Using Virtual Reality to Treat Offenders: An Examination

Bobbie Ticknor
Valdosta State University, United States of America

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 make 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.

Keywords: Correctional Rehabilitation, Virtual Reality, Offender Treatment, Criminal Justice, Evidence-Based Practices.

Introduction
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. This article introduces the concept of VR from the angle of offender rehabilitation.

1. What is 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 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 how to fly 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 more advanced computer-generated flight simulators. The technology has continued to advance over the past 50 years.

The 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 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 and web development became the focus of resources for many businesses. Many people thought VR was too expensive for wide distribution at this time 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 crowd-funding 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 has reduced in cost and become more widely distributed, an entire new industry is forming to expand the uses of VR. While VR is still strongly associated with entertainment, scientists, researchers and practitioners are finding new ways to incorporate this technology into learning, practice and treatment.

2. 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.
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 tests and procedures.

Practitioners in criminal justice have also used VR for training. VR simulators have been primarily used for weapons training for police officers. Early use of force simulators used projectors and air-powered rifles to expose officer to conditions they might find in the field. More modern simulators, such as the Firearm Training System (FATS) and VirTra V-300™, use high-definition camera, surround sound and haptic feedback devices for lethal and non-lethal weapons training. Studies show that recruits who use simulator training for weapons training take more use of force prevention actions, have lower rates of unintentional shooting and feel more prepared for field work than those who trained without the simulator (Davies, 2015; Helsen & Starkes, 1999).

Recent advances in the technology have also made VR an attractive tool to use during forensic investigations. Immersive Virtual Environment Technology (IVET) allows technicians, investigators and even those in the courtroom workgroup to experience a crime based on the forensic evidence of the case (Bailenson, Blascovich & Beall, 2006). These systems provide a three-dimensional reconstruction of the crime scene and often include augmented reality so that individuals can interact with the objects in the scene. There has been some concern about using VR in the courts, however (Leonetti & Bailenson, 2010). One side may have a disadvantage if either the prosecution or the defense does not have ample financial or technical resources to use the technology. Other criticisms surround the use of witness statements to create the simulation. Even with these concerns, technicians and investigators are using VR to gain a better understanding of what happened when a crime has been committed. Many of the criticisms being raised are less about using VR for investigative purposes but are focused on how the technology is used in court to determine guilt or innocence.

While VR simulations have been used by the criminal justice system for training and investigations, it is only recently that VR is being considered for use with correctional rehabilitation. This new exploration into the technology is based on decades of research out of psychology. Psychologists have been using VR for past thirty years 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 combined with VR-CBT to treat individuals with alcohol and/or drug dependence (Bordnick et al., 2009). The virtual simulation places the patient in high-risk situations they might find in the real world. Participants learn about their triggers and acquire coping skills to avoid a relapse. These programs have led to statistically significant decreases in substance abuse (Lee, Kwon, Choi & Yang, 2007; Lee et al., 2009). These techniques can also be used during behavior modification treatment for criminal offenders.

3. Using VR for Correctional Rehabilitation

Current correctional treatment efforts often focus on changing behavior and addressing cognitive distortions commonly associated with 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, role-play and reinforcement, to change thinking errors and, ultimately, behavior.

Individuals are taught a variety of skills to help them deal with problematic thoughts and situations. A trained facilitator teaches new skills and asks participants to apply them to their lives so they see the value of what they are being taught. Each skill is broken down into steps so it can be replicated. The facilitator will then model the skill so participants can see exactly how to use it. Participants role-play a scenario where they can use the skill. The facilitator will briefly review the scenario with each participant to ensure it captures the desired intention and will result in prosocial execution of the skill. After the role-play, the facilitator provides immediate feedback to each participant and any co-actors that joined the scenario. Homework is assigned at the end of the group so participants can practice what they learned.

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). These programs could be enhanced by incorporating VR into the curriculum.

4. Implementation

VR can improve on traditional CBT by offering a safe, controlled and realistic environment for offenders to learn and practice new skills. Group facilitators can use the virtual environment to model each skill. This provides participants the ability to actually see how the skill can be used rather than imagining it. Additional features, such as
embedded videos, music and other software, can be used to enhance the skill training portion of group.

Once trained, participants can then practice their new skill by role-playing scenarios they might experience in the real world. This might include a street scene, classroom, or night club, to name a few. Different scenarios can be created depending on the needs of each participant in the group. This allows facilitators to tailor content to focus on specific problems. Additionally, new environments or experiences can be used to facilitate graduated practice sessions.

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 role-play. 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 groups require 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 already been used successfully to treat these types of disorders and could be a great compliment to traditional rehabilitative efforts (Bordnick et al., 2008; Botella et al., 2007; Lee, Kwon, Choi, & Yang, 2007; Lee et al., 2009; Kuntze et al., 2001; Wiederhold, 2004).

