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Jihoon Kim  
*University of Alabama*, [jkim227@ua.edu](mailto:jkim227@ua.edu)

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# Analytical and Theoretical Perspectives on Sport-Related VR Research: Spatial Presence Manipulation Guidelines

Jihoon Kim

*University of Alabama*

Please send correspondence to: Jihoon Kim, [jkim227@ua.edu](mailto:jkim227@ua.edu)

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The development of communication technologies over the last few decades has massively transformed the role of communication and the ways in which people interact with each other (Flanagin, 2020; Moffett et al., 2020). This trend has accelerated with the rise of immersive digital technologies such as virtual reality (VR; Markowitz & Bailenson, 2019). These technologies and platforms are opening pathways to innovation in various areas, such as marketing (Luangrath et al., 2022), advertising, (de Ruyter et al., 2020), and health communication (Nowak et al., 2020). For instance, Global VR content revenue reached \$1.8 billion in 2020 and is likely to reach \$6.9 billion by 2025 (PwC, 2021). One market that VR has successfully penetrated is the sport industry. Because VR has distinctive advantages that enable users to engage actively with a mediated environment, it has gained traction in various disciplines, such as pro-level athlete training (e.g., collection of essential metrics to improve performance; Neumann et al., 2018) and deeper fan experience (e.g., viewing matched typically inaccessible positions; Kim & Ko, 2019). Additionally, the emergence of *metaverse*, a “3D virtual shared world where all activities can be carried out with the help of augmented and virtual reality services” (Damar, 2021, p. 1), has triggered systematic research and debate about VR among scholars and practitioners in the sport industry.

As scholars increasingly recognize such technological innovation, they need theory-based analytical methods to explain the impact of VR on various outcomes. Consider how, in most VR studies (e.g., Kim et al., 2022; Song et al., 2021), scholars conducted experiments in controlled laboratory environments to manipulate modalities (e.g., 2D vs. 3D) that led to different senses of being in a mediated environment. As more scholars incorporate VR into their research, theoretical frameworks for empirical investigation and methodological guidelines for manipulation become more crucial. Because VR is a relatively new instrument and validating the implementation of VR can be challenging, scholars need to exercise caution when manipulating stimuli and measuring experimental conditions. Thus, the aim of the current essay is twofold: (a) address various methodological challenges (e.g., manipulation check) in recent VR studies and (b) discuss potential theoretical frameworks for future VR research in sport.

## Theoretical Perspectives of VR

### Affordances in VR

Affordance has emerged as a central analytic tool and unique approach in communication research. Investigating affordance sheds light on how people perceive VR qualities (e.g., increase user engagement by stimulating vision, hearing, and touch to create an immersive experience; Steuer, 1992), how these qualities drive people to use a particular media, and which affective and cognitive experiences are salient. An affordance is “a characteristic of an environment that, when perceived, provides an opportunity for action” (Gibson, 1987). According to Gibson, perception of an environment inevitably leads to some type of action. However, the perception of affordances does not require internal processing by the perceiver. Instead of merely stimulating a passive receiver, various elements (e.g., visual) allow viewers to use the information they encounter (Davis & Chouinard, 2016). Within an immersive environment, users actively engage in a mediated environment with computer-simulated settings and events rather than passively receiving stimuli (Evans et al., 2017). By engaging in a virtual environment with various affordances, users can create a narrative or accomplish specific tasks (e.g., sense of presence). VR devices and other head-mounted displays (HMD) allow users to take natural actions by viewing the entire scene in that environment. Thus, the concept of affordance provides a theoretical framework for examining how immersion influences interactive routines (Steffen et al., 2019). The concept of affordance helps scholars exploring VR to better identify the elements with which user interact and when that interaction occurs.

Unlike traditional media engagement, immersive experience delivered via HMD allows users to interact with a virtual environment by controlling their viewing direction in ways that correspond to real-life movement. Indeed, viewing a virtual world via HMD intensifies engagement in a mediated environment. Various functional features (i.e., affordances) implemented by advanced technologies make users forget that they are in a simulation (Evans et al., 2017; Steffen et al., 2019). Therefore, scholars can manipulate affordance by exposing participants to various functional features of media devices.

