INNOVATIONS IN HEALTH & WELLNESS:

VIRTUAL REALITY OFFERS THE PROMISE OF NEW ENVIRONMENTS IN WHICH TO LEARN, HEAL AND PERFORM

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Virtual Reality Offers the Promise of New Environments in which to *LEARN, HEAL AND PERFORM*

What happens when a technology that offers a controlled and easily accessible environment enters the workplace? Virtual reality (VR) is defined by Merriam Webster as "an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment" (Merriam-Webster, 2020).

In recent years, some media outlets have noted the poor sales and commercial use of VR headsets (Lawrie, 2020) (Jenkins, 2019) (Van Boom, 2017). One may interpret this as VR's inability to launch a consumer-based product with mass popular appeal, perhaps marking VR's inevitable decline. Other industries, such as construction (Bleasby, 2020) and medicine (Blumstein, 2019), do not share this myopia.

In fact, the ability to enter normally inaccessible spaces and practice activities with reduced risk (Martin, 2019) presents entirely new opportunities to individuals and institutions.

Research indicates VR's viability in pain management, post-stroke therapy, and limb rehabilitation

WHAT WE KNOW ABOUT VR GENERALLY

VR has proven its practical uses outside of entertainment, especially in the medical field. Since 2005, cerebral palsy therapy studies have benefitted from VR intervention, leading to "neuroplastic change… associated with enhanced functional motor skills" (You, 2005). Further research indicates VR's viability in pain management, post-stroke therapy, and limb rehabilitation (You, 2005) (Won, 2017) (Lin, 2019) (Patel, 2019).

Currently, VR is employed mostly as a support tool for exposure therapy because it can generate controlled and easily accessible environments (Martin, 2019).

Exposure therapy requires "a safe environment in which to "expose" individuals to the things they fear and avoid" ("What Is Exposure Therapy?", 2017). The intention is to reduce symptoms of anxiety during such encounters, such as heights or public speech. What does this all mean for VR's future? VR technology has already become an indispensable tool in many settings and continues to produce research-based results that show promise for its staying power.

WHAT WE KNOW ABOUT VR AT WORK

How can VR medical developments benefit the everyday business? It helps with human-centered design and accommodation that support health and productivity. Employers can conduct virtual walkthroughs to design accessible workspaces for those with mobility challenges (Budziszewski, 2011).

To acclimate workers to their responsibilities, leaders are able to provide a simulated setting that allows for trial-and-error without more critical workplace risk (Noguchi, 2019). This practice greatly parallels VR exposure therapy. Verizon workers reenact high-stakes scenarios, such as armed robbery, to recall and enact their safety protocol.

Such VR training can enhance the application of learned concepts and procedures in a relatively risk free context. Reduced employee risk translates to reduced financial and legal risk for the employer (Adarve Gómez, 2019).

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In addition to training applications, VR shows some promise for alleviating stress at work. Employers are already introducing non-VR based mindfulness meditation and resilience training in workspaces to help alleviate stress (West-Rosenthal, 2017) (Gelles, 2018). Mindfulness meditation has proven effective as an on-the-spot intervention with "four aspects of job performance - escalation of commitment, counterproductive work behaviors, negotiation performance, and motivation to achieve goals" (Hafenbrack, 2017). Even its brief usage has been shown to decrease psychological stress (Gregoire, 2014).

VR developers are tapping into this trend and developing multi-faceted products that utilize guided meditation, address social phobia, track health indicators, and incorporate biofeedback (Rogers, 2019) (Moreno, 2018). For example, VR companies often pair immersive nature scenes with slow breathing exercises, allowing participants to lower their heart rates, quiet their minds and reach heightened levels of wellbeing (Navarro-Haro, 2017) (Blum, 2019).

VR meditation applications provide an immersive environment for workers to lower their stress reactions and that's a good thing for employees and employers alike.

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HOW THIS INNVOATION WORKS

How does VR achieve stress reduction? There are two general approaches: "The first one is focused on generic environments filled with relaxing "narratives" to induce control over one's own body and physiological response, while the second one engages the user in virtual reality-mediated activities to empower his/her own abilities to regulate emotion" (Pizzoli, 2019). When transported to a comfortable and safe place, users experience a lowered heart rate and learn how to control their heart rate variability through a biofeedback response (Blum, 2019).

