



# Social interaction in a virtual environment: Examining socio-spatial interactivity and social presence using behavioral analytics



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## ABSTRACT

A behavioral observation methodology was employed in this study to examine how social behavior unfolds within a virtual environment and to identify what might perpetuate this behavior. Partial interval recording sampling was used to code social interactions (Socio-Spatial Interactivity and Social Presence) that occurred between experienced World of Warcraft players during their game play. Given the bidirectional nature of social interactions, Socio-Spatial Interactivity and Social Presence variables (Affective Association, Community Cohesion, Interaction Intensity, and Knowledge & Experience) were employed as both dependent and independent variables in two separate sets of regression analyses. Findings suggest that a positive feedback loop exists between Socio-Spatial Interactivity and Social Presence. Based on these findings, the researchers discuss implications for designers and end-users of virtual environments.

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## 1. Introduction

Despite their contrasting purposes, virtual environments including *World of Warcraft*, *The Sims Online*, and *Second Life* are designed to promote social interaction (Childress & Braswell, 2006; Cole & Griffiths, 2007; Martey & Stromer-Galley, 2007). Drawing upon the affordances of an avatar (i.e., digital representation of self), participants assume the role of social actor in order to problem solve and achieve goals (McCreery, Schrader, & Krach, 2011; Talamo & Ligorio, 2001). Intended or not, these social dynamics have led to the emergence of a broad range of sociocultural norms and artifacts, social structures and hierarchies, as well as social roles that impact behavior (Martey & Stromer-Galley, 2007; McCreery, Krach, Schrader, Boone, 2012; Squire & Steinkuehler, 2006; Yee, Bailenson, Urbanek, Chang, & Merget, 2007). However, little is known regarding how social behavior emerges within these environments and what factors contribute to such behavior. Accordingly, we employed a behavioral observation methodology (McCreery et al., 2011; Whiteside & Garrett Dikkers, 2012) to examine how social behavior unfolds within a virtual environment and what might perpetuate this behavior.

### 1.1. Cognitive functioning in spatial domains

Research has shown that offline reality frames many of the experiences seen in online worlds (Webb, 2001). However, the mediated nature of virtual environments requires the translation of experiences into a space with which we do not reside. In other words, in a world that is free of physical boundaries (i.e., the body), participants are required to engage in a variety of proxemics or cognitive functions in the form of spatial domains (e.g., *spatial positioning*, *spatial realization*, *spatial appropriation*, *spatial interactivity*, *socio-spatial interactivity*) in order to problem solve and achieve goals (McCreery et al., 2011). In each case, spatial domains provide the participant with a framework through which to navigate the environment (spatial positioning), orient to the system rules (spatial realization), interact with the graphical user interface (spatial appropriation), discriminate between system and environmental choices (spatial interactivity), and interact with other participants in the environment (socio-spatial interactivity) (McCreery et al., 2011).

Although proficiency with each of these spatial domains is critical to the successful navigation of a virtual environment, it is the domain of socio-spatial interactivity where social behavior arises (McCreery et al., 2011). Specifically, socio-spatial interactivity refers to participants' ability to: (a) recognize player-controlled avatars; (b) use internal social networking tools to communicate player-controlled avatars; and (c) employ system affordances to engage in group-based activities. For example, a player might recognize another player's avatar by its name, use a text chat tool to

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talk with that player, and then invite them to a group in order engage in mutually beneficial problem solving.

Ultimately, socio-spatial interactivity consists of a set of behavioral outcomes that facilitate in-world social interaction. Although the mediated nature of virtual environments appear to require the spatially-based function of socio-spatial interactivity to navigate the social environment, researchers have also argued that social presence influences the salience of these experiences (Horvath & Lombard, 2010; Short, Williams, & Christie, 1976).

### 1.2. Social presence

Defined as a “sense of being there with another”, the construct of social presence suggests that interpersonal communication and social behavior are directly influenced by the psychological connections toward other people that are experienced within a mediated environment (i.e., a virtual environment) (Biocca, Harms, & Burgoon, 2003, p.456). Ekman and colleagues (2012) describe a variety of factors that influence social presence, including: (a) Sensory Representations (seeing another’s avatar); (b) Mental Representations (imagining the person connected to the avatar); (c) Psychological Involvement (mental and emotional connectedness); and (d) Behavioral Involvement (interaction among people). It is within these factors that social cues and norms arise, giving participants an opportunity to draw upon real-world experiences in order to contextualize events and respond appropriately (Horvath & Lombard, 2010).

