

Effects of haptic seat feedback on spatial presence experiences in a racing simulation

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simulation**

Haptic feedback can enhance the user experience of audiovisual media. For example, research has found that stimulation by a haptic seat can support the experience of music (Danieau et al., 2012) or movies (Danieau et al., 2014). Findings on the effects of haptic feedback in interactive, non-VR media include positive effects of vibrotactile feedback on a racing game's levels of perceived realism and immersion (Kim & Kim, 2007), or the induction of a self-motion illusion in a driving simulator by force feedback (Bouyer et al., 2017).

Additional haptic information beyond the traditional audiovisual sensory channels is presumed to support the construction of mental models during media use (Tamborini & Skalski, 2006) and to increase experiences of presence (Biocca et al., 2002). In terms of Wirth et al.'s (2007) presence model, presenting media-congruent haptic stimuli could support the construction of spatial situation models of the mediated environment, as well as forming and maintaining a state of spatial presence.

The present study investigated the effect of haptic seat feedback on spatial presence experiences in a racing simulation. The effect was tested for both adding and for removing haptic feedback from the gaming experience. We hypothesized that adding haptic feedback would increase self-reported spatial presence experiences, whereas removing haptic feedback would decrease presence.

Methods

Sixty-four participants (4 excluded due to technical failures during sessions; age $M = 22.2$ years, $SD = 1.58$) were assigned to one of two groups in a one-factor, repeated measures design. In both groups, participants played a racing video game in two five-minute-sessions. The gaming setup included a 46" screen, stereo sound and a force feedback wheel. Haptic feedback was provided by a transducer attached to the player's seat. The input signal for the transducer was derived from low frequencies in the game's audio channel, thus providing a game-congruent, vibrotactile feedback. Group one played the game without haptic feedback in session 1, and with added haptic feedback in session 2. Group two played with feedback in session 1, which was then removed for session 2. Self-

report data on presence experiences were collected after each session using the Spatial Presence Experience Scale (Hartmann et al., 2015).

Acknowledgements

The present study has been conducted within the scope of the bachelor thesis of Yannik Hendel under instruction and supervision by Michael Brill and Frank Schwab.

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