In exposure exercises, users balance the sense of "being there" with knowledge of the simulation, which, through iteration, reduces stress symptoms such as palpitation (Donat, 2017) and forehead tension (Crescentini, 2016). The appropriate approach depends on the context, user needs, and desired outcomes.

WHAT DO WE NEED TO KNOW MORE ABOUT

Despite its utility and promising future, VR still suffers from a paucity of evidence. For one, there is no standardized system to predict who will respond best to certain VR exercises ("Technology and the Future", n.d.). A major unanswered question is "which types of interventions make the most difference to therapeutic outcomes" (Martin, 2019). Sensory factors, such as tactile feedback and virtual scent (Tarantola, 2017), have not been explored as much as audio and visual stimuli. Additionally, some conditions such as anxiety (Oing, 2018) and depression (Jordan, 2018) do not respond as receptively to similar stimuli.

The VR of the future should focus on consistently identifying and implementing the most effective procedures for individual users in different contexts. Thus, a central challenge for VR is to develop more adaptable user-friendly designs and applications.

Without equitable accommodations for the differently abled, workplaces which implement VR may disadvantage certain employees

It cannot be overstated that, disregarding cost, VR can still be ill fit to those with differing abilities. If we reflect on the definition of virtual reality (Merriam-Webster, 2020), mentioned at the start, at no point does it exclusively identify sight and sound. Yet those two senses are given prime attention and, as a result, make VR very unapproachable for people with visual and hearing challenges. Some companies have integrated screen readers, such as TalkBack and VoiceOver, and text-magnification (Lewis, 2018) ("Tap Systems Introduces Support", 2018). Applications have been recalibrated to support those with mobility limitations (Hansen, 2019). Developers have incorporated foveated rendering (eye-tracking) (Stobing, 2020) and artificial intelligence (Greene, 2018) to reduce motion sickness.

Without equitable accommodations for the differently abled, workplaces that implement VR may disadvantage certain employees.

CONTEXT MATTERS

Notwithstanding the promising potential of VR solutions aimed at individuals, VR must also be assessed in relation to the context in which it is implemented. For example, what about changing the nature of the stressful work environment itself?

For some work environments it is difficult to imagine how stress exposure could be lowered -- think emergency room, battle field, active wildfire – and in those cases girding the individual worker to withstand stress more effectively has a logical appeal. Mindfulness meditation and resilience training can be important tools before and after stressful work situations or traumatic events.

However, there are elements in every day work settings that create stressful work environments for the average worker. We know that job structure and work climate

affect hypertension and work environment may represent "one of the most important risk factors for cardiovascular disease" (Rehkopf, 2017). Job stress is tightly linked to worker health and when "stressful situations go unresolved, the body is kept in a constant state of activation, which increases the rate of wear and tear to biological systems" (CDC/NIOSH, 1999).

Stressful work environments have real impacts on employee health, work injury rates, health care costs and sustainable business success (Jinnett, 2019). If an employer invests in mindfulness meditation and resilience training for employees and does nothing to change the underlying exposure to work stress in the workplace, they are potentially undercutting their investment in employee health and performance.

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TANGIBLE TIPS & EDUCATION

- Five Mindfulness Exercises for your office - WeWork
- How to Implement Mindfulness Training in the Workplace - ADP
- VR Meditation: The Path To Next-Gen Health and Happiness - Forbes
- New VR Tools Supporting Mental Health in the Workplace - Gartner
- Virtual Reality Therapy: Treating The Global Mental Health Crisis - TechCrunch
- Can Tech Help Manage Health in the Workplace? Corporate Wellness Magazine
- Virtual therapy and stress-busting apps: can tech support mental health at work? - The Guardian
- Can you use AR and VR to teach employees soft skills? - TechRepublic

REFERENCES

Adarve Gómez, C., Carval Castle, D. A., Restrepo Zapata, E. J., Villar-Vega, H. (2019, December 21). Una revisión de videojuegos de realidad virtual para aplicaciones de entrenamiento laboral. Revista CINTEX, 21(1), 64-70. doi:10.33131/24222208.346

