Motivation in home fitnessing : effects of immersion and movement

Motivation in Home Fitnessing: Effects of Immersion and Movement

Joyce Westerink[1], Marko de Jager[1], Ronald Bonants[1], Marijn Bruinink[1], Jan van Herk[1], Yvonne de Kort[2], Wijnand Ijsselsteijn[2], and Fren Smulders[3]

[1] Philips Research, Eindhoven, The Netherlands
[2] Eindhoven University of Technology, Department of Technology Management, Eindhoven, The Netherlands
[3] Maastricht University, Department of Psychology, Maastricht, The Netherlands
joyce.westerink@philips.com

Abstract. In this paper we explore how we can use technology to help people to stay motivated to do home fitnessing. Two experiments with a total of 48 participants were performed, both deploying a virtual reality in a bicycling task, one focusing of effects of immersion, the other on the intrinsic impact of movement. From the results it becomes apparent that user and technology can cooperate to achieve a optimum home fitnessing experience.

1 Introduction

Persuasive technology (Fogg [1]) is technology that is deliberately designed to change a person's attitude or behavior. Porcari et al. [5] have employed virtual technology in the context of home fitnessing, and concluded that can help people burn calories without raising the level of perceived exertion. Our interest is to investigate whether apart form changing behavior, virtual technology can also help to change people's attitude. To that end, we conducted two experiments in which we investigated how a virtual

Fig. 1. Experimental setting

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reality technology can be deployed to enhance people's motivation to do home fitnessing. The home fitnessing task for the subjects was to cycle on a home trainer bike for some 10 minutes (Figure 1). Using a large display in front of the bike, we compared two ways of representing to the user his/her progress on a virtual race track: either as a dot progressing along the track depicted as a map in bird's eye view, or as a first-person virtual world view of a bicycling course, through which the user could steer him/herself using the handle bars and pedals of the fitnessing bike.

2 First Experiment

2.1 Method

24 participants were each presented with all four conditions of a 2*2 within-subjects design: two levels of Immersion and two levels of Coach. The two levels of Immersion could were

- Low: abstract map-like cycling track represented in bird's eye view; no need for the subject to steer the bike (Figure 2, left),and
- High: Tacx virtual reality cycling track represented in first-person view, pedals and handle bars are used to control cycling speed and direction (Figure 2, right).

The two levels of Coach were

- With coach (a female animation character popped up every 60 seconds to coach the subject to maintain a certain heart rate, telling him/her to either "speed up", "slow down" or "keep up the good work", Figure 2 right) and
- Without coach (no extra information at all).

After each condition, the subjects filled out two questionnaires: the Index of Intrinsic Motivation (IMI, [2]) to measure how each condition motivated the subjects, and the ITC Sense of Presence Inventory (SOPI, [3]) to measure the amount of perceived presence in each condition.

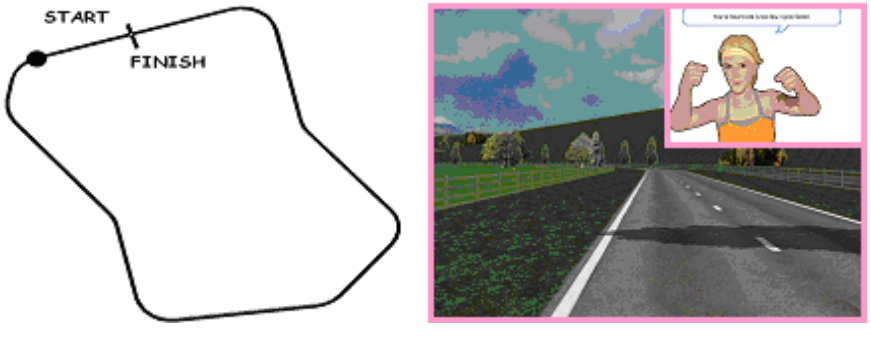

Fig. 2. Low immersion – no coach (left); High immersion – with coach (right)

2.2 Results and Discussion

In a series of repeated measures ANOVAs, the factor Coach had a distinctive impact on several subscales of the two questionnaires: significant effects were found for the Pressure/Tension, Value/Usefulness and Perceived Control subscales of the IMI and for the Spatial Presence and Negative Effects subscales of the SOPI (always $F(1,23)>6.61$, $p<0.02$). These effects generally are in favor of the With-Coach condition, the only exception being Perceived Control, which was lower with coach present. The factor Immersion was highly significant on most subscales of both the IMI and the SOPI questionnaires: Interest/Enjoyment (Figure 3 right), Perceived Competence, Perceived Control and Value/Usefulness, Spatial Presence (Figure 3 left), Engagement, Naturalness, Negative effects (always $F(1,23)>7.7$, $p<0.1$). In all cases, the High Immersion (virtual reality) level scored higher. Moreover, we found a significant correlation ($r=0.757$, $p<0.01$) between the main SOPI scale (Spatial Presence) and the main IMI subscale (Interest/Enjoyment).

