Embracing Cheating in Gamified Fitness Applications

Ayelet Gal-Oz
Media Innovation Lab
The Interdisciplinary Center (IDC)
P.O. Box 167, Herzliya 46150
Israel
goayelet@idc.ac.il

Oren Zuckerman
Media Innovation Lab
The Interdisciplinary Center (IDC)
P.O. Box 167, Herzliya 46150
Israel
orenz@idc.ac.il

CHI PLAY 2015, October 03-07, 2015, London, United Kingdom
ACM 978-1-4503-3466-2/15/10.
http://dx.doi.org/10.1145/2793107.2810298

Abstract
Gamification of fitness applications opens the door to cheating by exploiting inherent limitations of sensing, in order to advance in the game without performing the required physical activity. While this type of behavior is usually conceptualized negatively, we propose it could actually be beneficial for encouraging physical activity. We integrate prior work on cheating in online games with prior work on embracing non-normative behavior, and suggest design opportunities for embracing cheating in gamified fitness applications.

Author Keywords
Gamification; persuasive technology; physical activity.

ACM Classification Keywords
K.8.0 Personal Computing: General – Games.

Introduction
In recent years, mobile and wearable technology has been leveraged to support fitness [e.g., 8, 9, 20]. Utilizing built-in sensors such as accelerometer and GPS, various forms of physical activity can be detected. Increasingly, game design elements are implemented in fitness applications, a process called "gamification" [5]. Presumably, gamification makes physical activity more enjoyable, thereby motivates users to become more

active. While providing some positive effects [13], gamification has also been criticized for being reward-oriented, focusing on motivating through external rewards rather than intrinsic motivation [3, 19].

In this paper we highlight an aspect of gamified fitness that deserves special consideration – cheating or attempting to outsmart the system in order to advance in the game without performing the required physical activity. While this is usually conceptualized as a negative behavior, we suggest conceptualizing it as an acceptable or even positive behavior, which could be beneficial for encouraging physical activity. We build on prior work in the fields of cheating in online games and embracing non-normative behavior to suggest designs that embrace cheating in gamified fitness applications. We conducted a preliminary survey to evaluate how these designs were perceived by potential users.

Throughout this paper, we use the term "fitness" to refer to "good physical state of an individual achieved by means of sport training" [12, p. 197]. While fitness is comprised of several components (e.g., mental, social) [12], we focus on physical activity.

Cheating in Online Games

In online games, cheating refers to players' behaviors used to gain an advantage or achieve a target, which were not supposed to have been achieved according to the game rules [22]. Cheating can ruin the fairness of games, and might result in users giving up [6, 21]. According to Wu and Chen [21], players are more likely to cheat (1) the more others around them cheat, (2) the more they hold positive attitude towards cheating, (3) the more they value the outcomes (e.g., high ranking). Cheating appears to be a rather prevalent phenomenon in online games – 76% of respondents to a recent survey admitted they cheated [21].

Cheating in Gamified Systems

Since cheating occurs in online games, it is reasonable to assume it also occurs in gamified systems. Gamified systems have a hybrid nature, being neither 'pure' functional software nor a 'full-fledged' game [4]. Thus, compared to full-fledged games, the gameful experience they offer may be less engaging, and their outcomes may carry greater real-life implications, which potentially invite cheating.

Gamified fitness applications utilize sensors to detect certain movement patterns indicative of physical activity, and trigger pre-defined rewards. Users who are more interested in rewards than in physical activity might cheat by exploiting inherent sensor-related limitations to fabricate false detection.

To the best of our knowledge, cheating in gamified systems was not yet systematically explored. We were able to find several examples, mainly focused on location detection. Users of a gamified campus orientation application, which enables students to unlock achievements upon arrival to certain locations around campus, exploited the widely-defined GPS detection radius to unlock achievements without actually visiting the required locations [10]. Similarly, false check-ins occurred in Foursquare – a location-based mobile application enabling users to check-in at real-world venues to earn points and badges [2, 11].

We encountered cheating in a gamified fitness application called StepByStep, a prototype developed for research purposes [23]. This prototype operates as

Control Version Non-gamified version, offering continuous measurement of walking time, goal-setting and feedback on performance.
Points Version Gamified version, similar to the control version, but also rewards users with one point for every second walked. If users reach their daily goal, they receive a bonus – their accumulated daily points are doubled.
Leaderboard Version Gamified version, similar to the points version, but also ranks users in a leaderboard according to their accumulated points.