Bleasby, J. (2020, January 27). Inside Innovation: Virtual reality can transform construction worker training. Daily Commercial News. Retrieved from https://canada.constructconnect.com

Blum, J., Rockstroh, C., Göritz A. S. (2019, September 20). Heart Rate Variability Biofeedback Based on Slow-Paced Breathing With Immersive Virtual Reality Nature Scenery. Frontiers in Psychology. doi:10.3389/fpsyg.2019.02172

Blumstein, G. (2019, October 16). Research: How Virtual Reality Can Help Train Surgeons. Harvard Business Review. Retrieved from https://hbr.org

Budziszewski, P., Grabowski, A., Milanowicz, M., et al. (2011, August 13). Designing a workplace for workers with motion disability with computer simulation and virtual reality techniques. International Journal on Disability and Human Development, 10(4), 355-358. doi:10.1515/IJDHD.2011.054

CDC/NIOSH, 1999. Stress at Work. Publication No. 99-101. Retrieved from https://www.cdc.gov/niosh/docs/99-101/default.html#Job%20Stress%20and%20Health

Crescentini, C., Chittaro, L., Capurso, V., et al. (2016, June 1). Psychological and physiological responses to stressful situations in immersive virtual reality: Differences between users who practice mindfulness meditation and controls. Computers in Human Behavior, 59, 304-316. doi:10.1016/j.chb.2016.02.031

Donat, J. C., Barbosa, M. E., Silva, G. R., Kristensen, C. H. (2017). Virtual Reality Exposure Therapy for Posttraumatic Stress Disorder of bank employees: A case study with the virtual bank. Contextos Clínicos, 10(1), 23-32.

Gelles, G. (2018, October 30). How to Be More Mindful at Work. The New York Times. Retrieved from https://www.nytimes.com

Greene, T. (2018, May 29). LG developed AI to cure VR motion-sickness. The Next Web. Retrieved from https://thenextweb.com

Grégoire, S., Lachance, L. (2014, August 10). Evaluation of a Brief Mindfulness-Based Intervention to Reduce Psychological Distress in the Workplace. Mindfulness, 6, 836-847. doi:10.1007/s12671-014-0328-9

Hafenbrack, A. C. (2017, June 1). Mindfulness Meditation as an On-The-Spot Workplace Intervention. Journal of Business Research, 75, 118-129. doi:10.1016/j.jbusres.2017.01.017

Hansen, JP., Trudslev, A. K., Harild, S. A., Alapetite, A., Minakata, K. (2019, May). Providing Access to VR Through a Wheelchair. CHI EA '19: Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems, 1-9. doi:10.1145/3290607.3299048

Jenkins, A. (2019, June 20). The Fall and Rise of VR: The Struggle to Make Virtual Reality Get Real. Fortune. Retrieved from https://fortune.com

Jinnett, K. (2019, May 20) Your Bad Work Environment May Be Raising Your Healthcare Costs. Employee Benefit News. Retrieved from https://www.benefitnews.com/opinion/workplace-stress-increasing-healthcare-costs

Jordan, S. W., Grindle, M., van Woerden, H. C., Kamel Boulos, M. N. (2018, July 6). Head-Mounted Virtual Reality and Mental Health: Critical Review of Current Research. JMIR Serious Games, 6(3). doi:10.2196/games.9226

Lewis, V. (2018, May 21). VR for VI: How Visually Impaired Students Can Use Virtual Reality. Perkins eLearning. Retrieved from https://www.perkinselearning.org/technology

Lin, H., Li, Y., Hu, W., et al. (2019). A Scoping Review of The Efficacy of Virtual Reality and Exergaming on Patients of Musculoskeletal System Disorder. Journal of Clinical Medicine, 8(6), 791. doi:10.3390/jcm8060791

Martin, S. (2019, June 24). Virtual Reality Might Be the Next Big Thing for Mental Health. Scientific American. Retrieved from https://blogs.scientificamerican.com

Merriam-Webster. (2020, Jan 19). Dictionary Definition of "Virtual Reality". Retrieved from https://www.merriam-webster.com/dictionary/virtual%20reality.

