two and time three surveys gathered post-intervention walking and intrinsic motivation data so that changes over time could be tracked and compared between the two groups. Comments were solicited from participants at the end of each survey to gain additional insight into the study processes.

3.3. Measurement

Behaviour was measured by self-reported hours walked over the past week. *Intrinsic motivation* was measured with the pre-validated contextualised Intrinsic Motivation Inventory (IMI) (Ryan et al., 1983). This scale is a well-established and validated measure of intrinsic motivation in experimental studies (e.g., Ryan et al., 1991). IMI items were rated on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), with a midpoint undecided response. This scale was used to measure both the intrinsic motivation towards walking and the use of the gamification app. These measurements were taken at the baseline pre-exposure time point, as well as both the short term time point (one week following exposure) and medium term time point (three weeks following exposure).

3.4. Sample

A total of 39 participants (12 males and 27 females, mean age 20.69 years [SD = 2.19], range 18–27 years) completed the study from
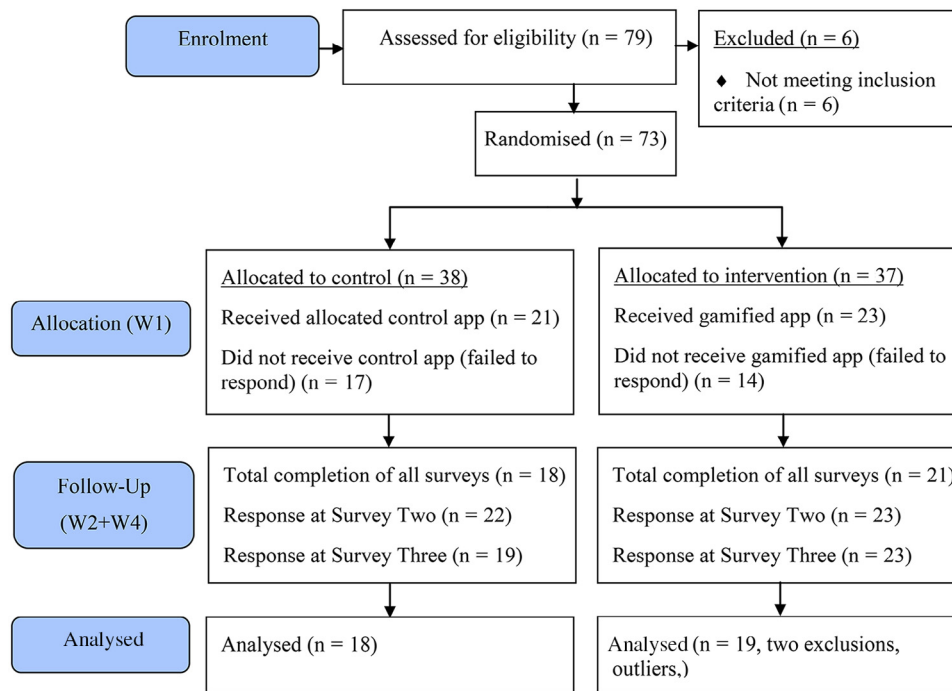
Fig. 1. Consort diagram.

the initial sample of 79 participants. Six participants were initially removed from the sample for not meeting inclusion criteria (too old or too young, physically incapable of exercise). Thirty-one participants did not respond to emails allocating the individual to the intervention or control group, potentially owing to incorrectly entered contact information, the presence of spam filters or simply voluntary attrition. A further nine participants who did respond were allocated and received their app but did not complete the following two surveys. Those participants who did not complete the study were removed from the sample before testing. Such attrition rates are common to online longitudinal intervention studies (Sue and Ritter, 2007) and, in fact, many studies report significantly higher rates of attrition (see Farvolden et al., 2005). A further two participants were removed from the sample owing to suspicious outliers indicating misreported data.

