Correctional rehabilitation: Using virtual reality to treat offenders

Abstract: Clinicians have used virtual reality (VR) for learning, practice, and treatment for decades, but few efforts have been made to incorporate this technology into correctional rehabilitation. Advances in hardware and software, reductions in price, and the wide availability of VR systems now makes this more viable. This article introduces readers to this innovative technology and explains how VR can be used to enhance current rehabilitative efforts. Potential pitfalls for implementing this type of program are also discussed.

Virtual simulations have been used in a variety of ways to address real world problems. For decades, practitioners in medicine, psychology, and the military have used virtual reality (VR) to learn and train in a safe, secure, and controlled environment. Recent advances in VR have resulted in further investigation on how the technology can be useful in other ways. While practitioners in the criminal justice system have been using virtual simulations for forensic investigations and law enforcement training for decades, it is only within the past few years that there has been a serious discussion into how it can be used for correctional rehabilitation. As the technology continues to improve and become more widely available, VR can be a useful tool for practitioners to deliver high quality treatment to a larger group of offenders.

Defining Virtual Reality

The term *virtual reality* refers to any computer-generated environment that uses three-dimensional visualization software and special transmission devices, such as a head mounted display (HMD) or controllers, to provide user input within in the virtual world (Ticknor & Tillinghast, 2011). The goal of the simulation is for the user to experience the virtual world as a realistic representation of the real world. The human visual and auditory systems respond to computer-generated stimuli while in the simulation in an effort to achieve full *immersion* and *presence*. Immersion refers to the awareness the user has of the real world while in the virtual environment, while presence represents "the psychological state in which a participant accepts, interacts, and is physically, socially, and emotionally engaged in the virtual world" (p. 8).

While modern VR technology has been greatly improved, virtual simulators have been around for some time. Edward Link created the first flight simulator in 1929. This allowed pilots the ability to learn under safe conditions. The *Sensorama*, which allowed user to experience video, motion, smell, and other physical feedback, was invented in 1957 by Morton

Heilig. Heilig also invented the precursor to the modern HMD called the *Telesphere Mask* in 1960. By 1973, developers were creating computer-generated flight simulators. The technology has continued to advance over the past 50 years.

The actual term "virtual reality" was coined by scientist Jaron Lanier in 1987. He also created the virtual programming language (VPL) and produced the *DataGlove*, the first sensing glove that measured hand movements. The first HMDs were also introduced around this time through a collaboration between the National Aeronautics and Space Agency (NASA) and VPL Research. By the mid-1990s, however, exploration into the technology began to wane as the internet became more widely available. Many thought VR was too expensive for wide distribution and abandoned their research and product development. Advances within the last few years, however, have brought about new founded interested in how VR can be used for both entertainment and to solve real world problems.

Palmer Luckey developed the *Oculus Rift* after launching a crowdfunding campaign in 2012. Anyone who made a pledge of $300 or more received a prototype of the device. The company was later sold to Facebook in 2014 for an estimated $2 billion. Under new ownership, the *Rift* began selling the first quarter of 2016 for $599USD. The *HTC Vive* was also unveiled in 2016. This kit included the headset, two wireless controllers, and two room sensors. The package currently sells for $799USD. Additional hardware, such as the *Samsung Gear, Google Cardboard*, and *Sony PlayStation VR*, have also contributed to the expansion of the technology. Today, you can view content in a virtual world for as little as $15USD and the price of a smartphone.

Deloitte Global estimated that 2.5 million headsets and 10 million VR programs were sold in 2016 resulting in roughly a billion dollars worth of business. As the technology

continues to become more cost efficient and widely distributed, an industry is forming to expand the uses of VR. Scientists, researchers, and practitioners are finding new ways to incorporate this technology into learning, practice, and treatment.

Uses of Virtual Reality

Most people think of gaming or entertainment when they hear the term *virtual reality*; however, it has been used in a variety of ways over the last 30 years for other purposes. Fields of study, such as medicine and psychology, have been using VR for training and treatment with great success. Research and product development within these areas continues to expand and we are beginning to see VR being used in other areas as well.

Medicine

The military has a long history of using VR for training. In 2014, the Surface Warfare Medical Institute (SWMI) unveiled their medical simulation center used to train medics on emergency medical response and triage (U. S. Department of the Navy, 2014). The center has virtual reality rooms that also contain props to mimic different environments. They train personnel on over fifty different medical procedures while exposing them to conditions similar to what they might encounter in the field.

