Virtual Reality in Training

ANIRBAN DHAR,
Department of Fine Arts, Graphic Era Hill University,
Dehradun, Uttarakhand, India 248002

Abstract

Many industries have begun to utilise virtual reality (VR), and numerous studies have shown that technology can be beneficial in the classroom. Human or mechanical instructors who can guide the pupil through exercises are essential in training for skill development, but VR is quickly becoming the medium of choice. Six VR training projects were chosen for this analysis because of their ability to visualise the possibilities of VR in education. Training in simulated and real-world settings were compared for their effects on the trainees' ability to learn. Virtual reality training may be done at any time and in any place, and it is risk-free and reversible. The importance of features like pre-planning and feedback-providing functionality in VR applications cannot be overstated. Virtual reality (VR) has several applications, one of which being training and development of skills. Those working on virtual reality projects to train new skills might use the information in this page as a resource.

Keywords: virtual reality, training, simulation, content creation, personalization
DOI Number: 10.48047/nq.2019.17.05.2080 **NeuroQuantology 2019; 17(05):167-176**

Introduction:
The use of virtual reality (VR) technology has spread beyond the gaming and entertainment industries and into the domains of medicine, the military, and education. Virtual reality (VR) has been called a high-potential medium in a variety of sectors because it allows users to experience life-like events through real-time simulation and interaction using multiple sensory channels to produce 'Presence' [1,2]. Subjects who participate in trials using immersive media report feeling transported to a different world (or "presence") than the one they're in [2]. In particular, numerous studies [3] show VR's efficacy in teaching and learning. Hu-Au & Lee [4] argue that young students prefer VR because it helps them gain new perspectives, develop empathy, and visualise complex models by providing opportunities, increasing student engagement, providing constructivist (i.e., allowing students to construct their own knowledge from meaningful experiences), and authentic experiences. By providing learners with a wealth of dynamic and interesting content, virtual environments (VEs) can facilitate experiential learning [5].

The usefulness and potential applications of virtual reality (VR) in teaching and learning have been the subject of a number of research [6]. Knowledge and meaning, according to constructivist theory, are built by individuals as a result of their life experiences. They acquire new information by expanding upon what they already know [7]. First-person experience refers to an individual's direct participation in and analysis of a situation; second-person experience involves hearing about an event from another individual; and third-person experience involves interacting with a computer through an interface. However, the psychological process of a third-person learner becomes analogous to a first-person learner because to the immersion and engagement afforded by VR [3].

Skill development training calls for actual, hands-on contact between the trainee and the object being trained. In this study, physical activity is used to define skill development training, which is a type of learning that requires the participant to move a body component in order to complete a task. To do any task, you need to move your arms, legs, and every muscle in your body. The kinesthesia ability to perceive motion of limb or joint is linked to training for skill development, also known as the sensation or perception of movement. Clark and Horch's study of kinesthetic memory demonstrates that people can recall the precise location of their limbs even after long intervals [8]. Our bodies learn through doing, picking up on cues about how to do a task and eventually adopting those motions. The trainee's body moves in response to the sensors and haptics being used in the virtual reality instruction. The learner can make the necessary adjustments and remember them later. In business, training helps workers develop the skills they need to do their jobs well. It gives workers enough hope that they can advance in the company, improve productivity, and make fewer mistakes on the job. Companies see training as an investment since it yields high financial returns and reinforces the company's status as an industry leader [9]. This study will examine and evaluate previous VR initiatives and studies that have used experimentation to improve the learning impacts of VR. Between 2009 and 2018, six types of data were gathered across four distinct topics and projects.

The benefits of virtual reality (VR) for training in a variety of professions are demonstrated by these initiatives. The projects are thoroughly detailed in those references, and there is a wealth of data available for determining what may be gleaned from them. We next compare the virtual and real-world training in these projects to offer variables for design consideration after reviewing the advantages of using VR for skill development training, the fields in which VR was used for skill development training, and so on.

The Training Domains in Virtual Reality

In this article, we examine the benefits and drawbacks of using virtual reality (VR) for instruction across a variety of fields. The research team looked at 48 virtual reality training programmes and other materials. Five-and-a-half percent of the works relied on HMDs; six percent made use of mobile VR; ten percent made use of CAVE-like VR monitors; and twenty-seven percent didn't say which VR devices they utilised. An additional 11% made use of supplementary trackers or sensors, such as depth sensors, to acquire information about hand gestures.

