Virtual Reality Gambling: Public Policy Implications for Regulation and Challenges for Consumer Protection

Sally M. Gainsbury & Alex Blaszczynski

School of Psychology, The University of Sydney, Australia

Gambling Treatment Clinic, 94 Mallett Street, Camperdown NSW 2050, Australia

sally.gainsbury@sydney.edu.au

Alex.blaszczynski@sydney.edu.au

Cite as:

Gainsbury, S., & Blaszczynski, A. (2017). Virtual reality gambling: Implications for regulation and gambling disorders. *Gaming Law Review & Economics, 21(4)*, 314-322. DOI: 10.1089/glr2.2017.2145

Final publication is available from Mary Ann Liebert, Inc., publishers
https://doi.org/10.1089/glr2.2017.2145

Disclosures:
In the past three years SG has received research funding from Echo Entertainment and the Manitoba Gambling Research Program, British Columbia Lottery Corporation, consultancies and honoraria from Gamble Aware/Responsible Gambling Trust, Cultural & Indigenous Research Centre Australia, the Australian Communications and Media Authority, Centre for Addiction and Mental Health, Nova Scotia Provincial Lotteries and Casino Corporation, Australasian Gambling Council and travel costs from British Columbia Lottery Corporation and Responsible Gambling Council. SG is a current member of the National Council on Problem Gambling (Singapore).

In the past three years AB has received research funding, honoraria, or had travel costs paid for by La Loterie Romande (Switzerland), Svenska Spel (Sweden), Club NSW (Australia), Comelot (UK), La Française des Jeux (France), Loto-Québec (Québec, Canada), Casino Austria, National Lottery (Belgium), Sportsbet, British Columbia Lottery Corporation, Aristocrat Leisure Industries, the Victorian Responsible Gambling Foundation, Ontario Problem Gambling Research Centre, the Responsible Gambling Trust, Manitoba Gambling Research Program, Ministerial Expert Advisory Group (Federal Government).

Correspondence to: Sally Gainsbury PhD, Gambling Treatment Clinic, 94 Mallett Street,

Camperdown NSW 2050, Australia: Email: sally.gainsbury@sydney.edu.au

Virtual Reality Gambling: Public Policy Implications for Regulation and Challenges for Consumer Protection

Abstract

Advances in Internet technology have substantially altered the characteristics of products offered by the gambling industry and associated effects on user experiences. Virtual reality gambling involves using an innovative 3D computer-based format with high-resolution graphics that totally immerses an individual into an interactive gambling environment. Regulators and policy makers are faced with the need to comprehend the full ramifications of this sophisticated mode on gambling behaviour and its potential contribution to the development of gambling disorders. This article aims to provide a description of virtual reality gambling, current market offerings and regulations, and discusses the implications for the gambling field. Although not yet widely adopted, commercially affordable virtual reality software and headsets will allow users to engage in 'live' gambling from any location in a fully immersive experience. For those vulnerable to experiencing problems, it is likely that the sense of involvement and presence will facilitate cravings, dissociation, behavioural disinhibition, and potential loss of control over expenditure of time and money. Virtual reality technology could enable innovative and effective harm minimisation strategies to be implemented. Although more research is needed, regulators need to consider the implications of this emerging form of gambling in a timely manner to enact safeguards to protect users.

Keywords: Virtual reality, gambling, regulation, technology, Internet, policy

Introduction

Virtual reality refers to computer simulated three-dimensional interactive representation that allows almost total sensory immersion into an artificial environment. Although 19th century stereoscope photographic viewers and 1920's flight simulators can be considered early precursors of the concept, head mounted devices emerged in the 1950's with more sophisticated and commercially available computer-based formats appearing in the following decades [1]. With improved graphics and computer capacities, virtual reality, a term first coined by Jaron Lanier in 1987, is now increasingly applied across a host of disciplines and activities: entertainment, military, architecture, business, and health [2].

Commercially, the virtual reality market is expected to reach US$1 billion in 2016 including sales and content, with estimates of continued sharp increases [3]. Applications in the entertainment sphere are predicted to be widespread, particularly in relation to entertainment including the gambling market. The interest in immersive entertainment experiences is demonstrated by movies, with 3D films accounting for over 20% of box office revenue in 2010, and expectations that as the industry matures interest will escalate [4]. Similarly, the augmented reality app Pokémon Go earned $206.5 million in revenues and set a Guinness World Record with 130 million downloads in its first month of release [5].

Estimates suggest that in 2016 there were already nearly 18 million virtual reality users playing games, even prior to the availability of affordable headsets [6]. Although estimates of sales of headsets and controllers were revised downward to account for slower than expected growth, predictions for the long-term growth of the market remain strong [7].

The total immersive and artificial nature of virtual reality raises significant concerns related to potential negative outcomes in relation to gambling behaviour and the development of potential

---

[1] "History Of Virtual Reality," *Virtual Reality Society*, December 25, 2015, http://www.vrs.org.uk/virtual-reality/history.html.
[2] Ibid.
[3] Deloitte, "Predictions 2016: Virtual Reality: A Billion Dollar Niche," *Deloitte*, 2016, https://www2.deloitte.com/global/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-media-virtual-reality-billion-dollar-niche.html.
[4] Stephen Heyman, "The Decline of 3-D? Not So Fast - The New York Times," *The New York Times*, August 1, 2015, sec. International Arts, http://www.nytimes.com/2015/01/08/arts/international/the-decline-of-3-d-not-so-fast.html?_r=0.
[5] Will Green, "Catch That Bet: 888Sport Launches Pokémon Go-Style Sports Free Plays," *Legal Sports Report*, September 20, 2016, http://www.legalsportsreport.com/11594/catch-that-bet-888sport-launches-pokemon-go-style-sports-freeplays/.
[6] SuperData, "Virtual Reality Industry Report 2016" (SuperData, 2016), https://www.superdataresearch.com/market-data/virtual-reality-industry-report/.
[7] Ibid.

gambling disorders (commonly referred to as compulsive, addictive, or pathological gambling)[8]. Being totally immersed in an artificial environment fuels the illusion that the behaviour and losses are virtual with no real-world connection and/or consequences from actions conducted in that setting. The potential exists for monetary worth to be devalued and the impact of losses detached from reality. Given the predicted expansion of virtual reality gambling, this article aims to highlight the potential impact of this form of gambling drawing attention to critical areas of inquiry needed to advance our understanding of this nascent form of technological consumption. The article will provide an overview of virtual reality gambling, current market offerings and regulation, and its future implications for the field of gambling.

Virtual reality: An introduction

Virtual reality uses hardware that incorporates a headset displaying 3D stereo images. Headsets are typically the size of large diving goggles and fit over the user's head and enclose the full visual field. Sensors track the user's movements to offer a corresponding view of the surrounding environment. Headsets can also provide 3D binaural audio with no external environmental sounds or lights penetrating the headset to disturb the virtual reality experience. Binaural recordings put users in the exact sound field as originally intended, that is, they fully immerse users in the intended experience, for example, casino sounds surrounding them, which tricks the brain into experiencing sounds as though they were first hand [9]. Accordingly, the experience is highly immersive. Immersion is the psychological state of perceiving oneself to be included in and interacting with the environment [10]. High resolution graphics create a powerfully realistic virtual environment that provokes emotional and cognitive responses that are almost indistinguishable from that experienced in real-world casino or gambling environments [11] despite the user's awareness of the virtual nature of that environment.

