

## Chapter 10

### Beyond the Prison Walls:

# The Development and Use of Virtual Reality in the Psychological Intervention for Persons-in-Custody in Hong Kong

Dr. Charles W. H. PAU, Ms. Daisy H. M. YEUNG, Mr. Jim H. K. CHEUNG, Mr. C. P. WOO  
Clinical Psychologists, CSD

### Definition of Virtual Reality

Fuchs and Guitton (2011) defined virtual reality (VR) as “a scientific and technical domain that uses computer science and behavioural interfaces to simulate in a virtual world the behaviour of 3D entities, which interact in real-time with each other and with one or more users in pseudo-natural *immersion* via sensorimotor channels.” It highlights **interaction and immersion** as the two key elements of VR, as compared to the usual three-dimensional environment, and this will be the focus of adopting VR for psychological interventions.

### Background

The Correctional Services Department (CSD) is committed to applying innovative technology to cater for the custodial and rehabilitation needs of persons-in-custody (PICs). As one of the main providers of rehabilitation services to PICs, the Task Group on the Application of Modern Technology on Psychological Service<sup>1</sup> of the Psychological Services Section 1 (PSS1) has been attempting to incorporate technology into the psychological intervention for PICs. One of the main challenges facing clinical psychologists working in prisons is conducting clinical work in a relatively isolated environment with limited social stimuli. The considerable difference between the penal environment and the community may limit the generalizability of skills learnt in psychological programmes in prisons.

<sup>1</sup> Members of the task group included the following clinical psychologists of PSS1: Dr. Charles PAU, Ms. Daisy YEUNG, Mr. C.P. WOO, and Mr. Jim CHEUNG



## Use of VR in Psychological Interventions

Over the past decade, the mental healthcare sector has witnessed exciting developments in psychological assessment and treatment due to technological advances in VR. VR has been widely applied in assessing and treating psychological and neurocognitive disorders such as anxiety disorders, post-traumatic stress disorder, substance abuse disorders and deviant sexual interest (Rizzo & Bouchard, 2019). In addition, it is also used in the field of education or training of healthcare professionals.

VR has several unique advantages that bring extraordinary potential to psychological interventions. As already mentioned, **the foremost benefit is its immersive and interactive computer-generated environment, where users can practise skills or be exposed to different stimuli in a realistic yet safe environment.** Also, **VR can simulate situations that are difficult or costly to access in real life.** It also allows the delivery of stimuli in a highly standardised manner, which helps ensure treatment consistency and quality (Freeman et al., 2017).

The utilization of VR in offender rehabilitation has been gaining popularity in the past few years (Ticknor, 2019). Its use is supported by previous efforts to use VR in the treatment of conduct disorder, attention-deficit hyperactivity disorder, and substance abuse (Bordnick et al., 2008; Ceranoglu, 2010), which are also commonly seen among offenders. In addition, it has been suggested that VR can be used to prepare offenders for reintegration, as it can expose offenders to high-risk situations without the risk of causing actual harm to anyone. **The gaming element of VR may enhance offenders' motivation for treatment** (Ticknor & Tillinghast, 2011).



An example of related VR programmes is **Virtual Rehab**, a company specialising in developing VR training for vulnerable populations, including offenders. Their programme exposes offenders to virtual scenarios of "temptations" in the community and encourages them to apply relevant coping skills (Virtual Rehab, n.d.). VR has also been used to develop re-entry training in a women's prison, which incorporates psychologically stressful situations that women commonly experience when returning home (Teng, Hodge, & Gordon, 2019). The evaluation of VR programmes in prisons is remarkably though understandably, scant at present, but the pilot study "Virtual Environment for the Treatment of Offenders" conducted at a juvenile facility in Ohio, USA has shown considerable promise (Ticknor, 2017). Participants of the study, who had gone through traditional CBT groups as well as skills training and role-playing in a virtual environment, found the virtual environment much more engaging than CBT groups. Further outcome studies of correctional VR programmes are expected soon with increasing use in the field.

