Short Communication

The effect of repeated exposure to virtual gambling cues on the urge to gamble

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HIGHLIGHTS

• VR casino environment was able to evoke a significant urge to gamble.
• The participants' urge to gamble was the strongest in playing a casino game scene.
• The urge to gamble decreased continuously as a function of repeated exposure.
• VR-CET combined with relaxation training can reduce recreational gamblers' urges.

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ABSTRACT

Introduction: This study aimed to investigate the effectiveness of using a virtual reality (VR) casino environment in cue exposure therapy (CET) for gambling. The main objective of this study was to assess the ability of five VR casino cues to elicit subjective reactions and physiological responses that can be used within the CET paradigm. A second objective was to analyze changes in participants' urge to gamble after repeated exposure to a VR casino program and relaxation training.

Methods: Twelve recreational gamblers were exposed to five virtual environments with casino-related cues that reproduced typical gambling situations. Self-reported subjective urges and psychophysiological responses were recorded during exposure.

Results: All virtual environments with casino-related cues generated craving in recreational gamblers, whereas no increase in the psychophysiological variables was observed. In addition, urges to gamble elicited by VR casino environment reduced through repeated exposure and relaxation training.

Conclusion: These findings provide evidence of the effectiveness of VR for simulating casino environments in the treatment of gambling.

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1. Introduction

Pathological gambling (PG) is a progressive and recurrent maladaptive pattern of gambling behavior characterized by increased preoccupation with gambling activities, loss of control over such behavior, and continued gambling despite problems in social or occupational functioning (American Psychiatric Association, 2000). It is associated with significant financial losses and disrupted interpersonal and familial relationships (Blanco, Hasin, Petry, Stinson, & Grant, 2006).

Cue exposure therapy (CET) refers to repeated exposure to drug-related cues aimed at reducing reactivity to such cues via extinction (Conklin & Tiffany, 2002). Craving and cue reactivity have been conceptualized as classically conditioned responses, and CET is based on the notion that prolonged and repeated non-reinforced presentation of cues will result in a gradual diminution of the urge through Pavlovian extinction. Several authors have reported that virtual reality (VR) is an effective approach to reducing cue reactivity related to alcohol, cannabis, and cigarettes (Bordnick, Graap, Copp, Brooks, & Ferrer, 2005; Bordnick et al., 2008, 2009; Choi et al., 2011).

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Symes and Nicki (1997) tested the effect of repeated exposure to stimuli associated with gambling on the urge to gamble and perceived self-efficacy. During each session, two probable pathological gamblers received five exposures to relevant stimuli to provoke the urge to gamble. Data obtained during each session showed a reduction in the urge to gamble over the course of certain sessions. Another case study conducted by Tolchard, Thomas, and Battersby (2006) found a reduction in the urge to gamble during a single exposure session. However, the case-study experimental design used in these two studies restricts the generalization of their findings (Giroux et al., 2013). One study reported the effectiveness of a VR cue exposure paradigm for pathological gamblers (Giroux et al., 2013). Ten participants moved throughout a virtual bar with five video lottery terminals five times. Whereas the desire to gamble significantly increased when participants transitioned from the practice environment to the gambling environment, this study was unable to confirm the process of extinction because it consisted of only a single 20-min session.

In this preliminary study, we aimed to investigate the feasibility and viability of a VR casino environment for the use in repeated CET to treat gambling. The main objective of this study was to assess the ability of five VR casino cues used within the CET paradigm to produce subjective reactions as well as physiological responses. A second objective was to analyze changes in participants' urge to gamble after several sessions of repeated exposure and relaxation training.

2. Materials and methods

2.1. Participants

We recruited subjects through advertisements posted at an outpatient clinic. Those eligible to participate had a basic interest in gambling for recreational purposes; score on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) of 4 or less; and no history of excessive gambling. One reason for recruiting recreational gamblers was that they have reported levels of cue-elicited urges similar to those reported by pathological gamblers in response to the videotaped exciting-gambling scenarios used in a previous study (Sodano & Wulfert, 2010). Twelve male participants were enrolled in this study. The sample had an average age of 32.32 (SD: 6.43) years, and their average number of years of education was 16.2 (SD: 1.95). This study was conducted in accordance with the Declaration of Helsinki. The Institutional Review Boards of the SMG-SNU Boramae Medical Center approved the study protocol, and all subjects provided written informed consent prior to participation. Each participant received compensation of approximately $30 for participating in each session of the study.