Civilian medical personnel have also used VR for training purposes. The company *Virtual Presence* developed the *Minimally Invasive Surgical Training – Virtual Reality* (MIST-VR) system to train doctors on incisions for laparoscopic surgery in the mid-1990s. Those who were trained on this simulator made significantly more correct incisions than those who had not (Gallagher, McClure, McGuigan, Crothers, & Browning, 1999). More recently, Stanford University released the *daVinci* Surgery Simulator in 2009 to train surgeons on various surgical techniques. Other modern systems include the *NeuroTouch* and *Microsoft Handpose*. These

systems use force feedback and a virtual representation of the patient to conduct remote operations.

Psychology

Psychologists have been using VR for decades for disorders such as obsessive-compulsive disorder, post-traumatic stress disorder (PTSD), and phobias (North, North, & Coble, 1998). Virtual reality exposure therapy (VRET) is used for patients who are unable to experience events or objects in the real world (Botella et al., 2007). Over time, patients are slowly exposed and desensitized from the source of their anxiety (Grillon, Riquier, Heberlin, & Thalmann, 2006). Many patients feel that this therapy is safer and less costly than traditional treatments (Riva, 2009; Wiederhold & Wiederhold, 2004). VRET has been shown to effectively reduce these types of disorders; outperforming both controlled conditions and in vivo treatments (Parsons & Rizzo, 2008; Powers & Emmelkamp, 2007; Wiederhold, 2004).

When combined with traditional cognitive behavior therapy (CBT), VR-CBT has been used to treat individuals with ADHD and conduct problems (Ceranoglu, 2010). During these sessions, clinicians focus on social skills training, coping strategies, and other techniques in order to reduce maladaptive behaviors (Anton, Opris, Dobrean, David & Rizzo, 2009). VR with cue-exposure therapy (VR-CET) has also been used to treat individuals with alcohol and/or drug dependence (Bordnick et al., 2009). The virtual simulation introduces high-risk situations to the patient. Participants learn about their triggers and acquire coping skills to avoid a relapse. VR-CET has led to statistically significant decreases in substance abuse (Lee, Kwon, Choi & Yang, 2007; Lee et al., 2009). Many of these techniques discussed here can also be used during treatment for criminal offenders.

Using VR for Correctional Rehabilitation

Current correctional treatment efforts often focus on behavior modification and cognitive behavior techniques to address antisocial attitudes and beliefs. Offenders engage in cognitive distortions that allow them to reinforce deviant behaviors (Van Voorhis, Braswell, & Lester, 2007). CBT attempts to correct these thinking errors by incorporating techniques, such as modeling, roleplay, and reinforcement, to change behavior. This treatment is often delivered in groups and can be used for offenders who are institutionalized or under community sanctions. Popular programs include *Thinking for a Change*, *Aggression Replacement Training*, and *Motivational Interviewing.* Several studies have confirmed that CBT is an effective form of treatment for the offender population (Andrews & Bonta, 2010; Andrews, Bonta, & Hoge, 1990; Hollin et al., 2008; Lipsey, Chapman, & Landenberger, 2001; Van Voorhis, 2006).

There have only been a handful of studies that have explored how VR can be used to compliment current rehabilitative efforts (see Ticknor, 2014; Ticknor & Tillinghast, 2011) and only one pilot, known to the author, that has actually implemented such as program (see Ticknor, 2017). VR can improve on traditional CBT by by offering a safe, controlled, and realistic environment for offenders to learn and practice. Group facilitators can use the virtual environment to model new skills. This provides participants the ability to actually see how the skill can be used rather than imagining it. Participants can then practice by roleplaying scenarios they might experience in the real world. Different scenarios can be created and used for graduated practice sessions. Furthermore, VR allows facilitators to tailor content to meet the needs of each offender.

Other features often available with VR could also be useful. Anything that occurs in the virtual environment can be recorded. This allows group facilitators the ability to provide feedback after the roleplay. This can be used to correct behavior and resolve any

misunderstandings. The recordings can also be used for opportunities to provide reinforcement for adaptive behavior.

VR-CBT is also a good solution for those who cannot physically come to group or who do not have access to quality services. While traditional group requires all participants to be in one location, VR allows participants who are physically anywhere in the world to share a single virtual environment with other group members. This could be invaluable in addressing responsivity issues, such as a lack of transportation or child care arrangements, or for those who do not have these types of services available in their local communities.