## Development of Scenario-based VR Role-play System

In keeping with worldwide trends and support of the above research, we conceived the idea of developing our first scenario-based VR Role-play system (VR system) for psychological assessment and treatment in 2017. To optimise the use of available resources, we were interested in producing an interactive and immersive VR system that addressed some of PICs' most prevalent treatment needs. It was therefore agreed that the system would consist of two different themes: (1) anger management (AM) and (2) relapse prevention - coping with negative peer pressure (RP), given that anger and negative peer pressure are the criminogenic needs most commonly found among male PICs.

We then formulated a 3-part VR scenario structure to fully utilise the immersive and interactive nature of VR (Fig. 1). After the initial exposure of a VR character to the PIC, the clinical psychologist would continue to interact with the PIC through the VR character by selecting from a list of pre-recorded verbal responses. The response choices allow the clinical psychologist to flexibly interact with the PIC and adjust the difficulty of the role-play as needed. The clinical psychologist would also decide whether to end the training with a "good ending" or a "bad ending", depending on how the PIC performed. Both scenarios were intended to be community-based as such scenarios would be unavailable to PICs and difficult to replicate in prisons.

Figure 1: The 3-part VR scenario structure

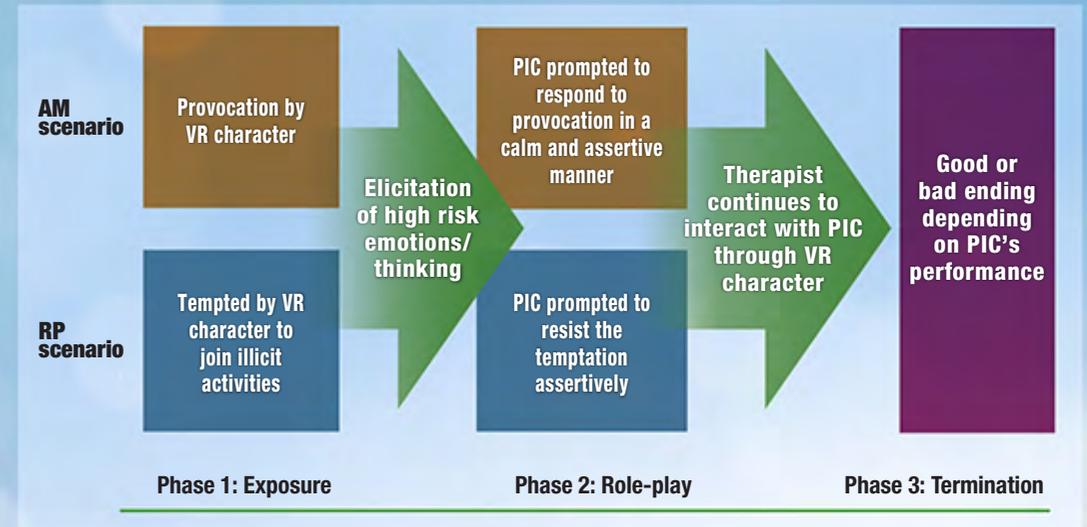


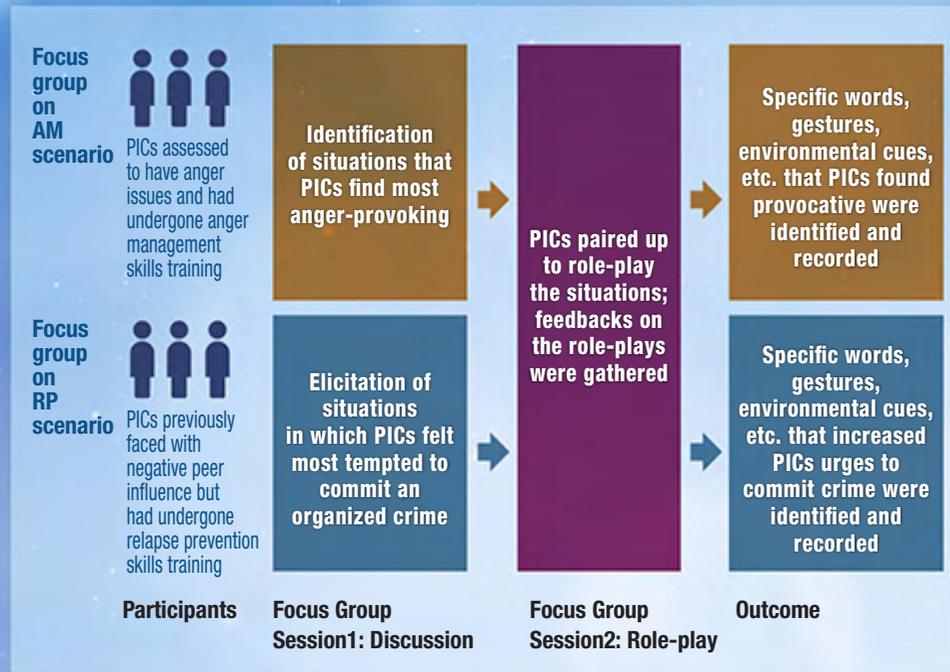
Figure 2: The virtual character in the anger management scenario



Figure 3: The virtual character in the scenario of relapse prevention - coping with negative peer influence

To ensure the scenarios were realistic, the clinical psychologist conducted some focus groups with PICs at Stanley Prison before scripting the scenarios (Fig. 4). We firmly believe that including the opinions of PICs in the development of a VR role-play system would enhance the immersiveness of the VR scenarios.

Figure 4: Focus groups on Anger Management (AM) and Relapse Prevention (RP) scenarios



The VR system on anger management and handling high-risk situations for re-offending has been administered to 31 and 29 PICs at Stanley Prison and Shek Pik Prison respectively. PICs were asked to rate their experience of using VR on several descriptors. The results showed that PICs tended to describe the stimuli as interesting, innovative, practical, attractive, effective, etc. They also found the stimuli realistic and immersive, which facilitated their skills learning.