3.5. Analysis

To examine the impact of gamification on motivation and behaviour a mixed-design analysis of variance (ANOVA) was conducted. Some of the walking behaviour data analysed returned a non-normal, moderate positive platykurtic skew results on the Shapiro–Wilk test, as recommended to assess normality in smaller samples by Razali and Wah (2011). Given that the robustness of ANOVA in dealing with such normality breaches is dependent on larger sample sizes than present in this study, we used square-root transformation to normalise the data (Osborne, 2005). Transformed and raw scores were analysed to compensate for the increased likelihood of false positive results (Pallant, 2013). The standard alpha level of .05 was used for all statistical tests.

4. Results

4.1. Preliminary testing

Before examining the effect of the gamified app over time, it was important to demonstrate relative equivalence between the inter-vention and control groups at the baseline (time one) so that relative changes over time could be more confidently attributed to the effect of the intervention. Independent sample t-tests (see Table 1) confirmed that there was no significant difference in age, initial walking behaviour rates or intrinsic motivation to walk between groups ($p > 0.05$). Crosstabs chi-square test of independence confirmed no difference in gender between conditions, $\chi^2 (1, n = 39) = .103$, $p = .75$.

4.2. Hypothesis testing

To test H1 a mixed-design, ANOVA was run in SPSS. This assessed the impact of the independent variable (IV) of the intervention condition on the dependent variable (DV) of walking behaviour over time, as measured by hours using transformed data. There was a significant interaction between intervention and time in hours walked, $F(2,70) = 3.39$, $p = .04$, $\eta_p^2 = .09$, indicating that gamification had a positive impact on behaviour over time. While the intervention had a significant impact on behaviour there were no significant simple main effects of group at week 1: $F(1,37) = .41$, $p = .52$, $\eta_p^2 = .01$; week 2: $F(1,36) = 2.72$, $p = .12$, $\eta_p^2 = .07$.; or week 4: $F(1,36) = .14$, $p = .71$, $\eta_p^2 < .00$. The simple main effect of time was examined at each time point and it was found that in the control group there was no significant effect of time on hours walked, $F(2,34) = 0.18$, $p = .85$, $\eta_p^2 = .01$. However, there was a significant effect of time on hours walked in the intervention group, $F(2,36) = 4.68$, $p = .02$, $\eta_p^2 = .21$. Pairwise comparisons were therefore examined and it was found that there was

Table 1
t-Test baseline comparison.

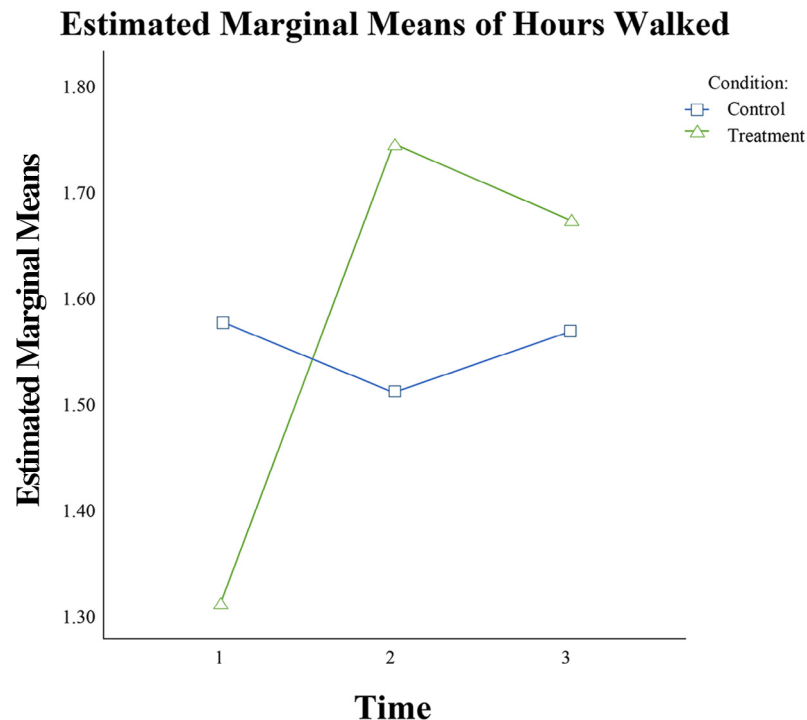| Variable	Condition	Mean (SD)	t (df)	Sig (2-tailed)
Age	Control	20.11 (1.68)	−1.56 (37)	.13
	Intervention	21.19 (2.48)		
Walking hours	Control	2.87 (2.30)	.42 (37)	.68
	Intervention	2.56 (2.30)		
IMI	Control	4.32 (1.08)	−1.20 (37)	.24
	Intervention	4.74 (1.16)		

