frontiers | Frontiers in Education

TYPE Hypothesis and Theory
PUBLISHED 11 January 2024
DOI 10.3389/feduc.2023.1286594

OPEN ACCESS

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RECEIVED 31 August 2023
ACCEPTED 22 December 2023
PUBLISHED 11 January 2024

CITATION
Kreijns K, Yau J, Weidlich J and Weinberger A (2024) Towards a comprehensive framework of social presence for online, hybrid, and blended learning. *Front. Educ.* 8:1286594. doi: 10.3389/feduc.2023.1286594

Towards a comprehensive framework of social presence for online, hybrid, and blended learning

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Social presence, which refers to the psychological phenomenon of perceiving other persons in technology mediated communication as "real" and with whom one can connect, has gained an increasing interest by teachers and researchers involved in designing online, hybrid, and blended learning environments, particularly group learning settings known as computer-supported collaborative learning (CSCL). While some scholars attribute social presence primarily to the physical attributes of communication media, others emphasize the importance of social contextual and individual factors. Despite considering these factors, they still cannot fully explain the varying degrees of social presence experienced across different communication and collaboration modes and modalities. Consequently, there is a need for a more comprehensive theoretical account on the antecedents of social presence. In this article we propose such an account that integrates the social information processing (SIP) theory, construal level theory (CLT), and telepresence theory into one social presence framework. In line with CLT, we propose that social presence is also influenced by the impressions (construals) we construct from other persons not only through the accumulation of messages over time but also through the psychological distance we feel to those persons, which may be imposed by features of the communication media or realities of the learning context. Further, in line with telepresence theory, we propose that social presence is influenced by the sense of being "present" in the remote physical or virtual place, as this is where other salient persons "are." This comprehensive theoretical framework allows us to understand varying degrees of social presence while in (pseudo) real-time and asynchronous communication and collaboration using a variety of different communication media ranging from text-based (e.g., e-mail, instant text messaging) to immersive (e.g., 3D computer generated; a physical remote place).

KEYWORDS

social presence, social information processing (SIP) theory, impression formation, construal level theory (CLT), telepresence, online learning (CSCL), hybrid learning, blended learning

1 Introduction

Online, hybrid, and blended forms of learning have become common additions to higher education programs. The recent covid-19 pandemic that compelled educational institutions to abruptly adopt online learning showed, however, that social isolation is a particular concern in online learning as it negatively affects well-being of students (Arslan, 2021; Aldosari et al., 2022). Social presence of teachers and peers may reduce feelings of social isolation and loneliness (Hung-Yuan et al., 2017; Phirangee and Malec, 2017). However, social presence also renders concrete benefits for group learning; for example, comparing notes and correcting misunderstandings as well as it helps building trust and communities of learners (Hostetter, 2013; Richardson et al., 2017; Poth, 2018; Lim, 2023). It is therefore that social presence has gained an increasing interest by teachers and researchers involved in designing online, hybrid, and blended learning environments, particularly group learning settings known as computer-supported collaborative learning (CSCL). CSCL refers to the instructional situation where students are grouped together to work collectively on a joint task using computer applications as mindtools for knowledge construction and meaning making in order to attain certain learning and social outcomes that benefit both individual members and the group as a whole. Especially in online CSCL, the only way to communicate and collaborate is through computers connected to the internet, which allows for both (pseudo) real-time and asynchronous communication; the latter being the usual mode for CSCL. If the social presence is low in the online group learning processes, then this will adversely affect the transactivity and epistemic interaction (Weinberger, 2003; Weinberger and Fischer, 2006) underlying collaborative knowledge construction. Therefore, comprehending the concept of social presence and identifying the factors that influence it is crucial for effectively harnessing the online group learning processes for attaining desired positive learning and social outcomes. In this article, we focus on the first (i.e., the concept of social presence and its antecedents) and not so on the latter (i.e., how social presence affects learning processes and outcomes); see for this, for example, Hostetter (2013), Zhao et al. (2014), Koutromanos et al. (2021), and Kreijns et al. (2023). Though, group learning (i.e., blended, hybrid, and online CSCL) is the backdrop from which we view social presence.