Full feature virtual reality devices requiring headsets, controllers and powerful computing devices or gaming consoles remain expensive [12]. However, the more affordable mobile virtual reality

1. [8] Alexander Blaszczynski, Robert Ladouceur and Howard Shaffer, "A science-based framework for responsible gambling: The Reno model", *Journal of Gambling Studies*, 20, no 3, (2004): 301-317.

[9] Mona Lalwani, "Surrounded by Sound: How 3D Audio Hacks Your Brain," *The Verge*, February 12, 2015, http://www.theverge.com/2015/2/12/8021733/3d-audio-3dio-binaural-immersive-vr-sound-times-square-new-york.

[10] Bob G. Witmer and Michael J. Singer, "Measuring Presence in Virtual Environments: A Presence Questionnaire," *Presence: Teleoperators and Virtual Environments* 7, no. 3 (June 1, 1998): 225–40, doi:10.1162/105474698565686.

[11] S. F. Kuliga et al., "Virtual Reality as an Empirical Research Tool — Exploring User Experience in a Real Building and a Corresponding Virtual Model," *Computers, Environment and Urban Systems* 54 (November 2015): 363–75, doi:10.1016/j.compenvurbsys.2015.09.006.

[12] Deloitte, "Predictions 2016."

incorporates high-end smartphone screens into special cases that are placed over the user's head and still provide a reasonably high quality experience. With evolving technological advances and mass production, it is anticipated that a widening range of sophisticated commercially affordable systems and hardware will become available. Headsets are becoming lighter and more comfortable, Avatars[13] more realistic allowing users to choose their own personal image, and facial tracking allowing "real" expressions to be depicted to facilitate social interactions. Users move around the virtual environment using a handheld game controller, although some allow for actual movement, including walking and the use of hands. The incorporation of voice navigation is anticipated, with users being able to chat and interact with real other users and/or hosts and other avatars provided by gambling operators, such as casino dealers and service staff.

Virtual reality gambling

Virtual reality gambling expenditure is predicted to rise 800 per cent in the next five years [14]. In 2016, estimates suggest that $58.5 million internationally has already been bet through virtual reality gambling. Current opportunities are typically concentrated in virtual reality casino gambling following the trend of online and mobile betting. Overall, the interactive gambling industry is expected to account for over 40% of total gross gambling wagers by 2021 [15]. Given the rapid popularity and uptake of online and mobile gambling, it is likely that users will continue to seek remote online gambling experiences (with virtual reality used to heighten experiences) that allow participation from any location.

Gambling companies have begun using augmented reality and, following the popularity of Pokémon GO, incorporated this into smartphone technology, including cameras and geolocation software. Augmented reality is an interactive visualisation system (e.g., a head-mounted display, smartphone, tablet) allowing the merging of digital contents with the real environment surrounding the user [16]. This allows the augmentation of a real experience by blending virtual elements into the real world.

[13] The representation of humans in digital form is referred to as an avatar. An avatar allows a user to interact with their environment, including controlling it where possible and manipulating certain stimuli.
[14] Juniper Research, "Virtual Reality Gambling Set to Deliver Real Spend," *Juniper Research*, October 10, 2016, https://www.juniperresearch.com/press/press-releases/virtual-reality-gambling-set-to-deliver-real-world.
[15] Ibid.
[16] Irene Alice Chicchi Giglioli et al., "Augmented Reality: A Brand New Challenge for the Assessment and Treatment of Psychological Disorders," *Computational and Mathematical Methods in Medicine* 2015 (August 3, 2015): e862942, doi:10.1155/2015/862942; Hyeon-Cheol Kim and Martin Yongho Hyun, "Predicting the Use of Smartphone-Based Augmented Reality (AR): Does Telepresence Really Help?," *Computers in Human Behavior* 59 (June 2016): 28–38, doi:10.1016/j.chb.2016.01.001.

Examples of augmented reality gambling apps include the capacity to point a phone at the screen and instantly identify all available bets across different markets on that game [17]. Betfair launched a product for Google Glass to provide real-time notifications around race results and odds [18]. Other betting companies have also begun experimenting with augmented reality, including casino and betting options [19]. For example, 888Sports launched 'free bet hunt', allowing users to hunt in real-life locations to find and capture free-play bets [20].

Virtual reality allows users to experience a jockey's perspective during a race, and watch a live sporting event as though they were present with friends and being exposed to promotions, live odds, receiving personalised messages and commentary, and placing bets. Virtual reality poker rooms allow players to interact with other players in real time, and casino sites can use live dealers and slots to enhance the highly immersive experience. In 2016, SlotsMillion was the first to market a virtual reality casino [21]. On their site, players can enter and walk through a casino setting located in a skyscraper overlooking a futuristic landscape. They can visit the bar, interact with other players, look out the window and experience real vertigo looking down, or use the many immersive 3D slot games situated around the casino. Other virtual reality casinos are currently under development; In Microgaming's virtual reality gambling environment, players sit in front of a roulette table and can use and see their own hands moving while placing bets. NetENT has developed a virtual reality slot game which uses 3D sound technology as a feature [22]. Gamblit Gaming is launching their Virtual Reality Cube onto casino floors across the USA in 2017 as a way for casino operators to bring people to new gaming areas on the floor [23]. This demonstrates that virtual reality is not only intended to be offered for gamblers at home, but by gambling venues with a gambling license, who could offer gamblers an opportunity to gamble in a new way, for example, while experiencing sitting on a beach, or in outer-space, potentially attracting new customers, including Millennials.

---

[17] BettingApps, "Augmented Reality Betting Apps - The Future of Betting on Your Mobile!," *Betting Apps*, October 11, 2014, http://www.bettingapps.co.uk/augmented-reality-betting-apps-the-future/.
[18] Natalie Mortimer, "Betfair to Use Google Glass during Live TV Betting Slots," *The Drum*, April 7, 2014, http://www.thedrum.com/news/2014/07/04/betfair-use-google-glass-during-live-tv-betting-slots.
[19] Gaming Intelligence, "Infinity to Launch Augmented Reality Live Casino with Will Hill," November 19, 2013, http://www.gamingintelligence.com/marketing/23127-infinity-ar-to-launch-augmented-reality-live-casino-with-william-hill.
[20] Green, "Catch That Bet."
[21] Online.CasinoCity, "SlotsMillion Unveils Virtual Reality Online Casino," October 19, 2015, http://online.casinocity.com/article/slotsmillion-unveils-virtual-reality-online-casino-120680.
[22] NetEnt, "NetEnt to Showcase the Future of Online Gaming at ICE," *NetEnt*, February 2, 2016, https://www.netent.com:443/en/netent-to-showcase-the-future-of-online-gaming-at-ice/.
[23] "Is 2017 the Year of Virtual Reality Gaming?," accessed March 10, 2017, https://www.gamblinginsider.com/in-depth/2977/is-2017-the-year-of-virtual-reality-gaming.

Despite the potential for virtual reality gambling, several challenges exist. High quality devices are still costly to purchase and require high-end capacity computers, which are likely to inhibit the extent of user adoption [24]. SuperData revised their estimate of the number of virtual reality units to be sold in 2017 downwards as sales of virtual reality headsets have not been as high as originally predicted [25]. However, this will change over time as devices become more mainstream. Those who purchase devices initially are likely to be early adopters, serious gamblers, and high-end users; this may provide a base of virtual reality high-roller casino players [26]. Nonetheless, since the inception of SlotsMillion's virtual reality casino, business has grown exponentially, but a base of virtual reality users remains absent, with players tending not to use headsets [27]. This suggests that perhaps the market may not have yet achieved its potential [28], or alternatively, whether it will go the way of 3D television, more of a gimmick where the product is singularly expected to maintain user engagement in the absence of supportive new and innovative content [29]. The long-term potential of virtual reality is still expected to be strong [30].