### Limitations of the Scenario-based VR system

Although the VR system can engage the PICs in an immersive and interactive virtual environment, the scenarios and the virtual characters cannot be customised to fit the specific needs of individual PICs. Moreover, the VR headset does not have an eye-tracking function which could provide important information concerning PICs' point of visual attention. This might be relevant as it is possible for some PICs to employ avoidant strategies, such as distracting himself by averting his gaze from the virtual character and disengage entirely from the scenario. Such disengagement would significantly undermine the effectiveness of anger induction and thereby the effectiveness of VR system treatment. Thus, it could be tricky for clinical psychologists to ensure active participation in some cases without an eye-tracking function.

The production of the VR system was completed in 2018 and, to our knowledge, it is one of the earliest locally developed VR programme for psychological interventions in Hong Kong. The system, which comes with a VR headset, a controller and a smart wristband, is operated only by trained clinical psychologists. The wristband measures a PIC's heart rate throughout the VR training and is charted on a graph available for reviewing after the role-play has ended. The clinical psychologist can then understand a PIC's level of arousal activity and how it changes, and subsequently elicit a PIC's thoughts associated with the changes in his responses during the VR scenario, as well as discuss with him the cognitive or behavioural management strategies he has used.

## Enhancement of the Scenario-based VR system

Given the limitations of the first version of the VR system, we developed a second version in February 2021. In this new VR system, psychologists can now:

1. Import a 360-degree panoramic video or photograph for building a virtual environment where the role-play takes place (figure 5);
2. Control the virtual character's facial expressions and gestures;
3. Interact verbally with PICs via the virtual character;
4. Adjust a virtual character's voice quality to match his or her gender and style in the role-play.