Estimated Marginal Means of Hours Walked

Fig. 2. Transformed hours' profile plot.

a significant difference in hours walked between week one (M = 1.31, SE = 0.14) and week two (M = 1.74, SE = 0.11), p = .008, but not between week one and week four (M = 1.67, SE = 0.19), p = .11, or week two and week four, p = 1.00 (see Fig. 2). These results are similar to the results found using raw scores, with no significant effect of time on hours walked in the control group, $F_{(2,34)}$ = 0.60, p = .56, η_p^2=.03, and a significant effect of time on hours walked in the intervention group, $F_{(2,36)}$ = 5.62, p = .008, η_p^2=.02. Pairwise comparisons of raw scores in the intervention group again showed a significant difference in hours walked between week one (M = 2.08, SE = 0.35) and week two (M = 3.25, SE = 0.38), p = .01, and between week one and week four (M = 3.42, SE = 0.55), p = .02, and no significant difference between week two and week four, p = 1.00.

This result indicates that the gamified app significantly increased behaviour over time, as measured by hours walked, when compared to the change in behaviour over time in the control group, supporting H1. The changes were focused between week one and week two, with a lack of significant difference between week one and week four as well as week two and week four. This suggests that while there was a reduction in walking between weeks two and four for the intervention group, the change was not significant, indicating behavioural maintenance and thus supporting H3.

To test H2 a mixed-design ANOVA was run in SPSS. This assessed the impact of the IV of the intervention condition on the DV of intrinsic motivation as measured by the IMI. The tests of within-subjects effects demonstrated that there was no significant interaction between intervention and intrinsic motivation, $F_{(2,74)}$ = .22, p = .80, η_p^2=.01. As there was no interaction, main effects were used (Winer et al., 1971). There was no significant main effect of time, $F_{(2,74)}$ = 1.11, p = .340, η_p^2 = .03, and no significant main effect of group, $F_{(1,37)}$ = 1.21, p = .28, η_p^2 =.03. This suggests that there was no difference in the level of intrinsic motivation between the intervention group and the control group at any time. This finding, therefore, does not support H2 as there is no significant difference in intrinsic motivation either between conditions or over time. Interestingly, however, visual inspection of the intrinsic motivation

profile plot (see Fig. 3) shows the expected trend of increased intrinsic motivation after treatment despite lack of significance.

As there was no significant change in intrinsic motivation between groups at any time, or over time within groups, H4 was not supported.

4.3. Additional findings

At week four, the intervention group was also asked about their intrinsic motivation to use the gamified app. A mean score of 3.89 (1.31) on the seven-point IMI scale was obtained. This suggests, on average, the participants felt ambivalent towards the gamified app and did not experience high levels of intrinsic motivation specific to the app. Qualitative comments solicited from participants included criticisms of the app design and gameplay: "I think the app was too complicated and had some bugs", and "The app was incredibly difficult to use and the story was incredibly boring and not the kind of content I enjoy". Issues with app use persisted even when product assessment was favourable: "I enjoyed using the app […] while it worked; however, while I was using it, it erased all my content so that made me lose interest in the app". Taken together, the low degree of intrinsic motivation directed towards the gamified app suggests that, for many participants in the intervention group, the app may not have been enjoyable or intrinsically motivating.