Regulation

Among the general population, there is currently very little consumer awareness and understanding of virtual reality, with estimates suggesting that more than half of US consumers are not familiar with the concept of virtual reality [31]. However, this is likely to change with multiple companies looking to generate adoption through marketing and promotions. Concomitantly, international gambling regulators have struggled to keep pace with new technologies impacting on gambling [32]. Internet gambling has become increasingly licensed and regulated, as jurisdictions realise the difficulties of prohibition and importance of consumer protection. As it is accessed remotely using the internet through a user's personal device, it is likely that virtual reality gambling will fall under Internet gambling regulation. However, it virtual reality may also be made available within an existing gambling venue via a peer-to-peer network (direct connection with a gaming server), as

[24] Juniper Research, "Virtual Reality Gambling Set to Deliver Real Spend."
[25] "Is 2017 the Year of Virtual Reality Gaming?"
[26] Deloitte, "Predictions 2016."
[27] Alexandre Tomic, "Why We Built SlotsMillion: The First VR Online Casino Which Has No Users... yet," *Thevirtualreport.biz*, March 18, 2016, http://www.thevirtualreport.biz/interviews-and-opinion/62900/vr-and-slotsmillion/.
[28] Sue Tabbitt, "AR & VR Bring Retail Stores Alive in People's Homes," November 21, 2016, https://newsroom.cisco.com/feature-content?type=webcontent&articleId=1803354.
[29] David Katzmaier, "With a Bullet to the Head from Samsung, 3D TV Is Now Deader than Ever," *CNET*, February 3, 2016, https://www.cnet.com/au/news/3d-tv-is-now-more-dead-than-ever/.
[30] SuperData, "Virtual Reality Industry Report 2016."
[31] Ibid.
[32] Sally Gainsbury and Robert Wood, "Internet Gambling Policy in Critical Comparative Perspective: The Effectiveness of Existing Regulatory Frameworks," *International Gambling Studies* 11, no. 3 (December 1, 2011): 309–23, doi:10.1080/14459795.2011.619553.

such, it may be regulated as an additional form of land-based gambling. As the technology is developed and utilised by gambling companies, it will be important for regulators across the sector to carefully consider their stances, and the implications of this new mode of gambling.

As virtual reality gambling is still in its developmental phase, few regulators have specifically addressed this new technology. No regulators have addressed augmented reality gambling specifically, to the author's knowledge, despite companies offering gambling options through this channel. Malta currently regulates the VR casino site Slotsmillion, with a license that includes some specific purported responsible gambling requirements, for example, clocks remaining visible at all times in the visual field. However, there is little evidence that having clocks in venues or on screens exert any impact on gambling behaviour [33]. Within SlotsMillion, customers can seek help and support from 'agents' in the casino, including having the option to exclude themselves.

Currently, most jurisdictions do not differentiate between various modes of online gambling, despite their many differences. Research has shown that those who gamble via mobile and supplementary devices are more likely to exhibit gambling problems than gamblers using computers [34]. There is little research that has specifically examined different modes of online gambling suggesting a need to further consider modes of access carefully if the potential impact and social harm are to be fully understood. Identifying the risks associated with new technologies is important to anticipate future issues and minimise gambling-related harm by developing effective responsible gambling strategies and interventions for those with gambling-related problems [35].

Impact of virtual reality on gambling

There is very limited empirical evidence regarding the impact of virtual reality gambling on consumers, including gambling problems. As such, there is little research to inform responsible gambling policies and practices.

---

[33] Harold Wynne and Randy Stinchfield, "Evaluating VLT Responsible Gaming Features and Interventions in Alberta" (Alberta Gaming and Liquor Commission, April 2004), http://aglc.ca/pdf/gaming/news_releases/VLT_responsible_features_phase1_report.pdf; Robert Ladouceur and Serge Sévigny, "Electronic Gambling Machines: Influence of a Clock, a Cash Display, and a Precommitment on Gambling Time," *Journal of Gambling Issues*, 2009, 31–41; Tony Schellinck and Tracy Schrans, "Video Lottery Responsible Gaming Feature Research - Final Report" (Focal Research, October 2002), http://greo.ca/sites/default/files/documents/Schellinck%20et%20al(2002)_alc_video_lottery_responsible_gaming_feature_conclusions.pdf.

[34] Sally M. Gainsbury et al., "Is All Internet Gambling Equally Problematic? Considering the Relationship between Mode of Access and Gambling Problems," *Computers in Human Behavior* 55, Part B (February 2016): 717–28, doi:10.1016/j.chb.2015.10.006.

[35] Richard J. E. James, Claire O'Malley, and Richard J. Tunney, "Understanding the Psychology of Mobile Gambling: A Behavioural Synthesis," *British Journal of Psychology*, October 2016, doi:10.1111/bjop.12226.

Structural features of the online gambling environment are likely to contribute to gambling problems, features that are inherently similar to or amplified in a virtual environment. Both online and virtual reality gambling allow instantaneous access to uninterrupted and extended sessions of play, in private settings, with no constraints on alcohol consumption [36]. Comparable to the effects to online gambling cues, desires, urges and cravings are elicited by exposure to virtual reality gambling [37]. This is similar to findings that exposure to smoking and substance use cues in virtual reality increase subjective cravings and physiological responses [38]. Similarly, in one experimental study, participants with gambling problems exposed to virtual reality gambling experienced increased urges to gamble that did not diminish after session cessation [39]. This suggests that virtual reality could increase gambling, not only in the virtual but also in subsequent, real gambling environments.

In contrast to Internet gambling, where users can still see, feel, and hear the world around them, virtual reality removes all external stimulation and connection to reality provoking a greater sense of involvement and presence. Involvement refers to the psychological state of focusing attention and engaging in activities in the virtual reality environment [40]. Presence is defined as the subjective experience of being in one place despite being physically situated in another (Witmer & Singer, 1998). Both involvement and immersion are necessary for presence; and both are achieved through the sophisticated virtual reality technology now appearing in the commercial sector. Video gamers

---

[36] June Cotte and Kathryn A. Latour, "Blackjack in the Kitchen: Understanding Online versus Casino Gambling," *Journal of Consumer Research* 35, no. 5 (February 1, 2009): 742–58, doi:10.1086/592945; Gill Valentine and Kahryn Hughes, "Shared Space, Distant Lives? Understandingfamily and Intimacy at Home through Thelens of Internet Gambling," *Transactions of the Institute of British Geographers* 37 (2012): 242–55; Nerilee Hing et al., "Do Advertising and Promotions for Online Gambling Increase Gambling Consumption? An Exploratory Study," *International Gambling Studies* 14, no. 3 (September 2, 2014): 394–409, doi:10.1080/14459795.2014.903989; Abby McCormack, Gillian W. Shorter, and Mark D. Griffiths, "An Examination of Participation in Online Gambling Activities and the Relationship with Problem Gambling," *Journal of Behavioral Addictions* 2, no. 1 (March 2013): 31–41, doi:10.1556/JBA.2.2013.1.5; Sally Monaghan, "Responsible Gambling Strategies for Internet Gambling: The Theoretical and Empirical Base of Using Pop-up Messages to Encourage Self-Awareness," *Computers in Human Behavior* 25, no. 1 (January 2009): 202–7, doi:10.1016/j.chb.2008.08.008.

