

Virtual Cycling: the effect of a virtual coach and a virtual landscape on motivation in home fitnessing

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Introduction

It has been widely recognized that physical inactivity is an important risk factor for particularly cardiovascular diseases, and that, consequently, physical activity needs to be promoted. Although many people try to become more active to improve their health by initiating regular exercising at home, they find it difficult to stay motivated and continue their practice once absence of noticeable progress or boredom has eroded their initial enthusiasm. We explored elements that could help making home fitnessing a more motivating experience. We focused on evaluating the influence of a virtual coach providing feedback on measured heart rate, and of a virtual landscape, specifically as far as the motivation and experienced presence of the users are concerned. Presence refers to the sense of being present in the virtual landscape, which may lead to increased engagement with and enjoyment of the exercise.

Methods

A fully counterbalanced 2x2 within-subjects experimental design was used whereby participants were presented with 2 levels of the Virtual Coach **VC** (with or without) and 2 levels of immersion for the Virtual Landscape **VL** (high or low). We enrolled 24 subjects (13 males, 11 females, mean age 41.3 years) that were not engaged in frequent physical exercise to participate in a home cycling exercise using a stationary exercise bike. The VL was projected in front of them (screen size: 159 cm wide, 111 cm high), with the VC (if present) in the upper right corner. The 'high' VL was a highly detailed interactive visualisation of a cycling course, which responded to cycling speed and steering action, suggesting the subjects they were actively cycling through the landscape; the 'low' VL was an abstract non-interactive picture of a racetrack in bird's eye view with a moving dot showing the subject's position. The VC was a graphic animation of a female coach who provided feedback on measured heart rate by saying that the heart rate was 'too high', 'too low' or 'ok', and adding an explicit instruction (e.g. 'cycle faster'), to direct subjects towards a moderately active exercise intensity (60-70% of maximum heart rate). We measured heart rate (for feedback), motivation, presence and average speed. For motivation we used the validated Intrinsic Motivation Inventory (IMI), consisting of six subscales, and, for presence, the ITC Sense of Presence Inventory (ITC-SOPI), comprising four subscales. Subjects cycled through all 4 experimental conditions, and completed the questionnaires after each condition. Both questionnaires were analysed with repeated measures analyses of variance (REMANOVA) with VL and VC as independent factors.

Results

Table 1 shows the results for the 6 IMI scales. Interest/enjoyment, perceived competence, value/usefulness, and perceived control showed a significant increase for high VL. With VC present, value/usefulness was higher, and perceived control and pressure were lower. No significant interactions were found. Mean velocity, used as a corroborative behavioural measure of motivation, was significantly higher in the high VL ($v=23.8$ km/h) vs. low VL ($v=20.6$ km/h), ($F(1,23)=65.73$, $p<.001$). VC had no significant effects on speed. **Table 2** shows the results for the 4 ITC-SOPI scales. All scales were significantly higher for high VL. With VC present, participants reported more presence and less negative effects. No significant interactions were found.

Table 1: REMANOVAs of motivation scales

	VL		VC	
	F	p	F	p
interest/enjoyment	29.14	.00	0.30	.59
perceived competence	7.69	.01	0.68	.42
value/usefulness	9.01	.01	6.61	.02
perceived control	22.07	.00	37.41	.00
Pressure/tension	3.89	.06	21.78	.00
effort/importance	1.17	.29	3.85	.06

Note: all $F(1, 23)$, p values printed in bold $< .05$

Table 2: REMANOVAs of presence scales

	VL		VC	
	F	p	F	p
spatial presence	72.22	.00	9.45	.01
engagement	90.20	.00	2.62	.12
ecological validity	68.08	.00	1.53	.23
negative effects	4.16	.05	13.49	.00

Note: all $F(1, 23)$, p values printed in bold $< .05$

Discussion/Conclusion

This study shows that a more realistic VL, in which the user feels present, heightens the user's fun, and thus has a beneficial effect on the user's motivation. In this 'high' VL, subjects reported more interest and enjoyment, more perceived competence and control and – perhaps even more importantly – they cycled faster! Additionally, we found some effects of the VC providing feedback. Neither cycling speed nor intrinsic motivation was higher with VC. However, VC presence lowered perceived pressure and tension, which is good, and perceived control. This last finding is somewhat striking since we would expect control to increase with feedback. Perhaps receiving directions regarding the intensity of your workout counteracted this effect. In future studies we aim to disentangle these effects further and continue our efforts to make virtual cycling even better than the real thing.

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