5. Discussion

This study investigated the potential for gamification using multiple game elements to improve consumers' intrinsic motivation to perform a behaviour and support initial and maintained behaviour change. The findings of our study support the hypotheses that gamification can facilitate both initial behaviour change and (at least over the four weeks of the study) the maintenance of this behaviour change (H1 and H3). This result is in accordance with previous research highlighting the efficacy of gamification as a tool for encouraging behaviour change (Hamari et al., 2014) and, in

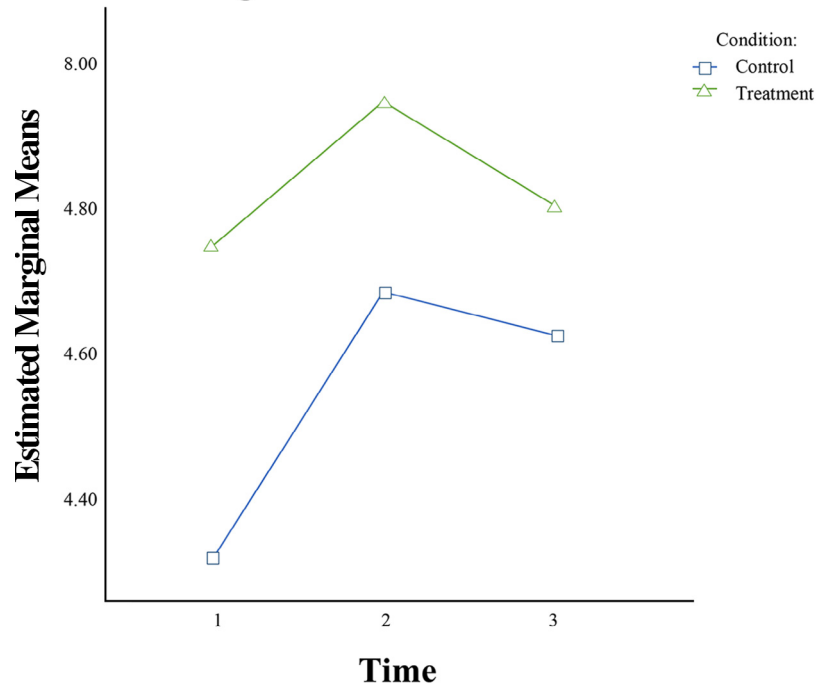## Estimated Marginal Means of Motivation to Walk

Fig. 3. Intrinsic motivation profile plot.

particular, socially-significant behaviour (Morford et al., 2014). Further, the results indicate that much of the initial increase in walking for the intervention group using the gamified app was maintained over time. This suggests that the behavioural impact of gamification is not solely due to a short-term novelty effect, as was the concern of Hamari et al. (2014).

In contrast, the results did not support the hypothesis that gamification can improve intrinsic motivation to perform a behaviour (H2) or the hypothesis that intrinsic motivation will mediate the relationship between app exposure and behavioural maintenance (H4). This finding is unexpected given previous success in using similar game elements to facilitate intrinsic motivation (e.g., Ryan et al., 2006) and the demonstrated role of intrinsic motivation in behaviour maintenance in other contexts (Deci and Ryan, 2004; Vallerand, 1997). A possible explanation for the lack of change to intrinsic motivation either between groups and over time is that there was relatively low intrinsic motivation towards using the gamified app itself. In the intervention group, quantitate measures suggested that the average user felt ambivalent towards using the app. Ryan et al. (2006) highlight the role of context in intrinsic motivation outcomes, suggesting that there may be other variables limiting the gamification app from fostering intrinsic motivation even with supportive gameplay elements. This is particularly possible considering the importance of autonomy in intrinsic motivation, as discussed further in the following section. In summary, while gamification was found to increase both initial behaviour change and behavioural motivation relative to the control group it was not found to have a significant impact on intrinsic motivation.

6. Limitations

Despite the care taken in this research there are limitations to this study. First, the findings suggest that participants in the intervention group were ambivalent towards to the gamified app selected in this study. This was highly unexpected given the popularity of the walking app that formed the focus of the study and given the

theoretical support for the capacity of game elements used in the gamified app to foster intrinsic motivation. However, it should be noted that this result is consistent with recent gamification research, in which behavioural outcomes were achieved without changes to intrinsic motivation (Lewis et al., 2016; Mekler et al., 2015).

