

Effects of Virtual Reality During Rowing Ergometry on Presence, Perceived Exertion, and Exercise Enjoyment

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ABSTRACT

Physical inactivity is associated with a host of negative health outcomes. Approximately 80% of Americans do not meet minimum levels of recommended physical activity. Virtual reality (VR) may improve exercise outcomes by enhancing presence, decreasing perceived exertion, and increasing exercise enjoyment.

PURPOSE: To assess the effects of a proprietary VR interface on presence, perceived exertion, and exercise enjoyment during rowing ergometry. **METHODS:** First, we developed a novel VR software program for rowing ergometry. Subsequently, sixteen apparently healthy, recreationally active individuals (12M, 4F; 35.5 ± 13.9 y; 174.5 ± 10.1 cm; 80.4 ± 12.8 kg; VO_{2max} : 38.1 ± 5.6 mL/kg/min) were familiarized with the rowing ergometer and VR software, and then completed a VO_{2max} test during two separate sessions. Finally, subjects performed four, 30-min rowing sessions in a randomized, counterbalanced order at maximal voluntary intensity in four different conditions: 1) no augmented visual or audio stimuli (CON), 2) no augmented visual stimuli with self-selected music (MUS), 3) screen-based environmental display (SB), and 4) a virtual reality environment (VR). Presence (Spatial Presence Experience Scale), perceived exertion (Borg 6-20 scale), and enjoyment (Exercise-Induced Feelings Inventory) were assessed using questionnaires. Data (mean \pm SD) were analyzed by repeated measures ANOVA and appropriate Tukey's post hoc tests. Alpha was set at $P < 0.05$. **RESULTS:** Eight of twenty spatial presence items indicated an enhanced experience in VR vs. SB ($P < 0.05$). Perceived exertion (CON: 14.7 ± 2.1 ; MUS: 14.9 ± 2.0 ; SB: 15.2 ± 2.5 ; VR: 14.9 ± 1.7) and exercise-induced feelings were not different between conditions ($P > 0.05$). **CONCLUSION:** The pilot version of the VR software for rowing ergometry did not reduce perceived exertion or increase exercise enjoyment in recreationally active individuals, although it did facilitate improved user presence compared to a screen-based enhanced environment. Added features, such as better coupling of rowing intensity to boat velocity in VR may further enhance presence and immersion, thereby decreasing perceived exertion and increasing exercise enjoyment.