Ten percent of navigation providers made use of high-tech gear like treadmills and motion platforms to provide really immersive user experiences. The needs of 21 percent of the works were met by using custom hardware such as Arduino or other 3D-printed elements. We found that 83% of the works we examined were simulation-based applications that recreated real-world situations in order to facilitate the completion of specific activities in virtual reality. A total of 71% of the works included some sort of user evaluation; on average, there were 34 ± 29 people participating.

(i) **Medical Training Using VR:** Regional anaesthetic (RA) simulators are used in conjunction with other training modalities such as video instruction, ultrasound guidance, and simulators [10]. The'see one, do one' method is traditionally used in RA training, in which trainees work under the direct observation of a senior and experienced surgeon. This method is time-consuming, expensive, and has varying degrees of success [11]. In 2009, O. Grottke et al. created a virtual reality (VR) based simulator that gave students the opportunity to hone their technical abilities in RA by virtually adopting a wide range of patient anatomies. Using the ViSTA virtual toolkit, the simulator app incorporates its collision detection, humanoid, interaction, and visual modules. Figure 1 depicts the implementation of a specialised haptic input device used for palpation to realistically pinpoint the injection spot prior to needle operation. This software provides a safe and adaptable training environment by combining visual and basic haptic representations with intuitive interactions and a convincing simulation. Because of its segmented algorithm, this simulator can be used for a wide variety of peripheral nerve blocks, representing a wide range of individual anatomical variations.

(ii) **Industry (Employee) Training VR:** Intuitive mining industry virtual reality teaching system based on HUDs.

The mining industry is very dangerous and hazardous, hence extensive training is essential for worker protection [13]. It is not safe to train miners to drill in the actual working environment. Physical damage to equipment, physical harm to the student, loss of reputation in business, etc. are all dangers associated with drilling that must be taken into account when providing training [14].

Zhang Hui created an easy-to-use VR mining training system in 2016 [12] that relies on head-mounted displays to provide a realistic experience. This project aimed to create an HMD [virtual reality headset, smartphone (Nexus 6P smartphone), and leap motion device with an HMD based intuitive type VR training system prototype] for use in deep mines drilling scenario training.

The user manipulates the virtual environment by moving their hands and engaging in drilling activities. The user can conduct complex gestures and movements inside the virtual world, controlling the virtual miner's hand in the manner depicted in figure 2. Then, 10 students participated in an experiment using both the HMD and the screen-based general training systems. HMD-based training was compared to screen-based instruction, and then to training using a joystick and wearable sensors.

Users' responses to surveys probing their experiences with immersion, intuitiveness, engagement, simplicity of use, and ease of learning formed the basis of the comparison. The results of training using HMDs were better in every category. The difference between the scores for immersion HMD based training (4.5 out of 5) and screen based training (1.5 out of 5) was substantial. After comparing the two, it became clear that the VR training system based on HMDs was the more user-friendly option. However, the wearable sensors did have one major limitation: they couldn't give the user any tactile feedback.

(iii) Safety Instruction Training VR: Training in Advanced Cardiovascular Life Support with a Virtual Reality Simulator Training in Advanced Cardiac Life Support (ACLS) can save the lives of those who are experiencing respiratory failures, as it is a time-sensitive and clinical team-based technique. Training involves both classroom instruction and hands-on practise with simulation equipment like the Heartsome and Anne Manikin [16], as the real-world setting is characterised by high stress and time-sensitive scenarios. A VR simulator was created by Vankipuram in 2014 [15] for use with ACLS. It's a virtual classroom that motivates, engages, and lets students act out realistic scenarios.

(iv) Application of VR in Disaster Response Training (Fire Safety): Firefighters have access to a wide variety of educational opportunities, but the general public rarely participates in fire safety drills and most of the education they receive consists of case studies, in-person lectures, and simulations of actual fires [17]. For the 2018 disaster response training [18], Rajit Pimpale created a virtual reality application.

As an alternative to traditional classroom or instructional learning, this project was designed to better prepare a disaster response team. It helps first responders deal with stressful situations better, too. As this research has shown, not only is virtual reality (VR) a fun and engaging medium, but it also offers a more realistic training platform for disaster management tactics.