In addition, the second version of the VR system uses a new headset which includes an eye-tracking function. The clinical psychologists can see where PICs are looking during the role-play.

Unlike the first version of the VR system, this second version does not have a specified theme. Clinical psychologists and PICs can both decide the settings of the role-play, including the environment and the virtual character according to the treatment needs of the PIC. This new version of the VR system has been incorporated in the psychological services of Stanley Prison and Shek Pik Prison.

## Future Direction

Although the development and implementation of the VR system is still in its early phase, preliminary ideas for its further development are being considered. We would like to make it more effective by enhancing interaction between the player and the virtual character, such as allowing clinical psychologists to maneuver and have more flexibility in facial expressions or gestures. We also hope to strengthen its immersive qualities by, for example, upgrading its graphic features and enriching the variety and representation of the virtual characters.

Figure 5: : The environment and setting of the role-play can be customised



## Conclusion

The purpose of this article is to share our experience in the development and use of VR technology in the psychological services for PICs in the Correctional Services Department of Hong Kong. We hope the aforementioned experience can contribute to the continuous development of VR-assisted psychological interventions, whether in correctional or other settings. The positive responses during our clinical experience indicate that the use of VR in psychological treatment is worthy of more thorough exploration. We are confident that VR is a technological advancement, which can improve the outcomes of psychological interventions for PICs beyond the prison walls.

## References

- Bordnick, P. S., Traylor, A., Copp, H. L., Graap, K. M., Carter, B. L., Ferrer, M., & Walton, A. P. (2008). Assessing reactivity to virtual reality alcohol-based cues. *Addictive Behaviors, 33*, 743-756. <https://doi.org/10.1016/j.addbeh.2007.12.010>
- Ceranoglu, T. A. (2010). Video games in psychotherapy. *Review of General Psychology, 14*, 141-146. <http://doi.org/10.1037/a0019439>
- Freeman, D., Reeve, S., Robinson, A., Ehlers, A., Clark, D., Spanlang, B., & Slater, M. (2017). Virtual reality in the assessment, understanding, and treatment of mental health disorders. *Psychological Medicine, 47*, 2393-2400. <http://doi.org/10.1017/S003329171700040X>
- Fuchs, P. & Guitton P. (2011). Introduction to virtual reality. In Fuchs, P., Moreau, G., & Guitton, P. (Eds.). *Virtual reality: Concepts and technologies* (pp. 3-10). Boca Raton, FL: CRC Press. <http://doi.org/10.1201/b11612-7>
- Miyahara, S. D., Folen, R. A., Stetz, M., Rizzo, A., Kawasaki, M. W. (2010). Use of immersive virtual reality for treating anger. *Annual Review of CyberTherapy and Telemedicine, 8*, 65-68. <http://doi.org/10.3233/978-1-60750-561-7-82>
- Rizzo, A. S., & Bouchard, S. (Eds.). (2019). *Virtual Reality for Psychological and Neurocognitive Interventions (Virtual Reality Technologies for Health and Clinical Applications)*. New York, NY: Springer. <https://doi.org/10.1007/978-1-4939-9482-3>
- Teng, M. Q., Hodge, J., & Gordon, E. (2019). Participatory design of a virtual reality-based reentry training with a women's prison. *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, 1-8. <https://doi.org/10.1145/3290607.3299050>
- Ticknor, B. (2017). Creating a virtual environment for the treatment of offenders: Pilot 1.0. *Corrections Today, 79*, 46-50.
- Ticknor, B. (2019). Virtual reality and correctional rehabilitation: A game-changer. *Criminal Justice and Behavior, 46*, 1319-1336. <https://doi.org/10.1177/0093854819842588>
- 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*, 4-44. <http://doi.org/10.4101/jvwr.v4i2.2071>
- Virtual Rehab. (n.d.). Video Gallery. Retrieved 20 December, 2021, from <https://www.virtualrehab.co/video-gallery/>