

## **PROJECT ABSTRACT**

**Thomas Conner**  
**Ojaswirajanya Thebe**

The study of motivation for engaging in exercise remains a central topic of research in sport and exercise science, even while health studies continue to tout the importance of a regular regimen of physical activity. We propose to study one possible technological option for increasing exercise motivation.

**Research question:** How does the addition of an immersive virtual reality (VR) display affect an individual's motivation while exercising?

**Hypothesis:** We believe that the addition of a visual VR stimulus during basic walking exercises will enhance the measure and quality of motivation to continue exercising. In addition, we believe that the addition of VR will decrease people's perception of the amount of time they have actually exercised, eliminating preconceived notions of exercising being a scheduling difficulty and thus motivating them to exercise again and for a sufficient amount of time.

**Related work:** A variety of theories examine people's adherence to physical exercise regimens, many of which focus on the role of specific individual reasons for exercising as the primary determinant of long-term motivation to continue with the activity. General research into human motivation includes early behavioral compliance studies (Dishman & Ickes, 1980) and is led by Deci & Ryan's (1985, 1991) self-determination theory, featuring three facets of motivation: (a) amotivation, (b) extrinsic motivation, and (c) intrinsic motivation. This theory has been the basis for developments of measurements such as the Exercise Motivation Scale (EMS) (Li, 1999) and the Behavioral Regulation in Exercise Questionnaire (BREQ) (Mullan, Markland, & Ingledew, 1997). The most widely used tool for objective measurement of motivation specific to physical exercise, however, is the latest version of the Exercise Motivations Inventory (EMI-2) (Markland & Hardy, 1993; Markland & Ingledew, 1997), developed as a measurement of participation motives "in order to examine such issues as the influence of motives on exercise participation, how such motives might influence the choice of activities undertaken, how affective responses to exercising may be influenced by reasons for exercising and how involvement in physical activity might have a reciprocal influence on participation motives." The EMI and EMI-2 were developed specifically to examine motives from the perspective of Deci & Ryan's self-determination theory. The EMI-2 has been employed successfully in generating scalable results in numerous recent studies (Maltby & Day, 2001; Kilpatrick, Hebert & Bartholomew, 2005; Wilson, et al., 2006; Dacey, Baltzell & Zaichkowsky, 2008; Egli, et al., 2011).

Separately, studies of the impact of VR immersion on cognitive behaviors (Bailenson, Swinth, & Hoyt, 2005) and relation to environment (Marsh, Wright, & Smith, 2001; Ibanez & Delgado-Matab, 2009) support the link between VR presence and self-determination factors. Related to exercise, the addition of VR visuals has been shown to

increase motivation in children overall (Harris & Reid, 2005) and specifically to increase motivation to exercise in children with cerebral palsy (Bryanton, et al., 2006), while the same has been shown for adults in various rehabilitation contexts (Jack, et al., 2001; Merians, et al., 2002).

**Theoretical contribution:** Our study is driven by a desire to find positive uses for easy-entry VR technologies such as Google Cardboard, as well as to expand ways this technology can enhance and improve life rather than merely add narratives and entertain.

**Method:** This study will utilize a smartphone with Google Cardboard for the presentation of an outdoor scene (such as a park or landscaped street) through which the immersed VR user can experience visuals of forward movement in sync with their physical movement while walking on a treadmill. Some subjects will experience the VR while walking on a treadmill; others will walk without the VR experience. After a set time walking with or without the VR, subjects' motivation will be measured using the EMI-2 questionnaire. In addition, heart rate will be measured before, during, and after the exercise.

**Recruitment plan:** Subjects will be recruited by word of mouth among fellow students with access to the RIMAC gym facilities, where we will utilize the existing treadmills during non-peak hours. From this initial group of subjects, we will utilize snowball sampling to grow the pool of potential subjects.

**Risks:** There is a risk of the Cardboard apparatus not fitting properly, and of movement issues arising on the treadmill. While we will try to account for it, disorientation while wearing the Cardboard while on a treadmill may result.