(v) Personal Development VR: Using motion capture technologies, a virtual reality dance training system In the actual world, managing training, location, and the precise time that teachers and students attend sessions is difficult [22]. While watching videos can still be used as a learning tool when the instructor is not there, there is no feedback. The traditional method of dance tutoring includes useful resources for developing dancers. A major obstacle is the possibility of the dancers becoming hurt or irritated while learning [23]. When a trainee doesn't perform well, choreographers yell and scream, instilling terror in the trainees and causing chaos in the dance studio [24]. The trainees' ability to perform to their full potential will therefore be hampered by declining confidence levels.

In 2011 Chan et al. used motion capture technology to create a VR dancing instruction system [22]. Users of this system should wear motion capture devices, mimic the movements of a virtual instructor, and then receive feedback on how to make their movements more fluid. Motion analysis techniques are used in this project together with motion capture technology. The whole-body motion of the users is included in the analysis that this method delivers.

(vi) Military Training: We can now mimic many environmental circumstances, including day and night, various weather kinds, and other scenarios thanks to technology (Rushmeier et al., 2019; Shirk, 2019). Simulator software and realistic video games have started to be used by the military for training. The Flooding Control Trainer (FTC) was created by Hussain et al. (2009) to instruct new recruits in a variety of abilities at the U.S. Navy. Through the Aviator Training Next (ATN) programme, U.S. Aviation started to experiment with VR training as a complement to the conventional hands-on training. According to their first findings, VR training produced pilots with a same level of quality and competency to pilots taught in a real aircraft (Dalladaku et al., 2020). Real-world training conditions and some specialised tools or equipment frequently place limitations on traditional training approaches. Military personnel can practise their technical skills and enhance their cognitive abilities through VR training, which offers a safe, controlled virtual environment at a reasonable price (Zyda, 2005).

(vii) Interpersonal Skills Training: In addition to teaching highly specialised technical abilities, VR has also demonstrated promise for teaching interpersonal skills. The potential for rich interpersonal interactions, which are essential for the development of interpersonal skills, increases as VR technology and software advances, in part because of the psychological effect of "being there" (Colbert et al., 2016). Although there hasn't been much research on VR in training environments, it has recently demonstrated promise for examining communication in healthcare teams (Cordar et al., 2017). In addition, VR has shown potential in assisting individuals in collectively developing business ideas while resolving team roles along the way (Kiss et al., 2015).

According to Akdere et al. (2021a), VR has also shown promise in the development of intercultural competency. According to a recent meta-analysis, continued technological advancements put VR in a good position to provide training for human resource management, including topics like recruiting and selecting new hires as well as enhancing knowledge and abilities of current employees (Stone et al., 2015). In addition, VR is combining with other cutting-edge technologies, such haptic interfaces, to support worker training (Grajewski et al., 2015). The most important interpersonal traits are openness, empathy, and vocal and nonverbal communication. Here's how they're discussed:

Openness: Since cognitive development alone is insufficient for communication skill development, scholars have long recognised the significance of the affective and behavioural learning dimensions (Greene, 2003). Positive attitudes are necessary for effective communicators, who can best utilise organisational tacit knowledge as speakers, listeners, and senders. Intercultural competency is commonly acknowledged to include intercultural openness as a key element. Openness is thus an appropriate subject for the VR-based training simulations because it is such a well acknowledged and fundamental feature of intercultural communication. Given the nature of openness, a virtual reality (VR) environment offers special training opportunities that enable students to fully experience contentious themes and topics and, as a result, enable them to consider their personal convictions and ideas, building the competence for being open.

Empathy: Understanding the experiences, viewpoints, and feelings of another takes a sophisticated skill called empathy. Because cultural differences can serve as obstacles to such knowledge of others, intercultural empathy is particularly difficult. According to a recent study on the effectiveness of virtual reality settings for fostering empathy in psychology education, "VR-based simulations of psychopathology may offer a promising platform for delivering a constructionist approach" (Formosa et al., 2018). Similar to this, historians contend that a virtual reality (VR) setting is useful for assisting students in understanding historical empathy, articulating its significance, and addressing its teaching methods. Van Loon et al. (2018) investigated whether virtual reality (VR) is driven by higher empathy and whether the impact extends to presumably real-stakes behavioural games, and they reported that VR can promote prosocial behaviour towards others.