One possible explanation was that the app was too complex to be easily understood with qualitative feedback highlighting the difficulty users had in using the app. While task complexity can help foster intrinsic motivation through cognitive empowerment this process depends on outcome feedback having significance to the user (Thomas and Velthouse, 1990). In this case, the complexity of the app may have deterred some users from continuing use by limiting competency need satisfaction. Future studies should therefore pre-test the app to ensure suitability for the target group and potentially adopt a more hands on approach to ensure that app use issues can be successfully resolved. Moreover, although the use of controlling language was limited to foster an autonomous supportive environment, the fact that some participants were asked to use this app for course credit could have led to a contextual reduction in feelings of control and perceptions of autonomy (Deci et al., 1999). This threat is considered small, however, as rewards were non-contingent on task completion and previous analysis suggests that these rewards have minimal impact on intrinsic motivation (Deci et al., 1999).

These limitations do, however, highlight the need to measure for a greater number of potential moderating and mediating variables that might impact on the exposure/behaviour relationship. Future research should therefore investigate variables shown to influence behavioural maintenance and intrinsic motivation such as perceived competence and perceived autonomy (Ryan et al., 2008). In addition, this study only tested one gamified app within a single behavioural context for a defined target population. Owing to attrition the final sample size was small, limiting the robustness of the statistical findings. These limitations have implications for external validity, and future research should aim to generalise the

results to the wider population through the use of a larger sample across different behavioural contexts. It is also recommended that future research examine the effect of gamification over a longer period of time to more fully understand its impact on maintenance of behaviour change.

7. Implications

This study builds on the current evidence base for the efficacy of gamification for behaviour change in social marketing. In the context of physical exercise it found that gamification can foster both initial behavioural gains but also sustained behavioural maintenance. By doing so, the research addresses the lack of longitudinal studies in the gamification literature (as highlighted by Hamari et al., 2014) and extends understanding of how maintained behaviour change can be facilitated via product offerings in social marketing – an important contribution given calls for a greater focus on long-term outcomes in the field (Dibb and Carrigan, 2013; Gordon, 2012).

Second, the findings of this study do not support the notion that intrinsic motivation underpins gamification's effect on behaviour, as previously argued (see Flatla et al., 2011). Given similar recent findings (see Lewis et al., 2016; Mekler et al., 2015), this suggests that gamification may achieve behavioural outcomes through alternative mechanisms. While SDT research largely supports the supremacy of intrinsic motivation as a behavioural maintenance determinate, internalising extrinsic motivation has been shown to facilitate behavioural maintenance (Deci and Ryan, 2004; Vallerand, 1997). Accordingly, it is possible that gamification achieves behavioural outcomes through amplifying existing extrinsic motivational pressures through feedback specific to personal goals, enhanced exposure to peer group pressure or directly through the creation and maintenance of virtual rewards. Future research should therefore investigate alternative probable models for gamifications' observed behavioural impact, such as extrinsic motivation.

For social marketers, this study suggests that gamification, in the form of a gamified app in particular, is a valid product offering to encourage behaviour change and maintenance in the physical activity domain. Social marketers, however, must recognise that the mechanism for its observed behavioural impact is still unclear, making it difficult to provide specific recommendations for the improvement of gamified product offerings at this point in time.

8. Conclusion

This study contributes to the growing body of literature exploring the outcomes and mechanisms of gamification. To test the efficacy of gamification for social marketers and to explore the role of intrinsic motivation in gamification outcomes an experimental study was conducted, measuring the effect of a gamified app on both walking behaviour and maintenance and intrinsic motivation over four weeks. It demonstrated that a gamified app can both increase walking behaviour and maintain these initial gains, but found no significant change to intrinsic motivation over the four weeks. This could suggest that the mechanics of gamification may involve different factors beyond the production of intrinsic motivation through gameplay, and provides an important basis for future research.

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