

Achievements in Exergames for Parkinson's Patients

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Abstract

While playing good games should be intrinsically rewarding, additional extrinsic rewards such as achievements if applied with care can further enhance the game experience and foster player motivation. However, if applied in an uninformed way, extrinsically induced motivation can also devalue the intrinsic rewards in the player's perception. The impact of achievements on the game experience of special target groups like older people suffering from Parkinson's disease is still largely unexplored. In this paper, two types of achievements are evaluated for the exergame "Sterntaler". Sterntaler was specifically developed for patients suffering from Parkinson's disease to motivate them to do physical exercises. Our results show that the majority of the participants prefer achievements to no achievements, with a near equal split between the different types of achievements included in this study.

1 Introduction

Exergames are games with exertion interfaces and motion-based interaction. They can be used to help elderly, the growing part of our society, in maintaining health and well-being or even fighting against motion disabilities. Commercial exergames for Nintendo Wii or Microsoft Kinect address the broad target group of young experienced gamers. Current research claims the lack of exergames that are specially designed for the needs and preconditions of elderly people (Gerling et al. 2011).

Parkinson's disease is a non-reversible, neurodegenerative brain disorder that slowly progresses. It mainly affects elderly and involves physical and cognitive disabilities. Physiotherapy is a possibility to slow down the progress of the disease. The patients have a basic motivation to fight their disease and do physical exercises, but they need an impulse to activate it. There is already some research that explores the players' motivation in games in general, but not for special target groups like Parkinson's patients. Psychologists and game designers request to do further research in the rising industry of motion-based interfaces

(Nijholt et al. 2008). Achievements as rewarding feedback represent one of those attributes in games that can foster motivation (Blair 2011), so we apply this in our study.

This work tries to fill the lack of research that examines exergames for special target groups with a focus on achievements. We examine the influence of different types of achievements on the gaming experience and preference of Parkinson's patients in a game specially designed for them.

2 WuppDi! Exergame Sterntaler

Assad et al. developed the exergames collection *WuppDi!* especially for Parkinson's patients (cf. Assad et al. 2011). Five games according to the theme "fairy tale world" are included in this collection: "Froschkönig" (Frog Prince), "Aschenputtel" (Cinderella), "Sterntaler" (Star Money), "Bremer Stadtmusikanten" (Town Musicians of Bremen) and Ali Baba. With these games the patients can train their mental and physical abilities.

In *Sterntaler* for example, the arms have to be moved so that the hand, which is symbolized with a digital hand on screen, can collect the appearing stars. The stars randomly build up one out of five set paths so that the hand collects the stars when it follows this path. The collected stars fall down and a girl at the bottom of the screen automatically collects them. For each collected star the player gets one point. After a certain amount of time the not collected stars disappear and a new random path of stars appears. In this work we extended the game *Sterntaler* with two different types of achievements as described below.

2.1 *Sterntaler* with and without Achievements

We implemented three *Sterntaler* game versions: without achievements (just "standard" points), with measurement achievements (quantitatively indicating the player's performance), and with completion achievements (awarded for completing tasks; cf. Blair 2011).

In the measurement achievement version a performance overview screen that is shown before the game starts displays the high score (the maximum of ever achieved points) and the previously achieved amount of measurement smiley coins. In the game screen (figure 1) the basic display of points is supplemented with information about the amount of possible points in the current level. It further contains the high score and the status of the measurement smiley coins (achieved/unachieved). When the player collects more than one-fifth of possible points, the first measurement smiley pops up and is displayed as a small icon in the upper right corner. In this way, the rest of the five measurement smiley coins give feedback on the proportion between collected and possible points. The second smiley tells the player that two-fifth of possible points are collected and so on until the last smiley. When the player has improved the last stored high score, the end screen (figure 1) gives a message about that. Additionally, it shows the just collected amount of points together with the measurement smiley coins.

In the game version with completion achievements the player gets feedback on accomplished achievements in the performance overview screen. The game and end screens (figure 1) provide the following information: awards, sum of points and time that have been achieved by the current player. In this way, the player gets to know how many points must be collected in what time to achieve the next award.



Figure 1: Achievement types: no achievements, completion achievements, measurement achievements (top to bottom); game screens (left) and end screens (right)

3 Evaluation Results

The evaluation sessions were conducted altogether in three groups, in five days and with 23 participants; 12 were male and 11 female. The average age was 69.74 years (SD 6.73). Because of the small sample size and the large individual cognitive and physical differences between the patients, the experiment was conducted following a within-subjects design with all participants trying all three conditions, i.e., no achievements, measurement achievements, and completion achievements in a randomized order. With an average record of 120.55 (SD 12.07) of possible 128 points the participants showed a good performance in playing Sterntaler in general.

A survey was read out loud by the experimenter because the patients have difficulties to read and write and it is possible to explain misunderstood questions. When the patients were asked, which game version they liked most, only 13.04% named the no achievement version. The rest preferred the achievement versions in equal parts. Although female users preferred the measurement achievement type and male users liked the completion achievement better, the differences were not significant.

4 Conclusion

In this paper, we investigated achievements as extrinsic rewards to enhance the game experience in exergames for Parkinson's patients. We extended the game Sterntaler with two different types of achievements and evaluated them against a no-achievements version as control. Our results suggest that there is indeed a strong preference in this target group for achievements and we recommend implementing achievements in similar games.

Acknowledgments

We thank the "Deutsche Parkinson Vereinigung", the physiotherapists, and all the participants who patiently and with great effort took part in this study.

References

- Assad, O., Hermann, R., Lilla, D., Mellies, B., Meyer, R., Shevach, L., Siegel, S., Springer, M., Tiemkeo, S., Voges, J., Wieferich, J., Herrlich, M., Krause, M. & Malaka, R. (2011). *Motion-Based Games for Parkinson's Disease Patients*. In: *Proc. International Conference on Entertainment Computing (ICEC 2011)*. October 2011, Vancouver, Canada: Springer.
- Blair, L. (2011). *The use of video game achievements to enhance player performance, self-efficacy, and motivation*. PhD Thesis. Orlando, Florida: University of Central Florida.
- Gerling, Schild & Masuch (2011). *Exergaming for Elderly: Analyzing Player Experience and Performance*. In: *Mensch und Computer 2011: 11. Fachübergreifende Konferenz für Interaktive und Kooperative Medien über Medien übermorgen*. 2011, pp. 401–411.
- Nijholt, A., van Dijk, B. & Reidsma, D. (2008). *Design of Experience and Flow in Movement-Based Interaction*. *Motion in Games*. pp. 166–175.