[37] Isabelle Giroux et al., "Gambling Exposure in Virtual Reality and Modification of Urge to Gamble," *Cyberpsychology, Behavior, and Social Networking* 16, no. 3 (March 1, 2013): 224–31, doi:10.1089/cyber.2012.1573; C Loranger et al., "Validation of Two Virtual Environments for the Prevention and Treatment of Pathological Gambling," *Journal of CyberTherapy and Rehabilitation* 4, no. 2 (2011): 233–36; Chan-Bin Park et al., "The Effect of Repeated Exposure to Virtual Gambling Cues on the Urge to Gamble," *Addictive Behaviors* 41 (February 2015): 61–64, doi:10.1016/j.addbeh.2014.09.027; Matthew M. Young et al., "The Desire to Gamble: The Influence of Outcomes on the Priming Effects of a Gambling Episode," *Journal of Gambling Studies* 24, no. 3 (September 2008): 275–93, doi:10.1007/s10899-008-9093-9.

[38] Patrick S. Bordnick et al., "Virtual Reality Cue Reactivity Assessment in Cigarette Smokers," *CyberPsychology & Behavior* 8, no. 5 (2005): 487–492; Antoine Hone-Blanchet, Tobias Wensing, and Shirley Fecteau, "The Use of Virtual Reality in Craving Assessment and Cue-Exposure Therapy in Substance Use Disorders," *Frontiers in Human Neuroscience* 8 (2014), doi:10.3389/fnhum.2014.00844; Irene Pericot-Valverde, Lisa J. Germeroth, and Stephen T. Tiffany, "The Use of Virtual Reality in the Production of Cue-Specific Craving for Cigarettes: A Meta-Analysis," *Nicotine & Tobacco Research* 18, no. 5 (May 1, 2016): 538–46, doi:10.1093/ntr/ntv216.

[39] Giroux et al., "Gambling Exposure in Virtual Reality and Modification of Urge to Gamble."

[40] Witmer and Singer, "Measuring Presence in Virtual Environments."

describe presence as total immersion, being cut off and detached from reality to such an extent that the game was all that mattered: "You just forget about the things around you and you're focused on what you're doing in the game" [41]. The level of immersion felt by gamers seems to correlate with the extent of stimuli and attentional resources needed [42], as such, virtual reality, with visual, auditory, and sometimes tactile stimuli would be expected to enhance presence. A relationship has been found between dissociation and presence experienced in virtual reality [43]. Consequently, it is important to consider how a sense of involvement and presence may impact gambling, including those vulnerable to experiencing dissociation during gambling sessions.

Virtual reality offers the prospect of ease of interaction, objective realism, and ability to interact and communicate with other virtual humans [44]. The ability for users to move around within the environment reinforces their sense or presence, contributing to the sense of realism and intensity of their reactions [45]. The level of presence felt within a virtual reality experience is positively related to affect [46], which is consistent with a study where cigarette craving levels were observed to be significantly correlated to the sense of presence within a virtual reality context [47]. Similarly, Park and colleagues reported that urges to gamble were strong when playing a casino game in a virtual environment [48]. These results suggest that compared to online gambling, there is a significantly greater capacity for virtual reality, through its immersive nature, to narrow the focus of attention (Anderson & Brown, 1984) and produce heightened states of dissociation [49]. Under these circumstances, virtual reality gambling represents a particularly effective form of gambling for

---

[41] Emily Brown and Paul Cairns, "A Grounded Investigation of Game Immersion," in *CHI'04 Extended Abstracts on Human Factors in Computing Systems* (ACM, 2004), 1297–1300, http://dl.acm.org/citation.cfm?id=986048.
[42] Ibid.
[43] Craig D. Murray, Jezz Fox, and Steve Pettifer, "Absorption, Dissociation, Locus of Control and Presence in Virtual Reality," *Computers in Human Behavior*, Including the Special Issue: Avoiding Simplicity, Confronting Complexity: Advances in Designing Powerful Electronic Learning Environments, 23, no. 3 (May 2007): 1347–54, doi:10.1016/j.chb.2004.12.010.
[44] Wallace Sadowski and Kay Stanney, "Presence in Virtual Environments," in *Handbook of Virtual Environments: Design, Implementation, and Applications*, Human Factors and Ergonomics. (Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, 2002), 791–806.
[45] B.K Wiederhold and M.D Wiederhold, "The Effect of Presence on Virtual Reality Treatment," in *Virtual Reality Therapy for Anxiety Disorders: Advances in Evaluation and Treatment.*, ed. B.K Wiederhold and M.D Wiederhold (Washington, D.C.: American Psychological Association, 2005), 77–86.
[46] Giuseppe Riva et al., "Affective Interactions Using Virtual Reality: The Link between Presence and Emotions," *CyberPsychology & Behavior* 10, no. 1 (February 2007): 45–56, doi:10.1089/cpb.2006.9993.
[47] Marta Ferrer-Garcia et al., "Efficacy of Virtual Reality in Triggering the Craving to Smoke: Its Relation to Level of Presence and Nicotine Dependence," *Annual Review of Cybertherapy and Telemedicine* 154 (2010): 123–27.
[48] Park et al., "The Effect of Repeated Exposure to Virtual Gambling Cues on the Urge to Gamble."
[49] Nadia B. Kuley and Durand F. Jacobs, "The Relationship between Dissociative-like Experiences and Sensation Seeking among Social and Problem Gamblers," *Journal of Gambling Behavior* 4, no. 3 (September 1, 1988): 197–207, doi:10.1007/BF01018332.

individuals seeking to use gambling as a coping mechanism to deal with affective and emotional stresses [50].

Coupled with this, in both online and virtual reality, the use of credit points and digital currency disrupts the financial value and salience of money, leading players to perceive losses as more tokenistic rather than real [51]. Given the capability of virtual reality to disconnect the players from reality to a much greater extent than online play, it is possible that the effect of tokenisation is greatly enhanced under virtual conditions increasing the propensity for poorer decisions and impulse control to be made.

The immersive and artificial environment generated by virtual reality has the propensity to suspend judgment and foster behavioural disinhibition. It is widely accepted that certain characteristics of online gambling act to impose fewer constraints on their behaviour as compared to land-based venues where there are interactions with real others [52]. In virtual reality, similar features such as anonymity and minimal face-to-face social interactions occur but these are intensified as the interactions with avatars are perceived to be artificial and divorced from reality. Accordingly, the immersion into an artificial environment where social interactions involve avatars provides a fertile foundation for behaviourally disinhibited decisions [53]. Therefore, the facilitation of behavioural disinhibition under conditions where actual gambling takes place is likely to contribute to excessive gambling.

One way in which virtual reality gambling differs from online gambling is the extent to which socialisation is possible. Within virtual gambling settings, gamblers can see, and interact with others, including gamblers, hosts, and avatars of artificial intelligence. The theory of social facilitation holds

---

[50] Katherine M. Diskin and David C. Hodgins, "Narrowing of Attention and Dissociation in Pathological Video Lottery Gamblers," *Journal of Gambling Studies* 15, no. 1 (1999): 17–28; Durand F. Jacobs, "A General Theory of Addictions: A New Theoretical Model," *Journal of Gambling Behavior* 2, no. 1 (1986): 15–31.

