An Analysis of Effects of VR Exercise on Physical and Mental Health

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Abstract

With technology advancing at an exponential rate, it is likely that virtual reality will soon become a integral part of life simply due to the fact it is applicable in so many areas. The purpose of our research was to perform a synthesis of virtual reality exercise research in order to gain a stronger understanding the current state of VR exercise and how it compares to traditional exercise methods physiologically and psychologically.

Physical Effects

➔The physical measures used in the studies were heart rate, blood pressure, and ECG patterns, and oxygen uptake, and caloric expenditure.

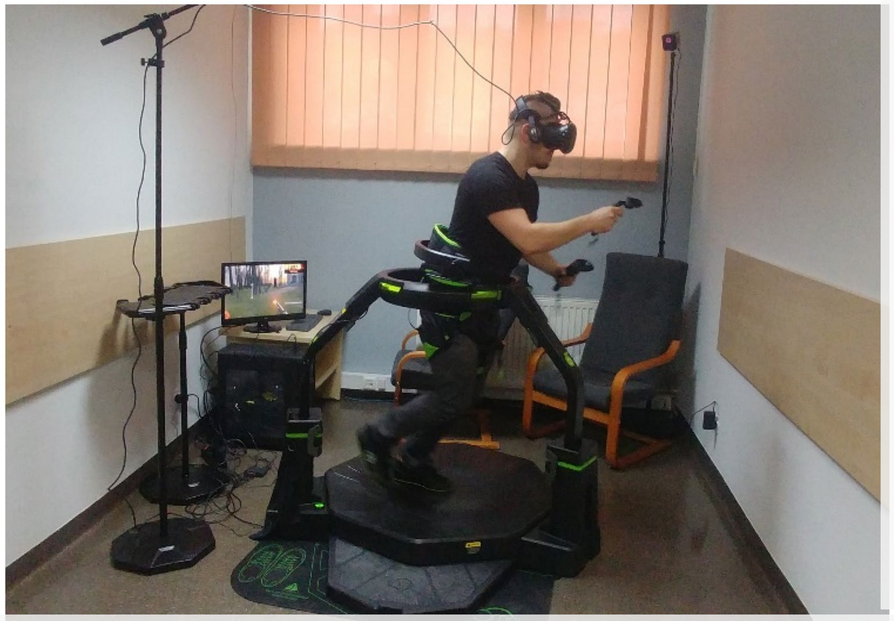
➔The studies used for our analysis had participants that were children, college students, and the elderly.

➔All studies gave a control treatment of exercising in an environment without VR, and a different treatment of exercising in a VR based environment. Some studies used a stationary bike, while one study used a treadmill.

➔In all studies, there wasn't a significant difference in VR immersed exercise and exercise without VR, but participants were more motivated to exercise in the VR immersed treatment.

➔One particular study showed that participants had increased average time, distance, and caloric expenditure due to motivation to continue the VR session longer than what was necessary (Chuang et al., 2003)

➔After analysis, the overall consensus is that it has potential to improve exercise, but there wasn't a significant difference and more studies need to be conducted to find a significant difference between VR and non-VR exercise.



A virtual reality system called the Omni Treadmill that allows a participant to exercise for the purposes of a research study (Debska et al., 2019). However, the most common form of VR exercise studied were cycling systems.