Lawrie, E. (2020, January 10). What went wrong with virtual reality? BBC News. Retrieved from https://www.bbc.com/news/business

Moreno, D. R. (2018, January 12). Virtual reality: a solution for work-related stress? Latin American Post. Retrieved from https://latinamericanpost.com

Navarro-Haro, M. V., López-del-Hoyo, Y., Campos, D., et al. (2017, November 22). Meditation experts try Virtual Reality Mindfulness: A pilot study evaluation of the feasibility and acceptability of Virtual Reality to facilitate mindfulness practice in people attending a Mindfulness conference. PLoS ONE, 12(11). doi:10.1371/journal.pone.0187777

Noguchi, Y. (2019, October 8). Virtual Reality Goes To Work, Helping Train Employees. National Public Radio. Retrieved from https:/www npr.org

Oing, T., Prescott, J. (2018, November 7). Implementations of Virtual Reality for Anxiety-Related Disorders: Systematic Review. JMIR Serious Games, 6(4). doi:10.2196/10965

Patel, J., Fluet, G., Qiu, Q., et al. (2019, July 17). Intensive virtual reality and robotic based upper limb training compared to usual care, and associated cortical reorganization, in the acute and early sub-acute periods post-stroke: a feasibility study. Journal of NeuroEngineering and Rehabilitation, 16(92). doi:10.1186/s12984-019-0563-3

Pizzoli, Silvia F. M., Mazzocco, K., Triberti, S. (2019, March 12). User-Centered Virtual Reality for Promoting Relaxation: An Innovative Approach. Frontiers in Psychology, 10, 479. doi:10.3389/fpsyg.2019.00479

Rehkopf, D., Modrek, S., Cantley, L.F., Cullen, M.R. (2017, February). Social, Psychological, And Physical Aspects of the Work Environment Could Contribute to Hypertension Prevalence. Health Affairs, 36(2). Retrieved from https://doi.org/10.1377/hlthaff.2016.1186

Rogers, S. (2019, March 28). VR Meditation: The Path To Next-Gen Health & Happiness. Forbes. Retrieved from https://www.forbes.com

Stobing, C. (2020 January 9). Tobii Brings Eye Tracking to VR Headsets for Faster Frame Rates. PC Magazine. Retrieved from https://pcmag.com

Tap Systems Introduces Support for Apple's VoiceOver Screen Reader. (2018, May 11). Market Watch. Retrieved from https://www.marketwatch.com

Tarantola, A. (2017, November 13). Smellable VR is coming whether you want it or not. Engadget. Retrieved from https://www.engadget.com

Technology and the Future of Mental Health Treatment. (n.d.). National Institute of Mental Health. Retrieved from https://www.nimh.nih.gov/health/topics/technology-and-the-future-of-mental-health-treatment/index.shtml

Van Boom, D. (2017, November 16). I gave up on VR, but I believe again. Sort of. CNET. Retrieved from https://cnet.com

West-Rosenthal, L. B. (2017, March 30). Why More Companies Are Incorporating Meditation Into the Workplace. Shape Magazine. Retrieved from https://www.shape.com

What Is Exposure Therapy? (2017, February). American Psychological Association. Retrieved from https://www.apa.org/ptsd-guideline/patients-and-families/exposure-therapy

Won, A. S., Bailey, J., Bailenson, J., et al. (2017). Immersive Virtual Reality for Pediatric Pain. Children, 4(7), 52. doi:10.3390/children4070052

You, S. H., Jang, S. H., Kim, Y., et al. (2005, August 15). Cortical reorganization induced by virtual reality therapy in a child with hemiparetic cerebral palsy. Cambridge University Press, 47(9), 628-635. doi:10.1017/S0012162205001234

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The Center for Workforce Health and Performance is an independent and objective source for scientific reports, educational resources, research & evaluation, and technical assistance on healthier, longer and more fulfilling working lives. CWHP fosters the use of evidence to support learning communities and promote the value of healthy work and healthy workers to employers, communities and society at large. By developing knowledge around workforce health and performance improvement and disseminating it widely through scientific and educational forums and regional learning communities, CWHP contributes to the adoption of evidence-based policies and practices that support healthier, longer and more fulfilling working lives, a healthier economy and, in turn, healthier and more productive communities.

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