Table 1. The three versions of StepByStep – a gamified fitness application [23].

a background process on Android-based mobile phones, utilizing the built-in accelerometer to automatically detect walking. There are three versions of this application, see Table 1. StepByStep was evaluated in a field study, which included interviews with students who used it for two weeks. The original study was not concerned with cheating, therefore participants were not directly asked regarding this type of behavior. Nonetheless, two participants admitted they cheated:

"At 23:55 I saw that I walked 40 minutes, and my daily goal was 60 minutes. So I changed it to 40 minutes, and then it doubled my points and I went to the top of the leaderboard. It made me feel very good, but I didn't actually meet my daily goal" (female, 24).

"Let's say I walked 28 minutes, and my goal was 30 minutes. If I didn't feel like walking, I just shook the device with my hand" (male, 25).

While only anecdotal, these examples provide a preliminary indication that users indeed attempt to advance in the game without performing the required physical activity. The first user exploited a design loophole to receive undeserved rewards. This type of loophole is relatively easy to contend with – the option to change one's walking goal could become available only during the morning hours. The second user exploited a loophole in mobile sensing to fabricate false detection of physical activity. This type of loophole is harder to contend with. Theoretically, the movement detection algorithm could be fine-tuned to distinguish between actual walking and shaking the device with one's hands. While security plays an important role, it cannot prevent cheating unequivocally [22]. Users who are determined to cheat will find other ways to imitate walking. Other possible techniques for cheating may include changing the device clock to give users more time to reach goals. Interestingly, both cheaters were using the leaderboard version of StepByStep. This could imply that the motivation to cheat is intensified by impression management considerations, though a firm conclusion is premature at this stage.

Embracing Non-normative Behavior

The idea of embracing non-normative behavior has been suggested in regard to various online behaviors. Kirman et al. [15] suggested embracing mischief in online communities because constant experimentation helps forge functioning communities. Iachello et al. [14] believe that location sharing applications should enable users to "stretch the truth" in order to preserve privacy. Epstein et al. [7] developed interfaces for transforming sensed physical activity data before sharing it, to balance privacy with accountability for one's behavior. Deterding [3] views attempts to "game the system" in order to maximize individual payoff as an inherent part of gaming.

Embracing Cheating in Fitness Applications

Traditionally, cheating in games is perceived as having negative consequences [6, 21], and game designers are encouraged to enforce fairness [16]. We believe that cheating has positive consequences when fitness is concerned. The main goal of fitness applications is to encourage physical activity. Hence, if cheating is conductive to encouraging physical activity, it can be conceptualized as a positive behavior. One must remember that gamification adds secondary challenges to an already challenging task – performing physical activity over time. An empathic design approach that tolerates limited cheating might be preferable for

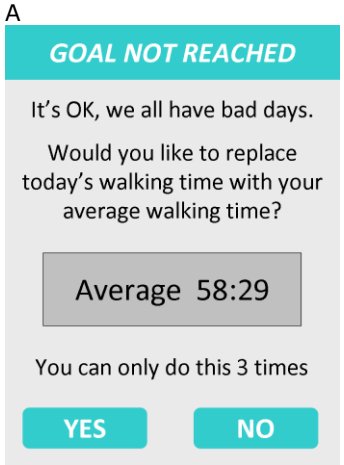

Figure 1. Suggested designs for embracing cheating in gamified fitness applications.

motivating physical activity in the long run. A similar approach was adopted by Laschke et al. [17] through "pleasurable troublemakers" – persuasive systems that include empathic features. The system prompts users to perform a desirable behavior, but accepts a less desirable behavior as well. Cheating is allowed, serving as a tool to initiate self-reflection. We suggest design opportunities for embracing cheating in gamified fitness applications. We distinguish between two main forms of cheating: cheating the self, and cheating others.

Design Opportunities: Cheating the Self

We believe that users might wish to cheat even if their data remains private. For example, users might cheat to compensate for non-representative data. Even regularly active users might get sick or be otherwise unable to perform physical activity on certain days, resulting in a sharp drop in their average score. Though this drop reflects reality, users might perceive it as unrepresentative of their routine, get discouraged, and consequently stop using the system altogether. We suggest allowing users to substitute the values from a non-representative day with those from an average day (see Figure 1A) to ensure the overall average score remains intact. This seems like a relatively small price to pay for maintaining users engaged with the system – and hopefully physically active – in the long run. The number of times a user is allowed to substitute bellow-average days with average days should be limited, to prevent abuse of this option. Furthermore, days which were substituted should be highlighted to the user in order to maintain personal accountability.