However, social presence has evolved from projecting one’s self in the form of an online personal identity to one of a “shared social identity” (Garrison, Anderson, & Archer, 2010). Viewing social presence as a group construct introduces a dynamic element. Group development and interactions occur in both epochal (event-based) and fungible (clock-based) times where both regularly occur simultaneously (Ballard, Tschan, & Waller, 2008). The group could be working together on a problem-solving activity but time spent on the activity could vary by individual. This variation in fungible time could affect the level of social presence experienced by members of the group as levels of social presence ebb and flow. The group representation an individual member has in one’s mind is dynamically recreated, influencing the development of social presence over time (Remesal & Colima, 2013).

As such, this framing of social presence as a shared social identity that emerges from group development and social interaction has afforded researchers an opportunity to construct a taxonomy (i.e., *Affective Association*, *Community Cohesion*, *Interaction Intensity*, and *Knowledge and Experiences*) in which to examine and code for trust, interaction, participant involvement, and group dynamics (Whiteside & Garrett Dikkers, 2012). In each case, these factors provide researchers a framework in which to examine emotional connections within the virtual environment (*Affective Association*), community perceptions (*Community Cohesion*), level of interaction among participants (*Interaction Intensity*), and knowledge and experience sharing (*Knowledge and Experiences*), and other participants in the environment (socio-spatial interactivity) (Whiteside & Garrett Dikkers, 2012).

Despite this body of work, no previous research was found that examined how social interaction emerges within a virtual environment. Therefore the current was designed to explore the bidirectional nature of factors that have been shown to influence this interaction (i.e. Socio-Spatial Interaction and Social Presence) and guided by the following research questions:

**Q1.** What are the relationships between Socio-Spatial Interactivity and Social Presence as measured through in-game behavior?

## 2. Methodology

### 2.1. Participants

Participants were recruited over a seven-month period through email solicitation from a metropolitan area in the southwestern United States. The email specifically asked for players who were experienced with *World of Warcraft* (WoW) and were willing to play their own avatar during the study. Experienced players were defined as people who had at least one main character (avatar) at level 80 or above, as this level of playing time had been shown to ensure familiarity with the game (McCreery et al., 2012). As such, 40 people were included in the study, however due to an error during video capture only 39 participant’s data was included in the analysis. Demographics associated with these participants were as follows: 35 White, two Asian, one Hispanic, and one who indicated they were multi-racial (the dropped participant was also multi-racial). The sample consisted of 30 males (76.9%) and 9 females (23.1%) with an approximate mean age of 29 with standard deviation of 7 years.

### 2.2. Measures

For the current study, operationalization of the socio-spatial interactivity and social presence variables were taken from previous behavioral observation protocols based on the works of

**Table 1**  
Operationalization of variables.

| Variable                                 | Behavior                                                                                                                                                                                                                                                 |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Socio-Spatial Interactivity              | Direct communication<br>Group communication<br>Public communication – say<br>Public communication – yell<br>Initiate grouping<br>Accept grouping<br>Leave group<br>Share items                                                                           |
| Social Presence – Affective Association  | Convey emotion<br>Humor or sarcasm<br>Paralanguage (emotes, capitalization, punctuation)<br>Self-disclosure (vulnerability)                                                                                                                              |
| Social Presence – Community Cohesion     | Provide additional resources (internal to game)<br>Greetings or salutations<br>Group reference (address group as we, us, our)<br>Social sharing (share about life outside of screen, happy birthday, etc.)<br>Vocatives (refer to people by avatar name) |
| Social Presence – Interaction Intensity  | Compliments<br>Agreement<br>Disagreement<br>Inquiry                                                                                                                                                                                                      |
| Social Presence – Knowledge & Experience | Share opinion about situation<br>Share previous experience about situation<br>Share comment (knowledge from outside source)<br>Share reference (reference a website for strategy)                                                                        |

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