Recent Exploration

There have only been a handful of studies that have specifically explored how VR can be used to compliment current criminal offender rehabilitation efforts (see Ticknor, 2014; Ticknor & Tillinghast, 2011). Those presently exploring VR for offender treatment commonly focus on how VR can be used for substance abuse treatment rather than behavior modification. As previously suggested, programs that incorporate VR have been strongly supported in the psychology literature for both substance abuse and conduct disorders. There have been two studies that have looked at how to incorporate the technology into assessment and traditional offender behavior treatment.

Massil Benbouriche and colleagues at the University of Montreal used a combination of Penile Plethysmography (PPG) and gaze time to assess sex offenders in 2014. They used a VR cave to display sexually explicit material and recorded the participant’s physiological responses. They measured gaze time and eye movements using the HMD. They also measured the participant’s response through the PPG. This tool measures the blood flow
to the penis and is commonly used as a measure of sexual arousal. They concluded that using VR and these devices provided similar results to other methods more commonly used to evaluate deviant sexual responses making it a viable method to assess sex offenders (Seidman, 2014).

Another study evaluating how VR can be used in correctional rehabilitation was conducted by the present author (see Ticknor, 2017 for more details). The pilot, nicknamed the Virtual Environment for the Treatment of Offenders (VETO), took place in June of 2013 at a juvenile residential facility in Ohio. This pilot represented a feasibility study to evaluate if VR could be used to enhance traditional CBT for offenders. Participants met with a CBT Master Trainer for one-hour sessions, three days a week for ten weeks. A pre- and post-survey were given to each participant. There were several strengths and weaknesses noted in this pilot study.

All of the juveniles who participated in the pilot study had been in traditional group treatment previously. When asked to compare their experiences, participant responded that learning new skills and role-playing in a virtual environment was much more engaging than their previous groups. They also felt more open to discuss their experiences and ask questions. The facilitator commented on the security features in the software that allowed for behavior management. She also felt that the recording feature offered her more ways to provide feedback and reinforcement. A main benefit cited was the ability to have members in the group that were physically in different locations. This could prove useful for those who do not have access to services in their area.

Some weaknesses were also noted. There was a learning curve to the software. The facilitator received basic training on using the software. It became obvious very quickly that she needed additional training on how to use the security features and what tools can be used to optimize the virtual experience. Additionally, the group was conducted using a traditional skill streaming curriculum. While the facilitator was able to successfully use the virtual environment for training, role-playing and feedback, other features in the software were not used that may have increased the effectiveness of the treatment. Finally, there was some discussion about the resources required to implement this sort of a program throughout the facility. These issues are further explored in the following section.

**Additional 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. 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 licensing to developers to create virtual simulations. Authoring software, such as Sansar, 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 curriculum for
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. They offer a hardware leasing package consisting of the HTC Vive HMD and a computer to run the program. They offer both a monthly and year fee to agencies so they can obtain all the hardware and software needed to run the program. Specialists setup and train staff on the product. Ongoing support is also offered. This might be a good solution for agencies looking to bundle their solution at a reduced cost or those without specialized staff to create and maintain their system.

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 require 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.

There are also physiological responses that must be considered and these will vary between each participant. Some users experience cyber-sickness 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 cyber-sickness 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 but mostly by psychologist. Many of these disorders are found in individuals who are under the control of the criminal justice system. Specifically, VR has been used to increase treatment outcomes for anxiety, conduct disorder and substance abuse. The technology has also been used to enhance the effects of both cognitive behavior and exposure therapy with great success. CBT is one of the most common treatment modalities used for behavior modification with criminal offenders. It stands to reason that criminal justice clinicians and practitioners could also benefit from incorporating VR into correctional rehabilitation programming. The availability and distribution of this technology has grown significantly over the past two years making it more viable to incorporate into offender rehabilitation.

Using VR for correctional rehabilitation offers several advantages over tradition offender treatment. First, VR can be used to demonstrate, role-play and model skills in a more realistic environment. Offenders can see how the skill can be used in scenarios that mimic what they might actually encounter in their everyday lives. Second, the software inherent in the virtual environment can assist facilitators in providing feedback, correcting behavior and use reinforcement when the targeted behavior is achieved. Finally, conducting a group in a virtual environment provides opportunities for treatment for those who would not otherwise have access. The virtual group members can converge in one virtual environment but physically be anywhere in the world. This may be especially
helpful for facilities who do not have trained staff to conduct treatment groups or those offenders who live in rural areas who may not have these resources available. While the extra cost and potential physiological limits of some offenders may be barriers for some criminal justice agencies, many agencies can incorporate this technology relatively easy, providing new and innovative strategies to increase treatment options and dosage.

The lack of resources and ever-shrinking budgets makes it difficult for many criminal justice agencies to provide access to effective treatment for their clients. This technology has the potential to 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