We use the following definition of social presence: "the psychological phenomenon in which, to a certain extent, the other persons are perceived as physical "real" persons in technology-mediated communication" (Kreijns et al., 2022, p. 141). In this definition, the term physical "real" does not refer to the literal reality of other persons as is the case in face-to-face settings. Instead, it refers to the extent to which a person feels the presence of these other people and is subsequently ready to interact with them because they *seem* to be real in many aspects. As a result, the person feels connected to and influenced by them. Although the definition employs the plural form "other persons," it should be understood as denoting the overall sense of collective social presence, encompassing the combined individual social presences of all others involved. Within a group learning context, certain members might exhibit more pronounced social presence compared to others, while some might exhibit no social presence due to, for example, non-participation.

Social presence is a concept devised by Short et al. (1976) to study the effects of real-time business communication on building interpersonal relationships to facilitate interpersonal interaction and decision making. Short et al. (1976) defined social presence as "degree of salience of the other person in the interaction," (p. 65). In their definition, they refer with the term "salience" to the physical "realness" of the other person; see, for example, on p. 73 they stated that social presence is invariant across communication behaviors when using a specific communication medium like a telephone: the "degree to which he is perceived as a "real person"—the Social Presence afforded by the telephone—will be the same." Short et al. (1976) even expressed this physical "realness" much stronger in the Preface of their book: "[i]t is within the scope of foreseeable technology to reconstitute by electronic means a virtual three-dimensional representation of an individual who is hundreds of miles distant" (p. v). In their view, this three-dimensional representation – which, by the way, is a reality today; see, for example, ARHT Media's Virtual Global Stage (ARHT, 2023) – was considered the utmost expression of fidelity to the "realness" of the other person. Hence, note that Short et al. (1976) clearly saw media attributes solely determining social presence. Note also that Short et al. (1976) statements mean that social presence can only be fully experienced while in real-time communication and this experience ceases once communication concludes. Note further that in their definition, the singular form "the other person" is employed, which implies that only two people are involved in the communication. However, Short et al. (1976) also applied their definition to situations involving multiple people, such as audio and videoconferencing. In these situations, they were actually referring to an overall sense of social presence rather than to individual social presence feelings.

While some scholars attribute social presence primarily to the physical attributes of communication media as Short et al. (1976) did, others emphasize the importance of social contextual and individual factors in its determination (Gunawardena, 1995; Tu and McIsaac, 2002; Kim et al., 2011). Even though these factors are taken into account, they still cannot fully explain the varying degrees of social presence in different communication situations. Consequently, there is a need for a more comprehensive theoretical account of the antecedents of social presence.

While indeed previously the former factors could describe and predict degrees of social presence perceptions in traditional communication situations using text-based media (e.g., e-mail, wikis, discussion fora, SMS) that were dominant in online education during the early years of online communication, in recent times, there has been a significant expansion in the variety of communication media available, and this trend is expected to continue in the coming years enabling non-traditional communication settings. One notable development is the emergence of Metaverse, a platform developed and promoted by Meta (formerly Facebook) that enables communication in computer-generated 3D virtual spaces where users (i.e., students) are represented by avatars. These avatars can take on diverse forms, ranging from abstract representations like cartoons to highly realistic human-like appearances. As the Metaverse – or any other similar platform – gain prominence in facilitating collaboration and communication among students, it raises questions about how social presence will be perceived in environments where students interact through avatars. Furthermore, the immersive nature of these 3D environments is likely to evoke feelings of being present in these environments, potentially influencing perceptions of telepresence.

Another significant difference in the current setup of online learning compared to the past is the prevalence of geographically

dispersed students in present-day online and hybrid learning settings. Students may come from various parts of the world but study at the same higher education institution. Consequently, they may be complete strangers to one another and differ in multiple aspects, including language and cultural background. When such diverse students are required to collaborate in online computer-supported collaborative learning (CSCL) settings, these differences may play a role in shaping how they experience the social presence of their peers. Thus, how will social presence differ between students residing in a distinct continent with a completely different time zone, as opposed to students living in the same country, possibly even within the same city?

To address the above issues, we developed a comprehensive framework of social presence by integrating (1) social information processing (SIP) theory – which focuses on impression management and impression formation in online communication (Walther, 1992, 1993, 1996), (2) construal level theory (CLT) – which centers on psychological distance and construal levels of objects, events, or people in terms of whether they are concrete versus abstract (Trope et al., 2007; Trope and Liberman, 2010), and (3) telepresence theory (Steuer, 1992; Draper et al., 1998; Waterworth et al., 2015). Note that while we linked these three theories to social presence in online, hybrid, and blended learning, it is surprising that the majority of the research related to them seldom takes these educational contexts such as group learning into account.

