

The Effect of a Virtual Reality Exergame on Mood

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Study Protocol:

Participants contacted the email address associated with the study advertisements when interested in the study. All participants completed the Ohio State University's Virtual Reality and Human Subjects prescreening recommendations to determine eligibility in the study and were presented a copy of the consent form. Eligible participants were invited to participate in the study. Participants were provided a consent form and then directed to complete the demographic questionnaire, PHQ-8, the ATI, PANAS, and mood rating scale. Participants then watched a 2-minute clip from the movie *Lion King* to induce a sad negative mood state. After watching the clip, participants completed the PANAS and a mood rating scale.

Participants were then randomly assigned to a virtual reality condition (n=33) or a control condition (n=31). Participants were randomly assigned through block randomization based on previous virtual reality experience. After random assignment, participants engaged in either the virtual reality or control condition.

Participants in the virtual reality condition were wearing an Oculus Rift Quest. Visual boundaries were placed within the headset if participants moved too close to the edge of the play zone to prevent potential injury. Participants were informed that if they feel nauseous or dizzy at any time that they can discontinue the study without any loss of compensation. Participants played the game "The Climb" which is a game that simulates climbing various mountain courses. In the virtual reality condition, participants attempted to complete the first level of the course to reach the top of the mountain utilizing a series of arm reaching movements for up to 20 minutes.

Participants in the control condition watched a pre-recorded first-person viewpoint video of the researcher who has played the game "The Climb". Participants were asked to "please copy

all reaching and hand movements, as accurately as you can, as if you were the individual climbing”. Participants engaged with the activity for the full 9 minute and 53 second clip. Participants were able to hear the background audio through a front oriented speaker.

After completion of their activity, participants in both groups completed the PANAS, the mood rating scale, 2 TPI subscales, media feedback questions, and the net promoter score question. Participants were then debriefed about the study and received compensation.

Statistical Analysis:

A linear mixed effects model was used for the following: group level differences by condition with mood changes before and after condition experience; group level differences by condition with positive affect changes before and after condition experience; group level differences by condition with negative affect changes before and after condition experience; TPI scores significantly affected subjective mood changes; TPI scores significantly affected positive affect changes; TPI scores significantly affected negative affect changes; PHQ-8 scores moderated the subjective mood changes in the virtual reality group; PHQ-8 scores moderated positive affect changes in the virtual reality group; PHQ-8 scores moderated negative affect changes in the virtual reality group; ATI scores moderated subjective mood changes in the virtual reality group; ATI scores moderated positive affect changes in the virtual reality group; ATI scores moderated negative affect changes in the virtual reality group.

A simple regression analysis was used for the following: condition differences on spatial presence; condition differences on the presence as engagement scale; condition differences on helpfulness; condition differences on net promoter score. An additive multiple moderator analysis for repeated measures was used for the following: TPI scores moderated the subjective

mood changes in the virtual reality group; TPI scores moderated positive affect changes in the virtual reality group; TPI scores moderated negative affect changes in the virtual reality group.

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