[51] Cotte and Latour, "Blackjack in the Kitchen"; Sally Gainsbury et al., "The Impact of Internet Gambling on Gambling Problems: A Comparison of Moderate-Risk and Problem Internet and Non-Internet Gamblers.," *Psychology of Addictive Behaviors* 27, no. 4 (2013): 1092–1101, doi:10.1037/a0031475; Sally M. Gainsbury et al., "How Risky Is Internet Gambling? A Comparison of Subgroups of Internet Gamblers Based on Problem Gambling Status," *New Media & Society* 17, no. 6 (June 1, 2015): 861–79, doi:10.1177/1461444813518185; Nerilee Hing et al., "Interactive Gambling," *Melbourne: Gambling Research Australia*, 2014, https://www.researchgate.net/profile/Alex_Russell/publication/261252655_Interactive_Gambling/links/00b7d53432b0a7c94a000000.pdf; Hing et al., "Do Advertising and Promotions for Online Gambling Increase Gambling Consumption?"; R. T. Wood and R. J. Williams, "A Comparative Profile of the Internet Gambler: Demographic Characteristics, Game-Play Patterns, and Problem Gambling Status," *New Media & Society* 13, no. 7 (November 1, 2011): 1123–41, doi:10.1177/1461444810397650.

[52] John Suler, "The Online Disinhibition Effect," *Cyberpsychology & Behavior* 7, no. 3 (2004): 321–326.

[53] John A. Bargh and and Katelyn Y. A. McKenna, "The Internet and Social Life," *Annual Review of Psychology* 55, no. 1 (2004): 573–90, doi:10.1146/annurev.psych.55.090902.141922.

that the presence of others raises arousal levels and reduces behavioural inhibitions [54]. This theory is in part explained as a consequence of fear of negative appraisal by others and the need to be perceived in a positive manner by others.

Virtual reality cue exposure studies have demonstrated that social interactions with virtual environments can increase cravings for substances, including tobacco and drugs [55]. In one study, smokers interacting with avatars and offered cigarettes experienced higher cravings than when limiting interactions to other materials [56]. Similarly, the presence of avatars drinking alcohol and offering users the opportunity to drink increased subjective craving levels for alcohol [57], a finding similar to crack cocaine dependent users where high cravings occurred in conditions where virtual avatars where observed using crack cocaine [58]. With regards to gambling, research has demonstrated that social presence can intensify gambling as people are concerned with making a favourable impression and are motivated by a negative mood state to avoid appearing as a 'loser' [59]. For problem gamblers, the greater degree of social interactions with others has been shown to increase persistence in betting as compared to gambling alone [60]. In virtual reality, a greater degree of social interactions with virtual gambling staff and players is possible with the nature of such interactions breaking down the common constraints limiting normal social protocols. Drawing on such evidence would suggest that interactions with other gamblers in a virtual environment is likely to increase desire to gamble for users. As the creators of virtual reality casinos are able to embed artificially intelligent avatars, it is likely that all users of virtual reality gambling will be influenced by the observed behaviours, gambling cues, and related social interactions of avatars.

However, in contrast to most land-based venues, individuals in virtual reality gambling are depicted as the optimal versions of themselves, often highly glamorised and attractive. 'Dissociative imagination' is the notion that 'one's online persona along with the online others live in a make-

---

[54] Robert Zajonc, *Social Facilitation* (Michigan: Research Center for Group Dynamics, Institute for Social Research, University of Michigan, 1965), http://www2.psych.ubc.ca/~schaller/Psyc591Readings/Zajonc1965.pdf.

[55] Hone-Blanchet, Wensing, and Fecteau, "The Use of Virtual Reality in Craving Assessment and Cue-Exposure Therapy in Substance Use Disorders."

[56] Bordnick et al., "Virtual Reality Cue Reactivity Assessment in Cigarette Smokers."

[57] Sangwoo Cho et al., "Development and Verification of an Alcohol Craving–induction Tool Using Virtual Reality: Craving Characteristics in Social Pressure Situation," *CyberPsychology & Behavior* 11, no. 3 (June 2008): 302–9, doi:10.1089/cpb.2007.0149.

[58] Michael E. Saladin et al., "A Preliminary Report on the Use of Virtual Reality Technology to Elicit Craving and Cue Reactivity in Cocaine Dependent Individuals," *Addictive Behaviors* 31, no. 10 (October 2006): 1881–94, doi:10.1016/j.addbeh.2006.01.004.

[59] Matthew Rockloff and Victoria Dyer, "An Experiment on the Social Facilitation of Gambling Behavior," *Journal of Gambling Studies* 23, no. 1 (March 1, 2007): 1–12, doi:10.1007/s10899-006-9042-4.

[60] Matthew Rockloff, "Validation of the Consumption Screen for Problem Gambling (CSPG)," *Journal of Gambling Studies* 28, no. 2 (June 1, 2012): 207–16, doi:10.1007/s10899-011-9260-2.

believe dimension, separate and apart from the demands and responsibilities of the real world' [61]. It is possible that consumers may specifically use virtual reality to depict themselves in a favourable manner and seek social affirmation. Individuals are increasingly turning to the Internet for social affirmation and engaging in impression management practices with young people in particular using online platforms, such as social networking sites, to carefully manage self-presentation [62]. Creating an idealised self-identity online can encourage people to embrace these attributes in their real life, which may result in virtual reality gamblers embracing the role of a gambler or 'big-spender', particularly if this is reinforced during online social interactions [63]. Therefore, the impact of self-presentation and social presence on virtual reality gambling needs to be specifically considered, as research findings based on land-based gambling venues may not be generalisable and/or applicable.

Implications

Virtual reality offers enormous potential and may be in the stage of nascent growth as in the 1990s when academics pondered the potential impact of the "World Wide Web". Virtual reality has yet to be embraced by mainstream consumers and its impacts are not fully realised at this stage. Virtual reality gambling will likely be a totally new experience and extend well beyond the offerings of a land-based or online casino or gambling experience. However, just as many gambling regulators who have traditionally dealt only with land-based gambling were initially relatively poorly prepared to deal with Internet gambling, the specific policies needed for virtual reality in terms of consumer protection and harm minimisation have not been developed or perhaps even been considered by many jurisdictions. Some lessons in this important context may be gleaned from the increased experience with Internet gambling among regulatory systems and jurisdictions, including many throughout the EU and the United Kingdom, for example, as may be applied to this new emerging technology. Virtual reality gambling appears to bring together some of the most problematic elements of gambling that have the potential to lead to gambling problems; availability, accessibility, and rapid and continuous play. There will be a mixed effect of anonymity and privacy where social interactions occur with avatars, with the potential for gamblers to be influenced by the highly glamorised presentation of others, including one's own avatar. The virtual reality environment represents an immersive and realistic environment where virtual credits disrupt financial value of

[61] Suler, "The Online Disinhibition Effect."
[62] Tuğçe Ozansoy Çadırcı and Ayşegül Sağkaya Güngör, "Love My Selfie: Selfies in Managing Impressions on Social Networks," *Journal of Marketing Communications* 0, no. 0 (October 24, 2016): 1–20, doi:10.1080/13527266.2016.1249390.
[63] Katelyn Y. A. McKenna and John A. Bargh, "Causes and Consequences of Social Interaction on the Internet: A Conceptual Framework," *Media Psychology* 1, no. 3 (September 1, 1999): 249–69, doi:10.1207/s1532785xmep0103_4.

bets placed, and provoke greater degrees of dissociation with no external distractions or awareness of the passage of time to cause or prompt breaks in play. These factors combined make it possible that this mode of gambling will contribute to the development of and significant exacerbation of gambling problems in the near future, especially if not addressed with reasonable regulatory measures put in place for this sort of new technology.