As a consequence we conclude that the coach helps to enhance usefulness and perceived presence, while reducing tension and taking over control. In addition, the virtual reality application raises perceived presence, as expected, and also serves to enhance the motivation of the home fitnessers, at least in first encounter with the equipment. New research questions that follow from these results include the relevancy of these results on a longer time scale (which will be tackled in future research); the relevant characteristics of the virtual coach (for additional experiments see [6]), and the nature of the immersion effect on motivation: is it intrinsically related to the cycling activity or is it an additional technology effect? This latter question was investigated in the second experiment.

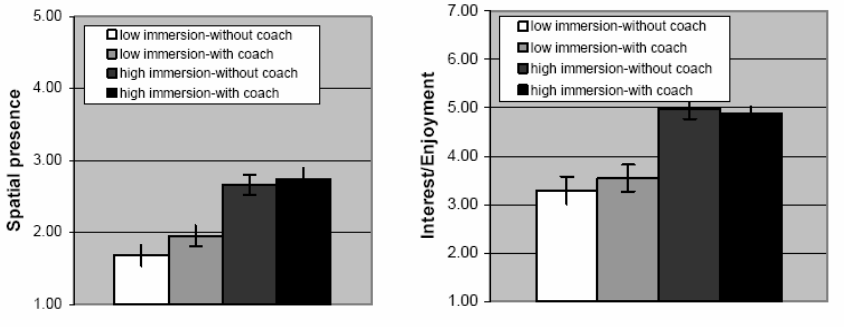

Fig. 3. Results for Spatial Presence (left); Results for Interest/Enjoyment (right)

3 Second Experiment

3.1 Method

24 (other) participants were again each presented with all four conditions of a 2*2 within-subjects design: This time with two levels of Immersion and two levels of

Movement. The Two levels of Immersion were the same as in the previous experiment. The two levels of Movement were

- With movement (in which the subject had to pedal just as in the previous experiment), or
- Without movement (in which the subject was propelled as if on a moped, and did not have to bike).

After each condition, the subject answered two questionnaires: The IMI [1], as in the previous experiment and the Self Assessment Manikin (SAM, [3]) to measure non-verbally how the subject felt during the exercises.

3.2 Results

Again significant REMANOVA effects of Immersion on the Interest/Enjoyment (Figure 4 left), Effort/Importance and Value/Usefulness IMI subscales are found (always $F(1,23)>5.6$, $p<0.027$), generally replicating the main findings of the previous experiment. This was underlined by the significant effects found on the SAM Happiness (Figure 4 right) and Excitement subscales, both in favor of the virtual reality world (High Immersion, both $F(1,23)>13.1$, $p<0.001$).

We also find main effects of Movement, on almost all IMI and SAM subscales (Perceived Competence, Interest/Involvement, Effort/Importance, Value/Usefulness, Happiness and Excitement, always $F(1,23)>6.8$, $p<0.016$), which indicated that movement is beneficial both to the motivation and to the way people feel.

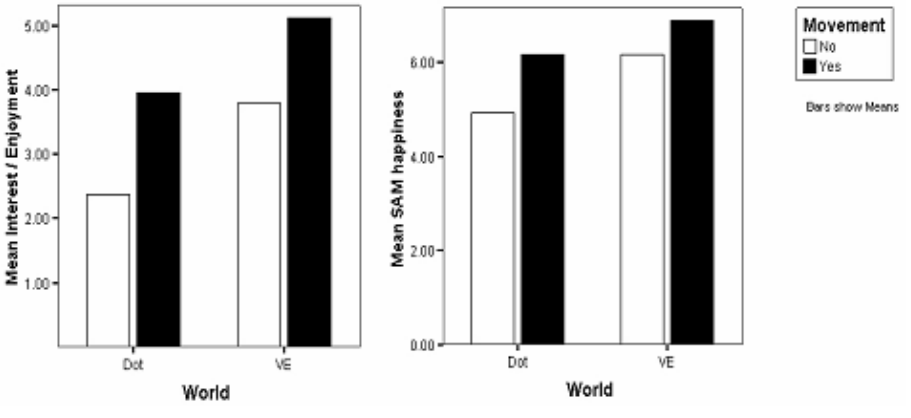

Fig. 4. Results for Interest/Enjoyment (left): Results for SAM Happiness (right)

However, we found no interaction effect between Movement and Immersion for any of the scales. This signifies that the gain in motivation achieved by adding virtual technology is not intrinsically related to the bicycling activity, since it is equally high in the condition in which no bicycling activity is present at all.

4 Conclusion

From these experiments we conclude that virtual reality technology can effectively be deployed to enhance motivation in the home fitnessing situation, at least in the first encounter. This enhanced motivation is directly related to the enhanced feeling of presence the technology offers, possibly offering escape into another world. On the other hand, the gain in motivation is not intrinsically linked to the activity itself, but rather an add-on brought by technology. Future challenges include the adaptation and evaluation of such prototypes for maintaining motivation during long term use.

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