We recognize that individuating impressions of others is adding to feelings of social presence as hinted by Short et al. (1976, Chapter 6) when discussing the influence of "getting to know someone" and friendships on social presence. To solidify this recognition of the role of "getting to know someone" – or more precisely, the individuating impressions we construct of others – on feelings of social presence, we adopted Walther's (1992) media theory of social information processing (SIP) theory as it explains how individuating impressions develop in various communication media and relate it to our perspective of social presence theory. Another theory that considers individuating impressions is construal level theory (CLT), put forward by Trope et al. (2007) and Trope and Liberman (2010). In essence, this theory establishes a connection between psychological distance and the construal levels at which objects, events, or people are perceived. Trope and Liberman (2010) defined psychological distance as the "subjective experience that something [i.e., an object, event, or someone] is close or far away from the self, here, and now" (p. 440) whereas a construal refers to the mental representation of these objects, events, or people, which can span a continuum from being very concrete to highly abstract. An analogy of this basic proposition of CLT can be found in the adage of seeing the forest for the trees, which occurs as we increase our distance from it. Conversely, as we approach the forest, we can increasingly make out individual trees and no longer attend to the forest itself but its individual constituents. In the context of psychological and interpersonal perceptions, the mental representation pertains to salient impressions of others, which can be more or less specific and distinguishing. Thus, CLT is addressing the issue mentioned above where we see a diversity of students involved in online education, which can vary significantly in psychological distance between them because they are all geographically dispersed and communicate and collaborate mostly asynchronously. It is important to note that CLT is not a media theory; it only states that psychological distance affects construal levels and vice versa, which may have consequences for how people react, behave, or draw conclusions. But it is the combination of effects that SIP theory and CLT have on impression formation in fully online, hybrid, and blended settings that makes both theories interesting for our social presence framework.

In the above, we already mentioned Metaverse as an example for evoking feelings of being present in these environments and questioned how this feeling connects to perceptions of social presence. To explain such feelings of being immersed in a distant place, an appropriate approach can be found in telepresence theory, which is another media theory (Kim and Biocca, 1997). Telepresence theory has a long history and was originally developed in the domain of teleoperations in remote locations (Sheriden, 1992; Steuer, 1992; Draper et al., 1998; Waterworth et al., 2015) but is now entering the center of attention because of computer-generated 3D virtual environments. Telepresence is the psychological phenomenon in which, to a certain extent, in mediated communication one perceives being "present" in another place, which can be mentally constructed, a physical remote place mediated by a computer, or a computer-generated 3D virtual environment. In other words, it is the level of illusion of being "there" in the other place (Heeter, 1992; Suh and Chang, 2006). Indeed, "[t]elepresence research […] often concerns how to understand why we have a feeling of being there, in a virtual place, and how to measure this experience" (Tjotsheim and Waterworth, 2022, p. 2). Succinctly, our interest in telepresence theory stemmed from the fact that nowadays, virtual reality spaces, such as the mentioned Metaverse (see Mystakidis, 2022), 3D platforms used for serious gaming (see Hämäläinen and Oksanen, 2014) and augmented reality (promoted by Apple with their recent introduction of its goggles Apple vision pro) (see Cowen, 2023) have experienced significant growth of its application in the educational domain. These developments point to the emergence of immersive communication methods as a compelling alternative to traditional video and audio-based communication. Such environments have specific potentials for learning; for example, through making phenomena like conductance of heat or electricity visible or allowing for simulating physical space between learning partners, and will be integrated in the next generation of learning environments.

To introduce this comprehensive framework of social presence, this article will first review the different distinct perspectives of social presence that were developed by educational researchers for online learning settings, predominantly those where students learn in groups using computer-mediated communication (CMC) tools and electronic platforms (thus, within the online CSCL context). We continue by, respectively, describing Walther's (1992, 1993, 1996) SIP theory, Trope and Liberman's (2010) construal level theory, and telepresence theory in more detail. Hereafter, we present the comprehensive framework of social presence by integrating all these theories. This is followed by a discussion and conclusion.