As with the emergence of remote gaming over the Internet many years ago], at the starting point of all new technologies, alarmist views can be unproductive. Certainly, not all those who engage in virtual reality gambling are likely to develop problems. It is possible that the experience of virtual reality is so realistic that the emotional and cognitive impact of losing money in a virtual gambling environment may cause negative attitudes. However, as in a real gambling environment, gamblers are likely to focus more on wins than losses, particularly when using virtual credits, which minimise the salience of expenditure.

It is important to consider the advantages of this new technology. As with Internet gambling, virtual reality gambling potentially provides opportunities to make harm minimisation strategies more effective [64].

- As social interaction can influence gambling, avatars can be used to approach players to discuss their gambling in an anonymous setting. For example, just as some jurisdictions require gambling venues to intervene if a player appears to have gambling problems, virtual reality gambling sites could intervene with avatars and personalised messages seen only by a specific player.
- Rather than requiring clocks to be visible, players should receive prominent time notifications to remind them to the time they have been in the virtual reality gambling environment. These could have default settings, but be modified by players. Similarly, players can be notified when they are approaching a pre-set limit on their gambling expenditure.
- Pop-up notifications can be displayed for users with appropriate messages, for example, encouraging gambling at a reasonable level and for entertainment and warnings about gambling to a problematic level.
- Virtual reality gambling environments should be required to have areas without any gambling stimuli for players to take a break and interact with others. Other virtual players taking breaks may promote imitation through vicarious social learning.

[64] Monaghan, "Responsible Gambling Strategies for Internet Gambling."

- Players should have to leave the virtual reality environment to add credit to their account, to provide an opportunity to think through this action and break any potential dissociation within a gambling session.
- Many of the consumer protection measures that have been suggested for Internet gambling are also relevant to this mode, for example, self-exclusion for temporary breaks and longer periods, ability to easily access aggregated activity statements on expenditure, detection of indicators of problems and intervention by gambling operators.

There is very little research on the impact of virtual reality on gambling, all of which has been conducted in highly controlled experimental studies, often in a treatment setting. Virtual reality gambling operators should be involved in independent research, including data sharing, to enable a greater understanding of the psychology of virtual reality gambling and impact on harms. Virtual environments can be used for research purposes, which is important in the field as it is difficult to simulate a realistic gambling scenario in a laboratory. Many gambling studies rely on decision-making tasks in a laboratory, which have limited applicability to real world gambling [65]. There are many research questions that need to be addressed; these include understanding what aspects of the virtual reality environment impact gambling urges and behaviour; How the experience of virtual reality gambling compares to online and offline gambling and what implications this has for the development of problems? And what harm minimisation measures are relevant and effective in a virtual reality gambling environment? Virtual reality has been used in treatment programs [66] and has many applications in health care. Further research is needed to understand how this technology is best utilised for preventing and treating gambling-related harms.

Conclusion

It is predicted that virtual reality gambling will progressively capture a portion of the market sector, particularly as technological, software and computing capacity and graphical resolution become more sophisticated and commercially affordable. The inclusion of features that enable a realistic representation of familiar and/or preferred environments coupled with some interactive skill-based

[65] Sally Gainsbury and Alex Blaszczynski, "The Appropriateness of Using Laboratories and Student Participants in Gambling Research," *Journal of Gambling Studies* 27, no. 1 (March 1, 2011): 83–97, doi:10.1007/s10899-010-9190-4.

[66] Stéphane Bouchard et al., "Using Virtual Reality to Provide a Naturalistic Setting for the Treatment of Pathological Gambling," in *The Thousand Faces of Virtual Reality*, ed. Cecilia Sik-Lanyi (InTech, 2014), http://www.intechopen.com/books/the-thousand-faces-of-virtual-reality/using-virtual-reality-to-provide-a-naturalistic-setting-for-the-treatment-of-pathological-gambling; Giroux et al., "Gambling Exposure in Virtual Reality and Modification of Urge to Gamble"; Loranger et al., "Validation of Two Virtual Environments for the Prevention and Treatment of Pathological Gambling"; Park et al., "The Effect of Repeated Exposure to Virtual Gambling Cues on the Urge to Gamble."

component that determines payout levels is expected to be of specific appeal to the young technically knowledgeable generation of players. The gambling environment is moving toward more interactive formats with electronic gaming machines containing skills-based elements. Virtual reality gambling is a logical extension of this development. To date, most regulators continue to either neglect or are attempting to gain an understanding of the potential impact of virtual reality gambling and the extent to which responsible gambling and harm minimisation regulations ought to or should be introduced. Similarly, treatment providers need to gain an understanding of the possible presence of unique psychological factors underlying virtual reality that contribute to, or exacerbate, gambling problems, and if present, modify existing interventions to counter those factors. Further research is urgently needed to understand the likely impact of virtual reality gambling on consumers, including the development and exacerbation of compulsive and other problematic gambling.

References

Bargh, John A., and and Katelyn Y. A. McKenna. “The Internet and Social Life.” *Annual Review of Psychology* 55, no. 1 (2004): 573–90. doi:10.1146/annurev.psych.55.090902.141922.

BettingApps. “Augmented Reality Betting Apps - The Future of Betting on Your Mobile!” *Betting Apps*, October 11, 2014. http://www.bettingapps.co.uk/augmented-reality-betting-apps-the-future/.

Bordnick, Patrick S., Ken M. Graap, Hilary L. Copp, Jeremy Brooks, and Mirtha Ferrer. “Virtual Reality Cue Reactivity Assessment in Cigarette Smokers.” *CyberPsychology & Behavior* 8, no. 5 (2005): 487–492.

Bouchard, Stéphane, Claudie Loranger, Isabelle Giroux, Christian Jacques, and Geneviève Robillard. “Using Virtual Reality to Provide a Naturalistic Setting for the Treatment of Pathological Gambling.” In *The Thousand Faces of Virtual Reality*, edited by Cecilia Sik-Lanyi. InTech, 2014. http://www.intechopen.com/books/the-thousand-faces-of-virtual-reality/using-virtual-reality-to-provide-a-naturalistic-setting-for-the-treatment-of-pathological-gambling.

Brown, Emily, and Paul Cairns. “A Grounded Investigation of Game Immersion.” In *CHI’04 Extended Abstracts on Human Factors in Computing Systems*, 1297–1300. ACM, 2004. http://dl.acm.org/citation.cfm?id=986048.

Çadırcı, Tuğçe Ozansoy, and Ayşegül Sağkaya Güngör. “Love My Selfie: Selfies in Managing Impressions on Social Networks.” *Journal of Marketing Communications* 0, no. 0 (October 24, 2016): 1–20. doi:10.1080/13527266.2016.1249390.

Chicchi Giglioli, Irene Alice, Federica Pallavicini, Elisa Pedroli, Silvia Serino, and Giuseppe Riva. “Augmented Reality: A Brand New Challenge for the Assessment and Treatment of Psychological Disorders.” *Computational and Mathematical Methods in Medicine* 2015 (August 3, 2015): e862942. doi:10.1155/2015/862942.

Cho, Sangwoo, Jeonghun Ku, Jinsick Park, Kiwan Han, Hyeongrae Lee, You Kyong Choi, Young-Chul Jung, et al. “Development and Verification of an Alcohol Craving–induction Tool Using Virtual Reality: Craving Characteristics in Social Pressure Situation.” *CyberPsychology & Behavior* 11, no. 3 (June 2008): 302–9. doi:10.1089/cpb.2007.0149.

Cotte, June, and Kathryn A. Latour. “Blackjack in the Kitchen: Understanding Online versus Casino Gambling.” *Journal of Consumer Research* 35, no. 5 (February 1, 2009): 742–58. doi:10.1086/592945.