### Immersion and Spatial Presence

Because VR immerses users in a virtual environment, allowing them temporarily to *forget* the real world and feel part of the simulated world they are experiencing, VR is an effective tool for changing attitude and behavior (Kim et al., 2022; Markowitz & Bailenson, 2019). Therefore, understanding how people perceive and process perceptual cues (e.g., vision and hearing) based on media modality (e.g., 2D vs. 3D) is important in VR research. The higher the number of technological features, the more immersive the experience will be. Slater and Wilbur (1997) defined *immersion* as “the extent to which computer displays are capable of delivering stimuli that allow viewers to perceive presence: an inclusive, extensive, surrounding, and vivid illusion of reality” (p. 604). According to this definition, *inclusive* indicates “the extent to which physical reality is shut out,” *extensive* indicates “the range of sensory modalities accommodated,” *surrounding* indicates “the extent to which this virtual reality is panoramic rather than limited to a narrow field,” and *vivid* indicates “the resolution of the visuality” (p. 604). Slater and Wilbur further explained that immersion occurs when a visual presentation changes as viewers move their bodies and when real-world sensations give way to simulated-world sensations. Accordingly, immersion

closely relates to the multi-modal nature of perception and to the resemblance of mediated experience to everyday non-mediated human experience. In this respect, the more a media technology delivers images that are inclusive, extensive, surrounding, and vivid, the more immersive it is (Diemer et al., 2015). Thus, *immersion* is a technological term that refers to the feeling that one has left the real world and is now present in a virtual environment. In this sense, VR is more immersive than traditional media (e.g., TV, Radio) because it provides more sensorimotor cues (e.g., visual feedback for an action).

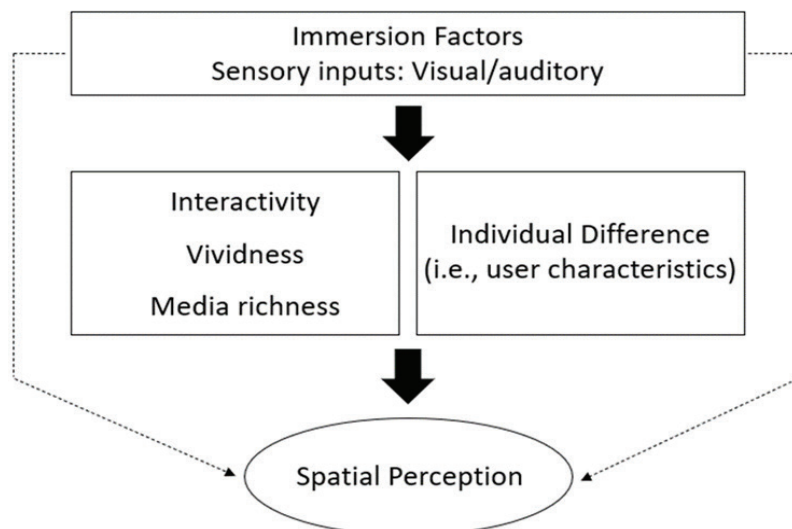
Compared to immersion (i.e., objective perception via technological features), presence is a subjective sense of being there (Wirth et al., 2007). Although immersion and presence are conceptually distinct (Diemer et al., 2015), scholars have utilized the terms similarly when describing a sense of presence in a mediated virtual environment, such as telepresence, presence, and spatial presence. However, even with conceptual and terminological confusion, scholars tend to agree that *spatial presence* – a category of presence – is a psychological phenomenon that users experience (Lee, 2004).

Lombard and Ditton (1997) described spatial presence as the “perceptual illusion of non-mediation.” Spatial presence is a subjective experience because the ability to immerse oneself in mediated content depends on cognitive abilities (Worth et al., 2007) and personality traits (Lombard & Ditton, 1997; Sacau et al., 2008). Further, the International Society for Presence Research (ISPR) conceptualized the experience of non-mediation as “a psychological state or subjective perception in which even though part or all of an individual’s current experience is generated by and/or filtered through human-made technology, part or all of the individual’s perception fails to accurately acknowledge the role of the technology in the experience” (ISPR, 2000). In other words, people feel a sense of being in a mediated environment even though they are actually in the real world using a digital device.