2 Comprehensive framework of social presence

Current research about social presence is troubled as there are many different perspectives and interpretations of what social presence is and how it should be measured, making it difficult, sometimes even impossible, comparing results and drawing general conclusions (Lowenthal, 2010; Lowenthal and Snelson, 2017; Öztok

and Kehrwald, 2017; Weidlich and Bastiaens, 2017; Kreijns et al., 2022). To improve on this situation, Kreijns et al. (2022) provided a review of the many social presence conceptualizations and measurements available in the literature. They found that, aside from a variety of quite distinct understandings of the concept, many of them were also confounded within themselves; that is, they sometimes included multiple distinct concepts under the umbrella of social presence. As a result of the review, Kreijns et al. (2022) discerned four mainstream perspectives on social presence, namely: (1) social presence as the perception of being "real," determined solely by medium attributes; (2) social presence as the perception being "real," determined by medium attributes, social contextual, and individual factors; (3) social presence as an ability; and (4) social presence as a critical literacy. Each of these perspectives will now shortly be elaborated. The first perspective regards social presence as the perception of "realness" of the other persons. This perception is solely determined by the medium attributes; that is, the physical characteristics of the medium such as screen size and quality of sound (Short et al., 1976; Ahn et al., 2014). Accordingly, social presence – in this perspective – can be considered a medium attribute. Researchers adhering to this perspective tend to compare different media in their degree of social presence (Kuyath and Winter, 2006; Arsenault, 2022). The second perspective shares the view that social presence is the perception of the other persons' "realness," but it emphasizes that this perception is shaped by a combination of medium attributes, social contextual, and individual factors (Gunawardena, 1995; Tu and McIsaac, 2002; Kreijns et al., 2020). Following this perspective, social presence cannot be a medium attribute. Social contextual factors include, for example, the conversation's topic, the degree of interactivity, and tone of the communication (Tu and McIsaac, 2002) whereas individual factors concern personality traits (Weidlich et al., 2021). The third perspective characterizes social presence as an ability to project oneself via an online medium as "real" persons (Gunawardena, 1995; Garrison et al., 2001), which is reformulated as "the ability of participants to identify with the community (e.g., course or study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities" (Garrison, 2009, p. 352). This perspective on social presence, along with cognitive and teaching presence, is central to the community of inquiry (CoI) model to describe the use of computer-mediated communication (CMC) and computer conferencing in supporting an educational experience (Garrison et al., 2001; 2010; Garrison and Anderson, 2003; Garrison and Arbaugh, 2007). In short, cognitive presence refers to the extent to which learners can construct and confirm meaning through sustained communication (Garrison et al., 2001). Teaching presence refers to "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educational worthwhile learning outcomes" (Anderson et al., 2001, p. 5). It is to be noted that this mainstream perspective is currently the most dominant one with a large community.[1] Finally, the fourth perspective posits that social presence is a critical literacy that "serves an influential role in advancing and sustaining successful, meaningful learning experience" (Whiteside, 2017, p. 133). According to Whiteside and Dikkers (2016) social presence is addressing the social dimensions of online learning by examining five interconnected components that form the social presence model (SPM): (1) affective association; (2) community cohesion; (3) instructor involvement; (4) interaction intensity; and (5) knowledge and experience.

Note that in discussing these mainstream perspectives, we must remind ourselves that the original social presence theory by Short et al. (1976) was developed in an era that only used analogous telecommunication tools such as video-, audioconferencing, and telephone that did not possess any buffering capacity so that the communication had to be done in real-time. Short et al. (1976) compared social presence for video conferencing, audio conferencing, telephone, and face-to-face communication although the latter is not "technologically mediated." In contrast, the perspectives on social presence outlined above usually consider digital communication tools that often are programs or apps running on computers which are interconnected through internet. Hence, the general term for these types of communication is computer-mediated communication (CMC). Thereby, we observed that text-based CMC (e.g., e-mail) mostly supports an asynchronous mode for communication whereas video-based and audio-based CMC (e.g., video-conferencing) does so for real-time communication. But indeed, text-based communication can be (pseudo) real-time as well, as enabled by instant text message systems such as the popular WhatsApp. Also, recordings of video footages and audio also make asynchronous communication possible as they become video and audio messages.