(a) Verbal and Nonverbal Communication : No matter what other elements a scholar may or may not include in different definitions of intercultural competency, verbal and nonverbal communication abilities remain a constant across all models (Spitzberg & Changnon, 2009). Roberts et al. (2016) showed "an approach in which a variety of nonverbal communication between client and therapist can be contextualised within a shared simulation, even when the client is at home and the therapist is in the clinic." They made sure that participants could employ nonverbal communication based on both the exposure experience and the immediate environment when using VR. Nonverbal communication can "support the conversational flow," "provide cognitive support," and "express emotions and attitudes," according to Allmendinger (2010), who examined "whether the actual use of nonverbal signals can affect the sense of social presence and thus help to establish and maintain the learner's motivation and provide support for structuring social interaction in learning situations."For intercultural competency, verbal communication is equally important. Chellali et al. (2011) stated that VR training "improves user's collaborative performance" in a study looking at how verbal communication might be improved in medical education through VR environments. According to Houtkamp et al. (2012), "users may experience higher levels of presence, engagement, and arousal when sound is included in the simulations."

Conclusion

Companies are working to enhance VR experiences by enhancing the resolution and field of vision of VR headsets. There are initiatives to enhance VR experiences from other angles as well, such as employing haptics to heighten the sense of presence (SoP). The haptics of VR experiences are frequently rather constrained in current practise. Fixed-shape controllers with a joystick are the norm in VR systems. A motor produces some basic vibrations that serve as the haptic feedback. The newest Valve controller, the Index, has hand recognition technology that can track finger movements. A technology called Wireality was created by Fang et al. (2020) that allows a user to feel the shape of virtual objects in the actual environment with their hands.

Other gadgets, besides haptics, work to increase VR's level of immersion in various ways. A person can experience more than 200 different scents in virtual reality with the FEELREAL Sensory Mask, for instance (FEELREAL, 2020). Pneumatic gloves that provide thermal feedback when a user interacts with virtual objects were created by Cai et al. in 2020 and are referred to as Therm Air Glove. A device called Ambiotherm was created by Ranasinghe et al. (2017) that simulates temperature and wind conditions in virtual reality by using a fan and other electronics. These gadgets can be used in future VR training apps to improve the immersion and realism of instruction.

References

1. Mihai Duguleana, Adrian Nedelcu, and Florin Barbuceanu, "Measuring eye gaze convergent distance within immersive virtual environments," Procedia Engineering, vol. 69, pp. 333-339, 2014, doi: https://doi.org/10.1016/j.proeng.2014.02.240.
2. Matthew Lombard and Theresa Ditton, "At the Heart of it all: The concept of presence," Journal of Computer Mediated Communication, vol. 3, issue. 2, 1997, doi: https://doi.org/10.1111/j.1083-6101.1997.tb00072.x.
3. Dorota Kaminska, Tomasz Sapinski, Slawomir Wiak, Toomas Tikk, Rain Eric Haamer, Ergils Avots, Ahmed Helmi, Cagri Ozcinar, and Gholamreza Anbarjafari, "Virtual Reality and Its Applications in Education: Survey," Information, vol. 10, issue. 10, 2019, doi: https://doi.org/10.3390/info10100318.
4. Elliot HU-Au and Joey J. Lee, "Virtual Reality in education: a tool for learning in the experience age," International Journal of Innovation in Education, vol. 4, no. 4, pp. 215-226, 2017, doi: https://doi.org/10.1504/IJIIE.2017.091481.
5. Mantovani Fabrizia, VR learning: Potential and challenges for the use of 3D environments in education and training, Towards Cyberpsychology: Mind Cognitions and Society in the Internet Age, Amsterdam: ISO Press, no. 12, pp. 207-225, 2011.
6. Veronica S. Pantelidis, "Reasons to use virtual reality in education and training courses and a model to determine when to use virtual reality," Themes in Science and Technology Education, vol. 2, pp. 59-70, 2009.
7. Dr. BADA and Steve Olusegun, "Constructivist Learning Theory: A paradigm for teaching and learning," IOSR Journal of Research & method in Education, vol. 5, issue. 6, pp. 66-70, 2015, doi: 10.9790/7388-05616670.
8. F. Clark and K. Horch, Kinesthesia, Handbook of Perception and Human Performance v.1 Sensory Processes and Perception, New York: Wiley-Interscience, vol. 1, pp. 1-62, 1986.