Spatial presence results from interaction among users, content, and technology. Thus, this phenomenon is the *subjective* experience of a user feeling *physically* located in a mediated environment. With spatial presence in mind, Figure 1 illustrates the general layout of VR research.

**Figure 1**

*General Experimental Layout for VR Research*



## **Manipulation Guidelines for Sport-Related VR Research**

### **Manipulation of Spatial Presence via Immersion**

Mediated experiences are available through traditional media (e.g., TV), but the novel affordances of VR (e.g., seeing and feeling the experience) allow users to go beyond passive viewership (Evans et al., 2017). Because VR provides a realistic computer-rendered world that enables users to interact seamlessly with the information, spatial presence (i.e., feeling a sense of being there) is a critical component of immersive experiences. For instance, individual capacity to attend to mediated content and filter out external stimuli is essential to spatial presence. Individuals are likely to experience high spatial presence if they sufficiently focus on the mediated content. Several scholars have also discussed how individual characteristics influence the perception of spatial presence (Heeter, 1992; Sacau et al., 2008).

In the context of VR, several scholars have conducted manipulation checks by measuring a sense of presence (e.g., spatial presence, telepresence) in a laboratory setting (e.g., Breves, 2021; Breves & Schramm, 2021; Uhm et al., 2020). However, because spatial presence is a subjective experience that depends on individual characteristics, scholars can only manipulate it by altering level of immersion via VR technology (Diemer et al., 2015; Worth et al., 2007). Based on the theoretical framework of affordance, immersion, and spatial presence, scholars can manipulate spatial presence by adjusting media modality, establishing different levels interactivity, vividness, or media richness (Diemer et al., 2015). For example, vividness is “the ability of a technology to produce a sensorially rich, mediated environment” (Steuer, 1992, p. 80). Vivid content stimulates sensory experience in consumers by evoking memories and previous sensations, typically generating mental imagery. When exposed to adequate vivid elements (i.e., 3D content via HMD), users become immersed more fully in the virtual world, fostering higher spatial presence (Diemer et al., 2015).

### **General Experiment Layout: VR Setting**

Previous findings widely suggest that level of immersion increases spatial presence experienced by the user (Diemer et al., 2015; Kim et al., 2022). What that means is scholars can design a rigorous VR study in sport using the theoretical framework of spatial presence. Indeed, given that the consumption of sport is experiential (Chanavat & Bodet, 2014), VR offers a distinctive opportunity to create immersive experiences for various stakeholders (e.g., fans, athletes, coaches). In most sport studies featuring VR, scholars (e.g., Kim & Ko, 2019; Uhm et al., 2020) have examined the effectiveness of VR by comparing different media modalities. Using different delivery devices, scholars can categorize VR content based on immersion level via media modality (e.g., more or less graphically enhanced simulations). In this way, a general experiment might contain the following two conditions: (a) desktop or laptop VR as low immersion (2D modality) and (b) VR HMD as high immersion (3D modality). Based on immersion level, scholars could then assign participants to different VR groups, such as groups with either low or high levels of interactivity, vividness, and media richness. Interested scholars would also need to perform a manipulation check to determine whether the different immersion levels actually influenced user perceptions of interactivity, vividness, or media richness.

## Conclusion

VR represents a more recent phenomenon that has become increasingly affordable and accessible. Sport management scholars have also shown increasing interest in VR. Thus, careful consideration of the prevailing theoretical frameworks and methodologies is necessary to improve the transparency and replicability of studies about the effects of VR. Through this short yet detailed overview, readers have been provided with the following: (1) a theoretical foundation for sport-related VR research, (2) a refined methodology for rigorous data collection, (3) a conceptual differentiation of immersion and spatial presence, and (4) manipulation guidelines for empirical investigation. Sport-related VR research will continue to grow due to the experiential nature of sport consumption. Thus, the author encourages sport scholars to venture into other consumer experience areas while bearing in mind the methodological challenges of VR research.

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