Whilst discerning the four mainstream perspectives, Kreijns et al. (2022) disentanglement of the many different social presence conceptualizations also has led to the distinguishment of three key variables that can foster cumulative research progress: sociability, social presence, and social space. The latter, *social space*, is defined as the network of interpersonal relationships embedded in group structures of norms and values, rules and roles, and beliefs and ideals. Social space is, therefore, an attribute shared by the group as a whole. A thriving/sound social space is characterized by a sense of community, trust, and cohesiveness, which fosters productive and successful collaboration among groups because these qualities create a secure environment for transactive discourse, involving critical thinking, decision-making, and epistemic interaction. However, the emergence of a sound social space is contingent on the presence of social presence. Furthermore, *sociability* represents a medium attribute of the virtual learning environment, typically an electronic platform with CMC- and specialized collaboration tools. Kreijns et al. (2022) defined sociability as the virtual environment's capacity to facilitate the expression and experience of social presence, leading to the emergence of a cohesive social space. A practical example could be text-messaging enriched with emoticons and emojis, allowing group members to express themselves freely and, thus, is a tool for manipulating how others perceive their social presence (Tang and Hew, 2020).

We purport that the interrelationships among the three key variables - sociability, social presence, and social space - and how they mutually influence one another emphasize the importance of exploring additional factors that can influence the degrees of these variables besides the key variables themselves. Because this article is centered on social presence, it becomes imperative to develop a comprehensive framework of social presence. To this end,

1 https://coi.athabascau.ca/coi-model/

we embraced the second perspective, thus, where "realness" of the other persons in mediated communication is central and determined by a combination of media attributes, social contextual and individual factors. However, despite considering these factors, they fall short in fully explaining the varying degrees of social presence experienced across different communication and collaboration modes and modalities. To address this gap, we expanded the perspective here by the inclusion of SIP theory, CLT, and telepresence theory, effectively giving rise to a fifth perspective on social presence. This fifth perspective, in essence, builds upon the second perspective with the aforementioned expansions, collectively forming the comprehensive framework of social presence. In the following sections, we lay out these different theories and describe how they relate to the concept of social presence.

3 Social information processing theory

Our interest in SIP theory (Walther, 1992, 1993, 1996) stemmed from findings of social presence researchers that when online persons self-disclose themselves it will increase their social presence (Kim and Song, 2016; Raza et al., 2020). Self-disclosure entails revealing personal life events, information, feelings, and emotions to other people through talk (Finkenauer et al., 2018) and functions as getting to know each other. Short et al. (1976, Chapter 6) considered the process of "getting to know someone" an important aspect of any conversation as it contributes to building interpersonal relationships which may become relevant and effective when in task-related activities. According to Walther (1996) "relationships are necessary for effective negotiation. Without them, getting consensus and agreement will not progress in most cases" (p. 15). Indeed, when people are put together in groups, such as is the case in group learning, the group dynamics are in large part governed by people's impression of other group members (Storck and Sproull, 1995). Based on these impressions, interpersonal relationships can be built. Therefore, teachers often are advised to start online classes, virtual seminars, and online group learning with icebreakers and other opportunities for getting to know each other to develop relationships before learning together (Conrad and Donaldson, 2011). These activities are aimed to compensate for specific hindrances to impression formation in online settings in comparison to face-to-face settings. For instance, Storck and Sproull (1995) concluded form their study on videoconferencing that "impressions people form of remote others are different from and less positive than the impressions they form of face-to-face others, starting from an equal baseline" (p. 1492). They further showed that "people make use of different kinds of information informing their impressions" (p. 1492). Walther (1992, 1993, 1996) proposed his social information processing (SIP) theory that explains how impression formation happens online. He argued that through exchanging and accumulating messages of the other over time, impressions of the other persons will successively individuate; impression formation will thus be stepwise as each message reveals something new about the other. Note hereby, that SIP theory was primarily focusing on asynchronous text-based communication such as e-mail and forums. Nevertheless, SIP theory can be applied on synchronous communication as well such as a video-conferencing, but where then each communication episode counts as one message exchange. Note further that Walther's (1992) SIP theory was actually a critical reaction to media theories at that time (i.e., around 1970–1990) including social presence theory (as seen by the first perspective "social presence as the perception of being "real," determined solely by medium attribute"), media richness theory (Daft and Lengel, 1986; Trevino et al., 1990), and reduced social cues theory (Sproull and Kiesler, 1988) that all suggested that lean media — because, its low bandwidth constrains the transmission of non-verbal cues — to be impersonal, inhibiting relational communication, and therefore fall prone to anti-social and hostile behavior. Non-verbal cues are, for example, facial expressions, gaze direction, posture, and tone of voice. Walther's (1992) SIP theory disagreed with these so-called "cues-filtered-out" theories and claimed that even in lean media close relationships can exist because users adapt to these media and make individuating impressions of each other. Another factor driving our interest in SIP theory is that alternative perspectives on social presence defined it as an ability to project one's personality in the online community (this is the third perspective "social presence as an ability"). SIP theory also delves into impression management, which involves individuals making conscious efforts to shape how they want others to perceive them. Therefore, the ability to project one's personality in the online environment is closely connected to the process of impression management. SIP theory has been investigated by many researchers, for example, in online dating (Farrer and Gavin, 2009; Sharabi and Caughlin, 2017), social media use (Jahng and Littau, 2015), and when cultural factors are involved in developing trust between virtual team members (Olaniran et al., 2012).