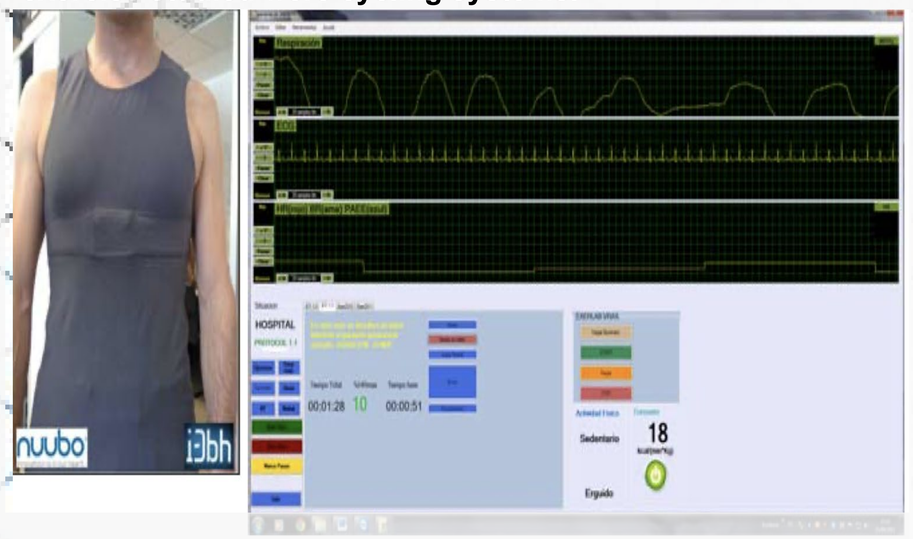


Photo depicting the Smart Shirt (TIAS) used by a study to read participants physiological responses (Guixeres et al., 2013).

Debska, M., Polechonski, J., Mynarski, A., & Polechonski, P. (n.d.). Enjoyment and Intensity of Physical Activity in Immersive Virtual Reality Performed on Innovative Training Devices in Compliance with Recommendations for Health. *INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH*, *16*(19). https://doi-org.libproxy.chapman.edu/10.3390/ijerph16193673

Guixeres, J., Saiz, J., Alcaniz, M., Cebolla, A., Escobar, P., Banos, R., Botella, C., Francisco Lison, J., Alvarez, J., Cantero, L., & Lurbe, E. (2013). Effects of Virtual Reality during Exercise in Children. *JOURNAL OF UNIVERSAL COMPUTER* , *19*(9), 1199–1218.

IJsselsteijn, W. A., de Kort, Y. A. W., Westerink, J., de Jager, M., & Bonants, R. (2006). Virtual Fitness: Stimulating Exercise Behavior through Media Te*SCIENCE*chnology. *PRESENCE -CAMBRIDGE MASSACHEUSSETTS-*, *6*, 688.

Jin-Kyung Kim, Jong-Eun Yang, & Tae-Young Lee. (2017). The effect of a VR exercise program on falls and depression in the elderly with mild depression in the local community. *Journal of Physical Therapy Science*, *29*(12), 2157. https://doi-org.libproxy.chapman.edu/10.1589/jpts.29.2157

Liu, W., Zeng, N., Pope, Z. C., McDonough, D. J., & Gao, Z. (n.d.). Acute Effects of Immersive Virtual Reality Exercise on Young Adults' Situational Motivation. *JOURNAL OF CLINICAL MEDICINE*, *8*(11). https://doi-org.libproxy.chapman.edu/10.3390/jcm8111947

Murray E. G., Neumann D. L., Moffitt R. L., Thomas P. R. (2016). The effects of the presence of others during a rowing exercise in a virtual reality environment. *Psychology of Sport and Exercise*, 22, 328-336. https://doi.org/10.1016/j.psychsport.2015.09.007

Takeaway Messages

➔Exercise with a VR environment hasn't shown a significant effect on participants' physical health compared to traditional exercise.

➔Participants had a significant increase in enjoyment and motivation for VR exercise compared to traditional exercise.

➔VR can be a powerful tool for physical activity and serve as a strong support system to motivate individuals to exercise, therefore increasing the physical benefits of exercise.

➔VR exercise has the potential to eventually become a competitor to traditional exercise methods.

➔More research and time to develop new technology will reveal more insight.

Mental Effects

➔Most common mental measures used were intrinsic motivation and enjoyment. Other common measures were calmness, tiredness, or perceived effort.

➔Participant's psychological measures were taken through questionnaires that depended on the study. Several studies chose to use existing, well established questionnaires such as the Intrinsic Motivation Inventory (IMI).

➔Nearly all studies reported their participants having increased motivation.

➔Various studies report participants having increased enjoyment and decreased anxiety as well as a decrease in the perception of physical exertion.

➔Though most studies involved young adults, one particular article found that VR exercise may have a positive effect on depression and mental health with the elderly (Kim et al., 2017).

➔After analysis, the overall consensus research studies have come to is that VR exercise can greatly promote PA by increasing participation and frequency, specifically with young adults.