9. L. Maharani and I. Nurnida, "The effect of training on employees' performance," Journal of Secretary and Business Administration, vol. 2, no. 2, pp. 52-59, 2018, doi: https://doi.org/10.31104/jsab.v2i2.49.
10. O. Grottke, A. Ntouba, S. Ullrich, W. Liao, E. Fried, A. Prescher, T. M. Deserno, T. Kuhlen, and R. Rossaint, "Virtual reality-based simulator for training in regional anaesthesia," British Journal of Anaesthesia, vol. 103, issue. 4, pp. 594-600, 2009, doi: https://doi.org/10.1093/bja/aep224.
11. Ahtsham U. Niazi, Philip W. Peng, Melissa Ho, Akhilesh Tiwari, and Vincent W. Chan, "The future of regional anesthesia education: lessons learned from the surgical specialty," Canadian Journal of Anesthesia, vol. 63, pp. 988-972, 2016, doi: https://doi.org/10.1007/s12630-016-0653-7.
12. Alehandro Jarillo-Silva, Omar A. Domingue-Ramiez, Vicente Parra-Vega, and J. Patrico Ordaz-Oliver, "PHANToM OMNI Haptic device: kinematic and Manipulability," Electronics, Robotics and Automotive Mechanics Conference, pp. 193-198, 2009, doi: https://doi.org/10.1109/CERMA.2009.55.
13. Zhang Hui, "Head-mounted display-based intuitive virtual reality training system for the mining industry," International Journal of Mining Science and technology, vol. 27, issue. 4, pp. 717-722, 2017, doi: https://doi.org/10.1016/j.ijmst.2017.05.005.
14. Lilian A. Okwiri, "Risk Assessment and Risk Modelling in Geothermal Drilling," M.S. thesis, Dept. of Sustainable Energy Engineering, Iceland School of Energy, Ryejavik University, 2017.
15. Akshay Vankipuram, Prabal Khanal, Aaron Ashby, Mithra Vankipuram, Ashish Gupta, Denise DrummGurnee, Karen Josey, and Marshall Smith, "Design and Development of a Virtual Reality Simulator for Advanced Cardiac Life Support Training," IEEE journal of Biomedical and Health Informatics, vol. 18, no. 4, pp. 1478-1484, 2014, doi: https://doi.org/10.1109/JBHI.2013.2285102.
16. Polpun Boonmak, Suhattaya Boonmak, Somyong Srichaipanha, and Sujettana Poomsawat, "Knowledge and Skill after Brief ALCS Training," J Med Assoc Thailand, vol. 87, no. 11, pp. 1322-1314, 2004.
17. Paul H.Lee, Baoguo Fu, Wangting Cai, Jingya Chen, Zhenfei Yuan, Lifen Zhang, and Xiuhong Ying, "The effectiveness of an on-line training program for improving knowledge of fire prevention and evacuation of healthcare workers: A randomized controlled trial," Plos One, 2018, doi: https://doi.org/10.1371/journal.pone.0199747.
18. R. Pimpale, N. Prabhajaran and R. Kannadasan, "Application of VR in disaster response training," in Special Issue on ICAC SET'18, V. Kannan, E. Ramaraj and N. Venkatesan, Eds., vol. 119, no. 7, pp. 303-306, 2018.
19. Min Jiang, Wei Lan, Jian Chang, Mark Dodwell, Jeremy Jekins, Hui Jun Yang, Ruo Feng Tong, and Jian Jun Zhang, "A game prototype for understanding the safety issues of a life boat launch," Virtual Reality, vol. 22, issue. 2, pp. 137-148, 2018, doi:

https://doi.org/10.1007/s10055-018-0334-7.