## References

- Bailenson, J., Swinth, K., & Hoyt, C. (2005). The Independent and Interactive Effects of Embodied-Agent Appearance and Behavior on Self- Report, Cognitive, and Behavioral Markers of Copresence in Immersive Virtual Environments. *Presence*, 14 (4), 379-393.
- Bryanton, C., Bossé, J., Brien, M., McLean, J., McCormick, A. & Sveistrup, H. (2006). Feasibility, Motivation, and Selective Motor Control: Virtual Reality Compared to Conventional Home Exercise in Children with Cerebral Palsy. *CyberPsychology & Behavior*, 9 (2), 123-128.
- Dacey, M., Baltzell, A., & Zaichkowsky, L. (2008). Older adults' intrinsic and extrinsic motivation toward physical activity. *American Journal of Health Behavior*, 32 (6), 570-582.
- Deci, E. L. & Ryan, R. M. (1985). *Intrinsic Motivation and Self-determination in Human Behavior*. New York: Plenum Press.
- Deci, E. L. & Ryan, R. M. (1991). A motivational approach to self-integration in personality. In R. Dientsbier (Ed.), *Perspectives on Motivation*. Lincoln, Neb.: Univ. of Nebraska Press. 237-388.
- Dishman, R. K., & Ickes, W. (1981) Self-motivation and adherence to therapeutic exercise. *Journal of Behavioral Medicine* 4, 4, 421-438.

Egli, T., Bland, H. W., Melton, B. F., & Czech, D. R. (2011). Influence of age, sex, and race on college students' exercise motivation of physical activity. *Journal of American College Health*, 59 (5), 399-406.

Harris, K., & Reid, D. (2005). The influence of virtual reality play on children's motivation. *Canadian Journal of Occupational Therapy*, 72 (1), 21-29.

Ibanez, J. & Delgado-Matab, C. (2009). Lessons from research on interaction with virtual environments. *Journal of Network and Computer Applications*, 34, 268–281.

Jack, D., Boian, R., Merians, A. S., Tremaine, M., Burdea, G. C., Adamovich, S. V., Reece, M. & Poizner, H. (2001). Virtual reality-enhanced stroke rehabilitation. *Neural Systems and Rehabilitation Engineering, IEEE Transactions on*, 9 (3), 308-318.

Kilpatrick, M., Hebert, E., Bartholomew, J. (2005). College Students' Motivation for Physical Activity: Differentiating Men's and Women's Motives for Sport Participation and Exercise. *Journal of American College Health*, 54 (2), 87-94.

Li, Fuzhong. (1999). The exercise motivation scale: Its multifaceted structure and construct validity. *Journal of Applied Sport Psychology*, 11 (1), 97-115.

Maltby, J., & Day, L. (2001). The Relationship Between Exercise Motives and Psychological Well-Being. *The Journal of Psychology*, 135 (6), 651-660.

Markland, D. and Hardy, L. (1993). The Exercise Motivations Inventory: Preliminary development and validity of a measure of individuals' reasons for participation in regular physical exercise. *Personality & Individual Differences*, 15, 289-296.

Markland, D. & Ingledew, D.K. (1997). The measurement of exercise motives: Factorial validity and invariance across gender of a revised Exercise Motivations Inventory. *British Journal of Health Psychology*, 2, 361-376.

Marsh, T., Wright, P., & Smith, S. (2001). Evaluation for the Design of Experience in Virtual Environments: Modeling Breakdown of Interaction and Illusion. *Cyberpsychology and Behavior*, 4 (2), 225-238.

Merians, A. S., Jack, D., Boian, R., Tremaine, M., Burdea, G. C., Adamovich, S. V., ... & Poizner, H. (2002). Virtual reality-augmented rehabilitation for patients following stroke. *Physical Therapy*, 82 (9), 898-915.

Mullen, E., Markland, D., & Ingledew, D.K. (1997). A graded conceptualization of self-determination in the regulation of exercise behavior: Development of a measure using confirmatory factor analysis. *Personality and Individual Differences*, 23, 745-752

Wilson, P. M., Rogers, W. T., Rodgers, W. M., & Wild, T. C. (2006). The psychological need satisfaction in exercise scale. *Journal of Sport and Exercise Psychology*, 28 (3), 231-251.