Design Opportunities: Cheating Others

Users might also wish to cheat in order to present themselves more favorably in the eyes of others. Gamified systems often publicly compare the scores of different users (e.g., leaderboard). Users with a low score, due to temporary setbacks or simply being new to the system, might get discouraged and stop using the system altogether, as in [18]. To enable users to save face, we suggest allowing them to temporarily substitute their low score with that of an average user. After all, it's better to be average than an underperformer. This strategy may prevent quitting, but clearly opens the door to cheating. Previous studies on online gaming showed that players are more likely to cheat the more others around them cheat [1, 21]. Hence, if we wish to avoid "contagious cheating", the fact that a certain user cheats by pretending to be average should remain hidden from others. Previous studies also showed that players are more likely to cheat the more they value the outcomes [21]. Hence, the outcomes should remain limited. Our suggested design will not allow users to climb to the top of the leaderboard by cheating, only to appear average, and only temporarily – the number of times each user could pretend to be average must be limited to prevent abuse of this option. Since users will be allowed to cheat, they will be aware that others might be cheating as well. Thus, according to our suggested design, the community will be aware that some users might currently be cheating, but not who is cheating at any given moment. How will the community react? Prior findings from an online gaming community showed that cheaters were well embedded in the community, treated similarly to non-cheaters [1].

How will the cheater react? As one of the participants in the StepByStep study indicated, she was well aware that her rewards were undeserved. For some users, this tension could potentially serve as a motivator –

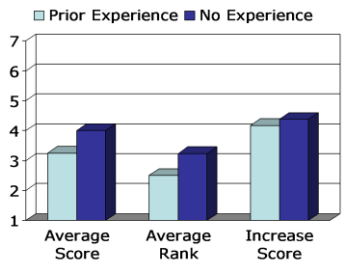

Figure 2. Ratings (1-7) of potential designs for embracing cheating in a gamified fitness application. A repeated-measures ANOVA revealed a significant effect for design, $F(2,46) = 4.06$, $p < .05$. A post-hoc analysis revealed that "increase score" was rated significantly higher than "average rank" ($p < .05$). The effect of prior experience with fitness applications, $F(1,23) = 1.20$, *n.s.*, and the interaction effect, $F(2,46) = 0.19$, *n.s.*, did not reach statistical significance. Similarly, 52% of participants preferred "increase score", 28% preferred "average score", 8% preferred "average rank", 12% preferred not to embrace cheating. A one-sample Chi-Square test was statistically significant ($p < .01$).

perhaps they would feel obligated to compensate for their cheating (private or public), which could encourage physical activity later on. The system could support this practice – allowing users to arbitrarily increase today's score, in exchange for automatically decreasing the score of a later date (see Figure 1B).

Pilot Study

We conducted a survey to evaluate how our designs are perceived by potential users. 25 participants (7 males, 18 females) were recruited through social networks. Their age ranged from 23 to 47 ($M = 30.72$, $SD = 6.64$). 48% had previously used a fitness application. We used StepByStep as a case study. We explained how it currently works, then presented three screen mockups in random order: (1) "average score" – enabling users to replace a below-average score with an average score, (2) "average rank" – enabling users to replace a low ranking in the leaderboard with an average ranking, (3) "increase score" – enabling users to increase today's score in exchange for automatically decreasing tomorrow's score. Each design was rated on a 7-point scale. Lastly, participants were asked to select their preferable design, or they could select not to embrace cheating. Results are presented in Figure 2. 88% of participants selected to embrace cheating. "Increase score" was the highest rated design ($M = 4.28$, $SD = 1.84$) as well as most preferred, followed by "average score" ($M = 3.64$, $SD = 2.18$), and lastly "average rank" ($M = 2.88$, $SD = 1.69$). Similar results were obtained for those who have previously used a fitness application and for those who have not. While promising, these results are not based on actual behavior, therefore limited. Nonetheless, this is an intriguing first step towards more rigorous research.

Conclusions and Future Work

We conceptualized cheating as a positive behavior in the context of gamified fitness, because it can motivate users to remain active over time. We suggested designs that embrace a limited form of cheating: (1) Allowing below-average performance to be presented as average, both privately and publically, to prevent discouragement over temporary setbacks. (2) Limiting the number of times users are allowed to misrepresent below-average performance, to prevent abuse of this option. (3) Allowing users to arbitrarily increase today's score in exchange for automatically decreasing the score of a later date. A pilot study showed that people are willing to embrace cheating. Future work will validate these suggested designs with real users, as well as further explore the benefits and risks of embracing cheating in gamified fitness applications.

Acknowledgements

This research was supported by the I-CORE Program of the Planning and Budgeting Committee and The Israel Science Foundation (grant no. 1716/12).