David Katzmaier. “With a Bullet to the Head from Samsung, 3D TV Is Now Deader than Ever.” *CNET*, February 3, 2016. https://www.cnet.com/au/news/3d-tv-is-now-more-dead-than-ever/.

Deloitte. “Predictions 2016: Virtual Reality: A Billion Dollar Niche.” *Deloitte*, 2016. https://www2.deloitte.com/global/en/pages/technology-media-and-telecommunications/articles/tmt-pred16-media-virtual-reality-billion-dollar-niche.html.

Diskin, Katherine M., and David C. Hodgins. “Narrowing of Attention and Dissociation in Pathological Video Lottery Gamblers.” *Journal of Gambling Studies* 15, no. 1 (1999): 17–28.

Ferrer-Garcia, Marta, Olaya Garcia-Rodriguez, José Gutierrezmaldonado, Irene Pericot-Valverde, and Roberto Secades-Villa. “Efficacy of Virtual Reality in Triggering the Craving to Smoke: Its Relation to Level of Presence and Nicotine Dependence.” *Annual Review of Cybertherapy and Telemedicine* 154 (2010): 123–27.

Gainsbury, Sally, and Alex Blaszczynski. “The Appropriateness of Using Laboratories and Student Participants in Gambling Research.” *Journal of Gambling Studies* 27, no. 1 (March 1, 2011): 83–97. doi:10.1007/s10899-010-9190-4.

Gainsbury, Sally M., Alex Russell, Robert Wood, Nerilee Hing, and Alex Blaszczynski. “How Risky Is Internet Gambling? A Comparison of Subgroups of Internet Gamblers Based on Problem Gambling Status.” *New Media & Society* 17, no. 6 (June 1, 2015): 861–79. doi:10.1177/1461444813518185.

Gainsbury, Sally, Alex Russell, Nerilee Hing, Robert Wood, and Alex Blaszczynski. “The Impact of Internet Gambling on Gambling Problems: A Comparison of Moderate-Risk and Problem Internet and Non-Internet Gamblers.” *Psychology of Addictive Behaviors* 27, no. 4 (2013): 1092–1101. doi:10.1037/a0031475.

Gainsbury, Sally, and Robert Wood. “Internet Gambling Policy in Critical Comparative Perspective: The Effectiveness of Existing Regulatory Frameworks.” *International Gambling Studies* 11, no. 3 (December 1, 2011): 309–23. doi:10.1080/14459795.2011.619553.

Gaming Intelligence. “Infinity to Launch Augmented Reality Live Casino with Will Hill,” November 19, 2013. http://www.gamingintelligence.com/marketing/23127-infinity-ar-to-launch-augmented-reality-live-casino-with-william-hill.

Giroux, Isabelle, Andréanne Faucher-Gravel, Alexandre St-Hilaire, Catherine Boudreault, Christian Jacques, and Stéphane Bouchard. “Gambling Exposure in Virtual Reality and Modification of Urge to Gamble.” *Cyberpsychology, Behavior, and Social Networking* 16, no. 3 (March 1, 2013): 224–31. doi:10.1089/cyber.2012.1573.

Green, Will. “Catch That Bet: 888Sport Launches Pokémon Go-Style Sports Free Plays.” *Legal Sports Report*, September 20, 2016. http://www.legalsportsreport.com/11594/catch-that-bet-888sport-launches-pokemon-go-style-sports-freeplays/.

Heyman, Stephen. “The Decline of 3-D? Not So Fast - The New York Times.” *The New York Times*, August 1, 2015, sec. International Arts. http://www.nytimes.com/2015/01/08/arts/international/the-decline-of-3-d-not-so-fast.html?_r=0.

Hing, Nerilee, Lorraine Cherney, Alex Blaszczynski, Sally M. Gainsbury, and Dan I. Lubman. “Do Advertising and Promotions for Online Gambling Increase Gambling Consumption? An Exploratory Study.” *International Gambling Studies* 14, no. 3 (September 2, 2014): 394–409. doi:10.1080/14459795.2014.903989.

Hing, Nerilee, Sally Gainsbury, Alex Blaszczynski, Robert Wood, Dan Lubman, and Alex Russell. “Interactive Gambling.” *Melbourne: Gambling Research Australia*, 2014. https://www.researchgate.net/profile/Alex_Russell/publication/261252655_Interactive_Gambling/links/00b7d53432b0a7c94a000000.pdf.

“History Of Virtual Reality.” *Virtual Reality Society*, December 25, 2015. http://www.vrs.org.uk/virtual-reality/history.html.

Hone-Blanchet, Antoine, Tobias Wensing, and Shirley Fecteau. “The Use of Virtual Reality in Craving Assessment and Cue-Exposure Therapy in Substance Use Disorders.” *Frontiers in Human Neuroscience* 8 (2014). doi:10.3389/fnhum.2014.00844.

“Is 2017 the Year of Virtual Reality Gaming?” Accessed March 10, 2017. https://www.gamblinginsider.com/in-depth/2977/is-2017-the-year-of-virtual-reality-gaming.

Jacobs, Durand F. “A General Theory of Addictions: A New Theoretical Model.” *Journal of Gambling Behavior* 2, no. 1 (1986): 15–31.

James, Richard J. E., Claire O’Malley, and Richard J. Tunney. “Understanding the Psychology of Mobile Gambling: A Behavioural Synthesis.” *British Journal of Psychology*, October 2016. doi:10.1111/bjop.12226.

Juniper Research. “Virtual Reality Gambling Set to Deliver Real Spend.” *Juniper Research*, October 10, 2016. https://www.juniperresearch.com/press/press-releases/virtual-reality-gambling-set-to-deliver-real-world.

Kim, Hyeon-Cheol, and Martin Yongho Hyun. “Predicting the Use of Smartphone-Based Augmented Reality (AR): Does Telepresence Really Help?” *Computers in Human Behavior* 59 (June 2016): 28–38. doi:10.1016/j.chb.2016.01.001.

Kuley, Nadia B., and Durand F. Jacobs. “The Relationship between Dissociative-like Experiences and Sensation Seeking among Social and Problem Gamblers.” *Journal of Gambling Behavior* 4, no. 3 (September 1, 1988): 197–207. doi:10.1007/BF01018332.

Kuliga, S. F., T. Thrash, R. C. Dalton, and C. Hölscher. “Virtual Reality as an Empirical Research Tool — Exploring User Experience in a Real Building and a Corresponding Virtual Model.” *Computers, Environment and Urban Systems* 54 (November 2015): 363–75. doi:10.1016/j.compenvurbsys.2015.09.006.

Ladouceur, Robert, and Serge Sévigny. “Electronic Gambling Machines: Influence of a Clock, a Cash Display, and a Precommitment on Gambling Time.” *Journal of Gambling Issues*, 2009, 31–41.

Lalwani, Mona. “Surrounded by Sound: How 3D Audio Hacks Your Brain.” *The Verge*, February 12, 2015. http://www.theverge.com/2015/2/12/8021733/3d-audio-3dio-binaural-immersive-vr-sound-times-square-new-york.

Loranger, C, S Bouchard, J Boulanger, and G Robillard. “Validation of Two Virtual Environments for the Prevention and Treatment of Pathological Gambling.” *Journal of CyberTherapy and Rehabilitation* 4, no. 2 (2011): 233–36.

M. Gainsbury, Sally, Yong Liu, Alex M. T. Russell, and Thorsten Teichert. “Is All Internet Gambling Equally Problematic? Considering the Relationship between Mode of Access and Gambling Problems.” *Computers in Human Behavior* 55, Part B (February 2016): 717–28. doi:10.1016/j.chb.2015.10.006.