Finally, many offenders in the criminal justice system experience some of the disorders discussed previously. The National Commission on Correctional Health Care (2002) found that 14-20% of federal inmates and 22-30% of offenders in state prisons suffered from anxiety disorder. Over 90% of inmates who are in long-term solitary confinement also suffer from high anxiety (Haney, 2003). Individuals who suffer from PTSD are more likely to abuse substances and commit various criminal offenses including as drunk driving, possession of drugs, assault, and domestic violence (National Commission on Correctional Health Care, 2002). A national study found that nearly 70% of those incarcerated met the DSM-IV criteria for substance abuse (Karberg & James, 2005). VR has been used successfully to treat these types of disorders and could be a great compliment to traditional rehabilitative efforts.

Considerations

The potential benefits for incorporating VR into offender treatment are clear but there are additional considerations that are likely to be areas of concern when implementing this type of program.

Cost

The first barrier for most agencies will be cost. The costs required for the hardware and software to run a VR simulation could vary greatly. The hardware is typically the easier of these considerations as most people have a personal computer, tablet, or smartphone. Prices on HMDs vary but there are several pricing options available ranging from $15 - $800USD. The software is likely to be the most cost restrictive piece. Several companies now offer different software solutions. VR engines, such as *Unity* and *Unreal*, offer licencing to developers to create virtual simulations. Authoring software, such as *Second Life*, also offers monthly memberships for use of a customizable virtual environment. Both of these solutions, however, requires a technical person to create and maintain the software which adds on additional costs for staffing.

Virtual Rehab, with offices in New York, California, and Quebec, has taken an innovative approach to solving the cost issue. The company develops software comprised of real-life scenarios and provides curriculum on vocational job training, substance abuse, and psychological treatment. Their program is based on cognitive behavior and exposure therapy and is customizable. Each scenario includes a mix of both soft and hard skills; thus, elevating the offenders' self-awareness and social, professional, and behavioral skills. All actions and reactions are also tracked and saved for further analysis. Additionally, they offer a hardware package that includes the use of the *HTC Vive* HMD and a personal computer. For a monthly or annual fee, agencies can obtain all the hardware and software needed to run the program. Technicians from the company setup and train staff and provide ongoing support. This would be a good solution for agencies looking to bundle their solution or those without specialized staff to create and maintain their system.

Training

Another consideration is the additional training required to run and participate in the virtual simulation. Facilitators and participants must be training on how to use the software and hardware. This may present issues for those who are not technologically savvy. Once developed, however, most VR programs provide a user-friendly interface so anyone with basic computer knowledge can use the program and requires minimal training.

A specialized curriculum should be used that would assist facilitators in optimizing the features of the virtual world. This would include the ability to teleport to different scenes, incorporate various objects into the scenarios, enhanced security options, and using the recording feature. A specialized VR-CBT curriculum would take advantage of these features. This would require additional training and the cost of the curriculum.

Physiological Responses

There are also physiological responses that must be considered and these will vary between each participant. Some users experience cybersickness during the simulation. This is similar to motion sickness with symptoms including from eye strain, headache, and vertigo. The quality of graphics and response time typically cause cybersickness but age, gender, and existing medical conditions may also play a role (LaViola, 2000).

Conclusion

VR has been used to treat a variety of disorders for decades. Many of these disorders are found in individuals who are under the control of the criminal justice system. VR has also been used to enhance the effects of both cognitive behavior and exposure therapy with great success. The availability and distribution of this technology has grown significantly over the past two years making it more viable to incorporate into offender rehabilitation. The lack of resources and ever-shrinking budgets makes it difficult for many agencies to provide access to effective

treatment for their clients. This technology has the potential address many of these issues and to revolutionize correctional rehabilitation as we know it. While VR may not be a solution for every offender in the criminal justice system, it can be a useful tool to assist practitioners in treating and reintegrating many people back into society.

References

Andrews, D. A., & Bonta, J. (2010). *The psychology of criminal conduct*, 5th ed. Cincinnati, OH: Anderson.

Andrews, D. A., Bonta, J., & Hoge, R. D. (1990). Classification for effective rehabilitation: rediscovering psychology. *Criminal Justice and Behavior, 17*, 19-52.

Anton, R., Opris, D., Dobrean, A., David, D., & Rizzo, A. (2009). Virtual reality in the rehabilitation of attention deficit/hyperactivity disorder. *Journal of Cognitive and Behavioral Psychotherapies, 7*, 235-246.

Bordnick, P. S., Copp, H. L., Traylor, A., Graap, K. M., Carter, B. L., Walton, A., & Ferrer, M. (2009). Reactivity to cannabis cues in virtual reality environments. *Journal of Psychoactive Drugs*, *41*, 105-112.

Ceranoglu, T. A. (2010). Video games in psychotherapy. *Review of General Psychology, 14*, 141-146.