2.2. Instrument and variables

2.2.1. Virtual environment
The three-dimensional (3D) VR environments were implemented on a high-speed PC computer, and visual stimuli were delivered to three surround screens (80 in.) via three LCD digital projectors (LX400; Christie Digital Systems, Cypress, CA, USA). A motion controller (WING; iStation, AnYang, Republic of Korea) was interfaced with the computer to control the 3D features and measure subjective urges. Urge to gamble was assessed by means of a visual analogue scale (VAS) that was incorporated in the virtual environments. Participants were asked to rate the strength of their urge at a precise moment using a scale ranging from 0 (no desire) to 100 (intense desire). Urge was assessed pre-exposure, during exposure, and post-exposure. Detailed information on the virtual environment was described in the previous report (Choi et al., 2011; Park et al., 2014).

2.2.2. Psychophysiological measures
Psychophysiological response data (electromyography (EMG), skin conductance (SC), and heart rate (HR)) were acquired during each VR exposure session using the multi-modality encoding system of the biofeedback unit and the BioGraph Infiniti ver. 4.0 software (ProComp; Thought Technology Ltd., Quebec, Canada). Detailed information on the psychophysiological measures was also described in the previous report (Choi et al., 2011).

2.3. Procedure

2.3.1. Experiment 1
Before the session started, baseline psychophysiological measures were recorded for each participant 3 min prior to exposure to the virtual environments. After the baseline measurements, participants watched a 3-min relaxation video, followed by each of five casino scenes. Psychophysiological responses were monitored throughout the session. One session lasted about 40 min. Snapshots of the restful video and 5 casino scenes are displayed in Fig. 1.

2.3.2. Experiment 2
Participants in Experiment 1 engaged in five weekly gambling-cue exposure sessions. Experiment 2 involved an additional five sessions that followed the identical procedures used in Experiment 1. To control for the carryover effect of craving that accumulated over the course of exposures, the order of the five casino scenes in each session was counterbalanced.

2.4. Data analysis

All statistical analyses were conducted with SPSS ver. 17.0 (SPSS Inc., Chicago, IL). A repeated-measures ANOVA was used to evaluate differences in the target variables among the scenes in Experiment 1 and among the sessions in Experiment 2. LSD post hoc comparisons were used for comparing the mean urge at each moment. Statistical analysis was two-tailed, and significance was set at $p < 0.05$.

3. Results

In the first section of Table 1, Experiment 1 shows the mean subjective gambling urges reported by participants, as well as their psychophysiological responses before and after exposure to the virtual environments. According to these data, all scenes with casino cues succeeded in increasing participants' subjective urges. The results of the repeated-measures ANOVAs revealed significant differences in subjective urge across scenarios ($F(3.83, 42.13) = 8.19, p = .00$). Post hoc comparisons showed the mean urges in the casino scenes differed significantly from those during the rest of the scenarios. The virtual scene eliciting the most pronounced urges involved playing a casino game. In contrast, no significant changes in the psychophysiological measures across the scenarios were observed.

In the second section of Table 1, Experiment 2 presents the changes in the urge to gamble during exposure to multiple sessions. The urge to gamble was reduced after repeated exposure to two cues: playing a casino game and discussing gambling with a colleague. The results revealed significant differences across sessions in the subjective urge elicited by playing a casino game ($F(3.06, 33.64) = 3.05, p = .04$). Post hoc analysis confirmed that scores obtained during sessions 2, 3, 4, and 5 were lower than those at baseline. The level of the urges elicited by the cue involving discussing gambling with a colleague also differed across sessions ($F(2.44, 26.79) = 3.36, p = .04$). The mean urge reported in sessions 3 and 5 was lower than those reported at baseline and that the urge reported in session 5 was lower than those reported in sessions 2 and 4. Consistent with the results of Experiment 1, psychophysiological measures did not significantly change across sessions.

4. Discussion and conclusion

To our knowledge, this is the first study to evaluate the effect of CET on the urge to gamble using VR system with a design including multiple