McCormack, Abby, Gillian W. Shorter, and Mark D. Griffiths. “An Examination of Participation in Online Gambling Activities and the Relationship with Problem Gambling.” *Journal of Behavioral Addictions* 2, no. 1 (March 2013): 31–41. doi:10.1556/JBA.2.2013.1.5.

McKenna, Katelyn Y. A., and John A. Bargh. “Causes and Consequences of Social Interaction on the Internet: A Conceptual Framework.” *Media Psychology* 1, no. 3 (September 1, 1999): 249–69. doi:10.1207/s1532785xmep0103_4.

Monaghan, Sally. “Responsible Gambling Strategies for Internet Gambling: The Theoretical and Empirical Base of Using Pop-up Messages to Encourage Self-Awareness.” *Computers in Human Behavior* 25, no. 1 (January 2009): 202–7. doi:10.1016/j.chb.2008.08.008.

Mortimer, Natalie. “Betfair to Use Google Glass during Live TV Betting Slots.” *The Drum*, April 7, 2014. http://www.thedrum.com/news/2014/07/04/betfair-use-google-glass-during-live-tv-betting-slots.

Murray, Craig D., Jezz Fox, and Steve Pettifer. “Absorption, Dissociation, Locus of Control and Presence in Virtual Reality.” *Computers in Human Behavior*, Including the Special Issue: Avoiding Simplicity, Confronting Complexity: Advances in Designing Powerful Electronic Learning Environments, 23, no. 3 (May 2007): 1347–54. doi:10.1016/j.chb.2004.12.010.

NetEnt. “NetEnt to Showcase the Future of Online Gaming at ICE.” *NetEnt*, February 2, 2016. https://www.netent.com:443/en/netent-to-showcase-the-future-of-online-gaming-at-ice/.

Online.CasinoCity. “SlotsMillion Unveils Virtual Reality Online Casino,” October 19, 2015. http://online.casinocity.com/article/slotsmillion-unveils-virtual-reality-online-casino-120680.

Park, Chan-Bin, Su Mi Park, Ah Reum Gwak, Bo Kyung Sohn, Jun-Young Lee, Hee Yeon Jung, Sam-Wook Choi, Dai Jin Kim, and Jung-Seok Choi. “The Effect of Repeated Exposure to Virtual Gambling Cues on the Urge to Gamble.” *Addictive Behaviors* 41 (February 2015): 61–64. doi:10.1016/j.addbeh.2014.09.027.

Pericot-Valverde, Irene, Lisa J. Germeroth, and Stephen T. Tiffany. “The Use of Virtual Reality in the Production of Cue-Specific Craving for Cigarettes: A Meta-Analysis.” *Nicotine & Tobacco Research* 18, no. 5 (May 1, 2016): 538–46. doi:10.1093/ntr/ntv216.

Riva, Giuseppe, Fabrizia Mantovani, Claret Samantha Capideville, Alessandra Preziosa, Francesca Morganti, Daniela Villani, Andrea Gaggioli, Cristina Botella, and Mariano Alcañiz. “Affective Interactions Using Virtual Reality: The Link between Presence and Emotions.” *CyberPsychology & Behavior* 10, no. 1 (February 2007): 45–56. doi:10.1089/cpb.2006.9993.

Rockloff, Matthew. “Validation of the Consumption Screen for Problem Gambling (CSPG).” *Journal of Gambling Studies* 28, no. 2 (June 1, 2012): 207–16. doi:10.1007/s10899-011-9260-2.

Rockloff, Matthew, and Victoria Dyer. “An Experiment on the Social Facilitation of Gambling Behavior.” *Journal of Gambling Studies* 23, no. 1 (March 1, 2007): 1–12. doi:10.1007/s10899-006-9042-4.

Sadowski, Wallace, and Kay Stanney. “Presence in Virtual Environments.” In *Handbook of Virtual Environments: Design, Implementation, and Applications*, 791–806. Human Factors and Ergonomics. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, 2002.

Saladin, Michael E., Kathleen T. Brady, Ken Graap, and Barbara Olasov Rothbaum. “A Preliminary Report on the Use of Virtual Reality Technology to Elicit Craving and Cue Reactivity in Cocaine Dependent Individuals.” *Addictive Behaviors* 31, no. 10 (October 2006): 1881–94. doi:10.1016/j.addbeh.2006.01.004.

Schellinck, Tony, and Tracy Schrans. “Video Lottery Responsible Gaming Feature Research - Final Report.” Focal Research, October 2002. http://greo.ca/sites/default/files/documents/Schellinck%20et%20al(2002)_alc_video_lottery_responsible_gaming_feature_conclusions.pdf.

Suler, John. “The Online Disinhibition Effect.” *Cyberpsychology & Behavior* 7, no. 3 (2004): 321–326.

SuperData. “Virtual Reality Industry Report 2016.” SuperData, 2016. https://www.superdataresearch.com/market-data/virtual-reality-industry-report/.

Tabbitt, Sue. “AR & VR Bring Retail Stores Alive in People’s Homes,” November 21, 2016. https://newsroom.cisco.com/feature-content?type=webcontent&articleId=1803354.

Tomic, Alexandre. “Why We Built SlotsMillion: The First VR Online Casino Which Has No Users... yet.” *Thevirtualreport.biz*, March 18, 2016. http://www.thevirtualreport.biz/interviews-and-opinion/62900/vr-and-slotsmillion/.

Valentine, Gill, and Kahryn Hughes. “Shared Space, Distant Lives? Understandingfamily and Intimacy at Home through Thelens of Internet Gambling.” *Transactions of the Institute of British Geographers* 37 (2012): 242–55.

Wiederhold, B.K, and M.D Wiederhold. “The Effect of Presence on Virtual Reality Treatment.” In *Virtual Reality Therapy for Anxiety Disorders: Advances in Evaluation and Treatment.*, edited by B.K Wiederhold and M.D Wiederhold, 77–86. Washington, D.C.: American Psychological Association, 2005.

Witmer, Bob G., and Michael J. Singer. “Measuring Presence in Virtual Environments: A Presence Questionnaire.” *Presence: Teleoperators and Virtual Environments* 7, no. 3 (June 1, 1998): 225–40. doi:10.1162/105474698565686.

Wood, R. T., and R. J. Williams. “A Comparative Profile of the Internet Gambler: Demographic Characteristics, Game-Play Patterns, and Problem Gambling Status.” *New Media & Society* 13, no. 7 (November 1, 2011): 1123–41. doi:10.1177/1461444810397650.

Wynne, Harold, and Randy Stinchfield. “Evaluating VLT Responsible Gaming Features and Interventions in Alberta.” Alberta Gaming and Liquor Commission, April 2004. http://aglc.ca/pdf/gaming/news_releases/VLT_responsible_features_phase1_report.pdf.

Young, Matthew M., Michael J. A. Wohl, Kimberly Matheson, Steve Baumann, and Hymie Anisman. “The Desire to Gamble: The Influence of Outcomes on the Priming Effects of a Gambling Episode.” *Journal of Gambling Studies* 24, no. 3 (September 2008): 275–93. doi:10.1007/s10899-008-9093-9.

Zajonc, Robert. *Social Facilitation*. Michigan: Research Center for Group Dynamics, Institute for Social Research, University of Michigan, 1965. http://www2.psych.ubc.ca/~schaller/Psyc591Readings/Zajonc1965.pdf.