Gallagher, A.G., McClure, N., McGuigan, J., Crothers, I., & Browning, J. (1999). Virtual reality training in laparoscopic survey: A preliminary assessment of minimally invasive surgical trainer virtual reality (MIST VR). *Endoscopy, 31*(4), 310-313.

Grillon, H., Riquier, F., Heberlin, B., & Thalmann, D. (2006). Virtual reality as therapeutic tool in the confines of social anxiety disorder treatment. *International Journal on Disability and Human Development*, *5*, 243-250.

Haney, C. (2003). Mental health issues in long-term solitary and supermax confinement. *Crime & Delinquency, 49*, 124-156.

Hollin, C. R., McGuire, J., Hounsome, J. C., Hatcher, R. M., Bilby, C. A. L., & Palmer, E. J. (2008). Cognitive skills behavior programs for offenders in the community: A reconviction analysis. *Criminal Justice and Behavior, 35*, 269-283.

Karberg, J. C., & James, D. J. (2005). *Substance dependence, abuse, and treatment of jail inmates, 2002*. Washington, DC: U.S. Department of Justice, Bureau of Justice Statistics.

LaViola, J. J., Jr. 2000. A discussion of cybersickness in virtual environments. *ACM SIGCHI Bulletin, 32*, 47-56.

Lee, S. H., Han, D. H., Oh, S., Lyoo, I. K., Lee, Y. S., Renshaw, P. F., & Lukas, S. E. (2009). Quantitative electroencephalographic (qEEG) correlates of craving during virtual reality therapy in alcohol-dependent patients. *Pharmacology, Biochemistry and Behavior, 91*, 393-397.

Lee, J., Kwon, H., Choi, J., & Yang, B. (2007). Cue-exposure therapy to decrease alcohol

craving in virtual environment. *CyberPsychology & Behavior*, *10*, 617-623.

Lipsey, M. W., Chapman, G. L., & Landenberger, N. A. (2001). Cognitive behavioral programs for offenders. *The ANNALS of the American Academy of Political and Social Science, 578*, 144-157.

National Commission on Correctional Health Care. (2002). *The health status of soon-to-be released inmates, volume 1*. Washington, DC: U.S. Department of Justice, National Institute of Justice. http://www.ncjrs.gov/pdffiles1/nij/grants/189735.pdf.

North, M. M., North, S. M., & Coble, J. R. (1998). Virtual reality therapy: An effective treatment for psychological disorders." In G. Riva (Ed.), *Virtual reality in neuro-psycho-physiology*. Amsterdam, Netherland: Ios Press.

Parsons, T. D., & Rizzo, A. A. (2008). Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias: A meta-analysis. *Journal of Behavior Therapy and Experimental Psychiatry*, *39*, 250-261.

Powers, M. B., & Emmelkamp, P. M. (2007). Virtual reality exposure therapy for anxiety disorders: A meta-analysis. *Journal of Anxiety Disorders*, *22*, 561-569.

Riva, G. (2009). Virtual reality: an experiential tool for clinical psychology. *British Journal of Guidance & Counseling*, *7*, 337–345.

Ticknor, B. (2017). Creating a Virtual Environment for the treatment of offenders: Pilot 1.0. *Corrections Today*, *58*, 46-50.

Ticknor, B. (2014, November 14). How virtual reality can help treat sex offenders. *The Conversation.* Retrieved from http://theconversation.com/how-virtual-reality-can-help-treat-sex-offenders-33955.

Ticknor, B. & Tillinghast, S. (2011). Virtual reality and the criminal justice system: New possibilities for research, training, and rehabilitation. *Journal of Virtual Worlds Research, 4*(2), 4-44.

U.S. Department of the Navy. (2014). *Virtual simulation training prepares hospital corpsman for reality* [Press release]. Retrieved from http://www.navy.mil/submit/display.asp?story_id=79265.

Van Voorhis, P. (2006). Comprehensive evaluation of cognitive behavioral programs in corrections-guidelines and approaches. In B. Glick (Ed.), *Cognitive behavioral interventions for at-risk youth*. Kingston, New Jersey: Civic Research Institute.

Van Voorhis, P., Braswell, M., & Lester, D. (2007). *Correctional counseling and rehabilitation*, 6th ed., Cincinnati, OH: Anderson Press.

Wiederhold, B. (2004). *Conquering panic, anxiety, and phobias: Achieving success through virtual reality and cognitive-behavioral therapy.* Virtual Reality Medical Center Publications.

Wiederhold, B. K., & Wiederhold, M. D. (2004*). Virtual reality therapy for anxiety disorders: Advances in evaluation and treatment*, 1st ed. American Psychological Association.