References

[1] Blackburn, J., Simha, R., Kourtellis, N., Zuo, X., Ripeanu, M., Skvoretz, J., and Iamnitchi, A. Branded with a scarlet C: Cheaters in a gaming social network. In *Proc. WWW 2012*, ACM Press (2012), 81-90.

[2] Cramer, H., Rost, M., and Holmquist, L.E. Performing a check-in: Emerging practices, norms and 'conflicts' in location-sharing using Foursquare. In *Proc. MobileHCI 2011,* ACM Press (2011), 57-66.

[3] Deterding, S. Eudaimonic design, or: Six invitations to rethink gamification. In M. Fuchs, S. Fizek, P. Ruffino, and N. Schrape, eds., *Rethinking gamification*. Meson Press, Lüneburg, 2014, 305–331.

[4] Deterding, S., Björk, S.L., Nacke, L.E., Dixon, D., and Lawley, E. Designing gamification: Creating gameful and playful experiences. *Ext. Abstracts CHI 2013*, ACM Press (2013), 3263-3266.

[5] Deterding, S., Dixon, D., Khaled, R., and Nacke, L. From game design elements to gamefulness: Defining "gamification". In *Proc. MindTrek 2011*, ACM Press (2011), 9-15.

[6] Duh, H.B.L. and Chen, V.H.H. Cheating behaviors in online gaming. In *Proc. OCSC 2009*, Springer Berlin Heidelberg (2009), 567-573.

[7] Epstein, D.A., Borning, A., and Fogarty, J. Fine-grained sharing of sensed physical activity: A value sensitive approach. In *Proc. UbiComp 2013,* ACM Press (2013), 489-498.

[8] Fitbit. http://www.fitbit.com/.

[9] Fitocracy. https://www.fitocracy.com/.

[10] Fitz-Walter, Z. and Tjondronegoro, D. Exploring the opportunities and challenges of using mobile sensing for gamification. In *Proc. UbiComp 2011*, ACM Press (2011), 1-5.

[11] Glas, R. Breaking reality: Exploring pervasive cheating in Foursquare. *Transactions of the Digital Games Research Association 1,* 1 (2013).

[12] Haag, H. and Haag, G. (eds.). *Dictionary: Sport, physical education, sport science*. Kiel, Institut für Sport und Sportwissenschaften, 2003.

[13] Hamari, J., Koivisto, J., and Sarsa, H. Does gamification work? A literature review of empirical studies on gamification. In *Proc. HICSS 2014,* IEEE (2014), 3025-3034.

[14] Iachello, G., Smith, I., Consolvo, S., Abowd, G.D., Hughes, J., Howard, J., Potter, F., Scott, F., Sohn, T., Hightower, J., and LaMarca, A. Control, deception, and communication: Evaluating the deployment of a location-enhanced messaging service. In *Proc. UbiComp 2005,* Springer Berlin Heidelberg (2005), 213-231.

[15] Kirman, B., Lineham, C., and Lawson, S. Exploring mischief and mayhem in social computing, or: How we learned to stop worrying and love the trolls. *Ext. Abstracts CHI 2012*, ACM Press (2012), 121-130.

[16] Lan, X., Zhang, Y., and Xu, P. An overview on game cheating and its counter-measures. In *Proc. ISCSCT 2009*, Academy Publisher (2009), 195-200.

[17] Laschke, M., Diefenbach, S., Schneider, T., and Hassenzahl, M. Keymoment: Initiating behavior change through friendly friction. In *Proc. NordicCHI 2014,* ACM Press (2014), 853-858.

[18] Lin, J.J., Mamykina, L., Lindtner, S., Delajoux, G., and Strub, H.B. Fish'n'Steps: Encouraging physical activity with an interactive computer game. In *Proc. UbiComp 2006*, Springer Berlin Heidelberg (2006), 261-278.

[19] Nicholson, S. A user-centered theoretical framework for meaningful gamification. In *Proc. GLS 8.0*, (2012).

[20] RunKeeper. http://runkeeper.com/.

[21] Wu, Y. and Chen, V.H.H. A social-cognitive approach to online game cheating. *Computers in Human Behavior 29*, 6 (2013), 2557-2567.

[22] Yan, J. and Randell, B. A systematic classification of cheating in online games. In *Proc. NetGames 2005*, ACM Press (2005), 1-9.

[23] Zuckerman, O. and Gal-Oz, A. Deconstructing gamification: Evaluating the effectiveness of continuous measurement, virtual rewards, and social comparison for promoting physical activity. *Personal and Ubiquitous Computing 18*, 7 (2014), 1705-171.