20. Jinki Jung and Young Joong Ahn, Effects of interface on procedural skill transfer in virtual training Lifeboat launching operation study, Wiley, 2018, doi: https://doi.org/10.1002/cav.1812.
21. Kenichi Sasayama, JSMQA lifeboat 7 Launching Application Maintenance Engineering Training Course, Japan Ship-Machinery Quality Control Association, 2017.
22. Jacky C. P. Chan, Howard Leung, Jeff K. T. Tang, and Taku Komura, "VR dance training system using motion capture technology," IEEE Transactions on Learning Technologies, vol. 4, issue. 2, pp. 187-195, 2010, doi: 10.1109/TLT.2010.27.
23. Donna Krasnow and Steven J. Chartfield, "Dance Science and the Dance Technique Class," Impulse, vol. 4, pp.162-172, 1996.
24. Colbert, A., Yee, N., and George, G. (2016). The Digital Workforce and the Workplace of the Future. Acad. Manage. J. 59 (3), 731–739. doi:10.5465/amj. 2016.4003
25. Cordar, A., Wendling, A., White, C., Lampotang, S., and Lok, B. (2017). “Repeat After me: Using Mixed Reality Humans to Influence Best Communication Practices”, in 2017 IEEE Virtual Reality, Los Angeles, CA, March 18–22, 2017 (New York, NY: IEEE), 148–156
26. Kiss, L., Hámornik, B. P., Köles, M., Baranyi, P., Galambos, P., and Persa, G. (2015). “Training of Business Skills in Virtual Reality”, in 6th IEEE International Conference on Cognitive Infocommunications (CogInfoCom), Debrecen, Hungary, Sep 11–14, 2017 (New York, NY: IEEE), 215–216.
27. Grajewski, D., Górski, F., Hamrol, A., and Zawadzki, P. (2015). Immersive and Haptic Educational Simulations of Assembly Workplace Conditions. Proced. Comput. Sci. 75, 359–368. doi:10.1016/j.procs.2015.12.258
28. Greene, J. C. (2003). Handbook of Communication and Social Interaction Skills. London, United Kingdom: Psychology Press
29. Deardorff, D. K. (2006). Identification and Assessment of Intercultural Competence as a Student Outcome of Internationalization. J. Stud. Int. Educ. 10, 241–266. doi:10.1177/1028315306287002
30. Formosa, N. J., Morrison, B. W., Hill, G., and Stone, D. (2018). Testing the Efficacy of a Virtual Reality-based Simulation in Enhancing Users’ Knowledge, Attitudes, and Empathy Relating to Psychosis. Aust. J. Psychol. 70, 57–65. doi:10.1111/ajpy.12167
31. Allmendinger, K. (2010). Social Presence in Synchronous Virtual Learning Situations: The Role of Nonverbal Signals Displayed by Avatars. Educ. Psychol. Rev. 22, 41–56. doi:10.1007/s10648-010-9117-8
32. Chellali, A., Dumas, C., and Milleville-Pennel, I. (2011). Influences of Haptic Communication on a Shared Manual Task. Interact. Comput. 23, 317–328. doi:10.1016/ j.intcom.2011.05.002
33. Houtkamp, J. M., Toet, A., and Bos, F. A. (2012). Task-relevant Sound and User Experience in Computer-Mediated Firefighter Training. Simul. Gaming 43, 778–802. doi:10.1177/1046878112444564
34. Sho Botham, "Ethical Issues in the Training and Developing of Dance Teachers in the

Private Sector," Ph.D. dissertation, Dept. of Philosophy, University of Brighton, 2012.

35. [Mann, C. T., and Fischer, H. (2019). Recent Trends in Active-Duty Military Deaths.
36. Sweeney, S. K., Newbill, P., Ogle, T., and Terry, K. (2018). Using Augmented Reality and Virtual Environments in Historic Places to Scaffold Historical Empathy. TechTrends 62, 114–118. doi:10.1007/s11528-017-0234-9.
37. Dalladaku, Y., Kelley, J., Lacey, B., Mitchiner, J., Welsh, B., and Beigh, M. (2020). "Assessing the Effectiveness of Virtual Reality in the Training of Army Aviators", in Proceedings of the 2020 Annual General Donald R. Keith Memorial Capstone Conference, New York, NY, April 30, 2020.]
38. Fang, C., Zhang, Y., Dworman, M., and Harrison, C. (2020). "Wireality: Enabling Complex Tangible Geometries in Virtual Reality with Worn Multi-String Haptics", in Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, Honolulu HI, April, 2020 (New York, NY: Association for Computing Machinery), 1–10. Farmer, E., Van Rooij, J., Riemersma, J., and Jorna, P. (2017). Handbook of Simulator-Based Training. United Kingdom: Routledge. doi:10.4324/ 9781315253671 Feelreal (2020). Feelreal Multisensory Vr Mask. Available at: https://feelreal.com/ (Accessed May 10, 2020).
39. Ranasinghe, N., Jain, P., Karwita, S., Tolley, D., and Do, E. Y.-L. (2017). "Ambiotherm: Enhancing Sense of Presence in Virtual Reality by Simulating Real-World Environmental Conditions", in Proceedings Of the 2017 CHI Conference On Human Factors In Computing Systems, Denver, CO, May, 2017 (New York, NY: Association for Computing Machinery), 1731–1742
40. Jonathan Steuer, "Defining Virtual Reality: Dimensions Determining Telepresence," Journal of Communication, vol. 42, pp. 73-93, 1992, doi: https://doi.org/10.1111/j.1460-2466.1992.tb00812.x.