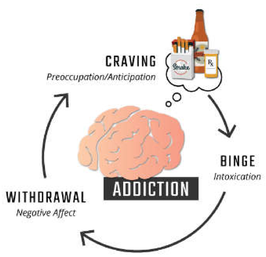
Virtual Reality Tool to Assess Cue Reactivity Component of Addiction via the Oculus Rift™ Virtual Reality Headset

Mary Metcalf, PhD, Bradley Tanner, MD, Brian Tanner, Clinical Tools, Inc., Chapel Hill, NC

Theoretical Basis: Substance use disorder therapies aim to interrupt addiction at various points in the cycle. The planned tool aims to assist in assessment the progression from encountering a substance cue, to experiencing an urge to use, to actually using a substance

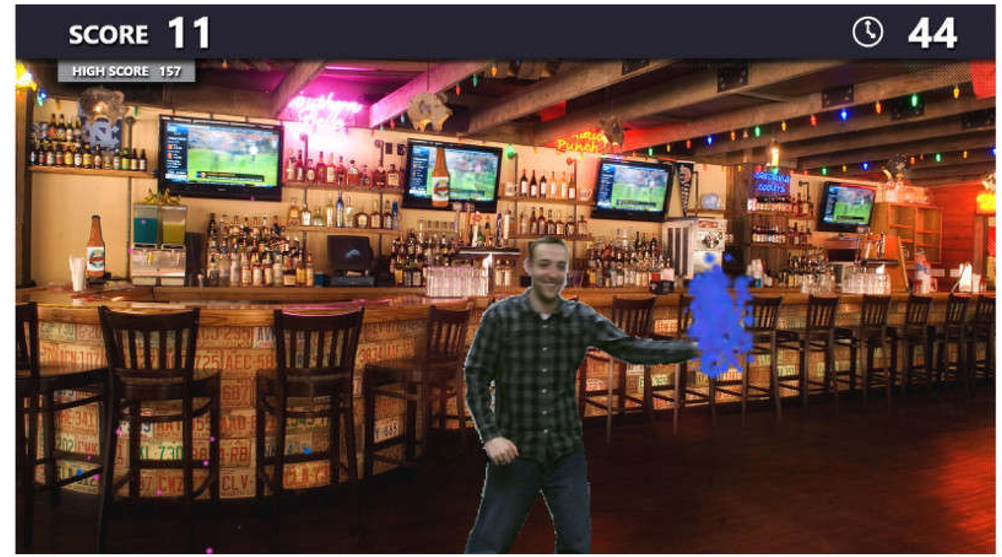


Potential Value: Measuring the impact of behavioral treatment approaches for substance use and eating disorders is essential to developing new treatments and assessing the value obtained from existing treatments.

Problem: Brain activation patterns associated with cue reactivity and craving in patients with substance use depend on reliable and valid duplication of real world cues in the form of substances, environments and social situations. Unfortunately, assessment of the effects of cue-exposure and measurement of brain response using typical cue presentation tools is hindered by a lack of an authentic environment. Virtual Reality (VR) offers investigators a solution with high ecological validity given its ability to present specific visual and auditory stimuli in proper social and environmental context, and also high internal validity given its ability to control exposure parameters. The potential value of VR to measure the perceived impact of presented cues, social situations, and environments extends across the full range of substances including nicotine/cigarettes, alcohol, cocaine, methamphetamine, cannabis and obesity/food.

Approach: In our Virtual Reality Cue Exposure (VRCE) we can consistently and measurably present a variety of virtual stimuli and environments that might illicit or inhibit drug or food seeking activity. Using a widely available commercial VR platform (e.g., Oculus Rift/Samsung Gear) and software (Unity) subjects can engage a customized and immersive 3D VR world containing high quality graphics and sounds that typically trigger relapse. In our VR experience, patients can navigate through the challenges in cue exposure, environments and social situations and complete ratings to assess response.

Goal: Our prototype solution can impact basic neuroscience and neuroimaging research related to addiction and obesity by providing a more convenient and valid means to measure the effect of cues and the corresponding brain response.



Future Directions: In the near future, sensors for VR head mounted displays will identify visual focus and emotional reaction in virtual environments; thus more direct correlation of the patient's cue response with brain activity may be possible

Suggested Citation & Communication

Metcalf M, Tanner B, Tanner B. Virtual Reality Tool to Assess Cue Reactivity Component of Addiction via the Oculus Rift™ Virtual Reality Headset. Poster presented at the 2017 Winter Conference on Brain Research Meeting January 30, 2017, Big Sky, MT.

Contact Author: **metcalf@clinicaltools.com**

References

Hone-Blanchet Antoine, Wensing Tobias, Fecteau Shirley.
The Use of Virtual Reality in Craving Assessment and Cue-Exposure Therapy in Substance Use Disorders. *Front Hum Neurosci*. 2014;8. doi:10.3389/fnhum.2014.00844.

Martin Temeia, LaRowe Steven D, Malcolm Robert.
Progress in Cue Exposure Therapy for the Treatment of Addictive Disorders: A Review Update~!2009-11-25~!2010-02-08~!2010-04-09~!
. *Open Addict J*. 2010;3(2):92-101. doi:10.2174/1874941001003020092.

Kaganoff Eili, Bordnick Patrick S, Carter Brian Lee.
Feasibility of Using Virtual Reality to Assess Nicotine Cue Reactivity During Treatment. *Res Soc Work Pract*. 2012;22(2):159-165. doi:10.1177/1049731511428617.

Pericot-Valverde Irene, García-Rodríguez O, Weidberg-López S, Artamendi Sergio Fernández.
The effect of virtual cue exposure therapy on background and cue exposure craving. *Drug Alcohol Depend*. 2014;140:e174. doi:10.1016/j.drugalcdep.2014.02.489.

Bordnick PS, Yoon JH, Kaganoff E, Carter B.
Virtual Reality Cue Reactivity Assessment: A Comparison of Treatment- vs. Nontreatment-Seeking Smokers. *Res Soc Work Pract*. 2013;23(4):419-425. doi:10.1177/1049731513482377.

Acknowledgments & Disclosure

The preliminary research was funded by the National Institutes of Health (NIH contract #HHSN271201200007C and #N44DA-13-4415 Bradley Tanner, PI). The Clinical Tools, Inc. IRB reviewed and approved the research.
Clinical Tools, Inc is 100% owned by Bradley Tanner, MD and he serves as President of Clinical Tools, Inc.