

**Title:** Effect(s) of a motor interface used to navigate a virtual environment on cybersickness, presence and age

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**Introduction:** The use of Virtual Reality (VR) technology is growing despite cybersickness being a recurrent issue hindering a wider use. Theories around sensory integration try to provide relevant explanations about the cause of cybersickness (e.g., the neural mismatch theory, Reason and Brand, 1975). External and internal factors could be responsible for cybersickness (Servotte et al., 2020). Since aging is degrading our sensory perceptions, differences between young and older individuals might be visible in cybersickness and presence responses. However, Pala et al. (2021) did not find any significant differences in presence and cybersickness ratings between young and older adults using a HMD, whereas, according to the review made by Weech et al. (2019), cybersickness would rather depend on “presence”. Presence and sensory integration could be related as they are dependent to individual perception. In VR, the virtual environment (VE) is mainly perceived through visual inputs. Visually dependent individuals and the elderly tend to rely more on visual inputs than others (Eikema et al., 2012). Consequently, individual characteristics such as perceptual style could influence responses to VR exposure. Lastly, Seay et al. (2002) found that controlled navigation in a driving simulator (“passive” passenger versus “active” driver) increases presence and reduces simulator sickness. Therefore, active navigation could enhance perception thereby improving presence while reducing cybersickness. This paper studies the effect(s) of a joystick on navigation control in a virtual environment on cybersickness and presence (as dependent variables) in relation to age and perceptual style. Regarding Weech et al. (2019) review, we may formulate the following hypotheses: cybersickness is expected to be lower and presence to be higher in the active condition compared to the passive condition; cybersickness and presence are expected to be higher and lower in older individuals; cybersickness and presence are expected to be respectively lower and higher for visually dependent individuals whatever their age.

**Method:** The experiment consisted in immersing young and older individuals on two separate days to several VR exposures. The same VE was presented 3 minutes, 5 times each day. On the first day, individuals’ perceptual style was assessed using a modified rod and frame test. On one of the two days, they would control their navigation in the virtual environment using a joystick. On the other, their navigation path would be pre-recorded with no navigation control. These two conditions are respectively labelled as “active condition” and “passive condition”. In both conditions, individuals were standing on a force platform wearing a head mounted display (HTC Vive). After each VR exposure they had to fill the cybersickness questionnaire (Kennedy et al., 1993) and after each day the presence questionnaire (Witmer & Singer, 2004). Participants were instructed to collect “coins” in the active condition, but they get no feedback about the traveled distance on the path. Conditions were presented randomly. The trajectory of the center of pressure was recorded during each trial but these data will be presented over the next year.

**Results:** The experiment is in process and results will be presented at the conference. An ANOVA with condition, age and group as factors, and cybersickness and presence as dependent variables will be used to analyze the results.

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