According to SIP theory, and already mentioned above, communication partners develop interpersonal relationships over time; even in communication media that are low in richness in terms of transmitted cues, the same relational dimensions, and qualities as in face-to-face relationships can emerge. Two processes take place in online communication; the first process is impression formation and the second is impression management. In impression formation, communication partners construct mental models; that is, individuating impressions of each other. This occurs through the accumulation of messages collected during the many communication episodes contributing little by little to the construction of mental models or representations about the communication partners. This ultimately results in individuating impressions that are very concrete and detailed. Interestingly, as Walther (1996) showed, there is a tendency to judge the others more positive and to idealize them than would be the case in face-to-face settings, known as the hyperpersonal effect (Ramirez and Zhang, 2007). In impression management, on the other hand, communication partners are concerned with how they are going to present themselves online and how to maintain that. During the impression management process, the communicating partners consistently seek feedback to adapt the way they present themselves in the communication; this is commonly known as "projecting" oneself. Impression management is necessary as it is a way for communicating partners to "create" social presence (Gunawardena, 1995). See also, our previous example of text-messaging using emoticons and emojis. Impression management also gives communication partners the possibility to present themselves more favorably to others and in this way add to the hyperpersonal effect (Walther, 1996), as can be observed in social media (e.g., with TikTok influencers actively marketing themselves).

4 Construal level theory

Proposed by Trope and Liberman (2003, 2010), construal level theory (CLT) builds on two main ideas, construal and psychological distance, and how the two affect each other. That is, how psychological distance affects construal levels of events, objects, or people, and vice versa, which in turn affect individuals' thoughts, decisions, and behavior toward them (Trope et al., 2007). The first main idea, construal, refers to the mental representation of those events, objects, and people and the construal level is the degree to which the mental representation is concrete or abstract (Trope and Liberman, 2003, 2010). Concrete construals are focused on the specific details of an event, object, or person, such as its physical properties, sensory features, or personality; therefore, concrete construals are designated to be low level. Abstract construals are focused on the higher-level concepts or ideas associated with an event, object, or person, such as its meaning or relevance to personal goals; therefore, abstract construals are designated to be high level. For example, if someone is thinking about a close friend, a concrete construal might focus on whether she is friendly and patient, the specific sneakers she wears, and her opinions and thoughts about a certain subject, while an abstract construal might focus on the fact that she is a stranger, the country in which she lives, the culture of that country that may determine her habits in addition to the traditional clothing that she may wear. In general, concrete construals tend to be more heterogeneous and distinguishing whereas abstract construals tend to be more homogenous and uniform. The second main idea, psychological distance, refers – as already mentioned above – to the subjective experience of a separation between the self, here and now, and targets of interest such as events, objects, or people. Trope and Liberman (2010) indicated that psychological distance is caused by four types of objective distances: (1) spatial; (2) temporal; (3) social; and (4) hypothetical distance. Spatial distance refers to the proximity in physical space; thus, whether the event takes place nearby and whether object or person are in close physical proximity versus just the opposite; that is, the event takes place far away and object or person are also far away. Temporal distance refers to the proximity of an event, object, and people in time, thus whether the event takes place right now and objects or persons can be accessed right at this moment versus the event will take place somewhere far in the future as is the accessibility of objects and persons. Social distance refers to the relationship between the self and others involved in the event, for example in case of persons, social distance is the degree of similarity between the self and the other persons, which can refer to the same interest in topics, reference groups, and ambitions. Finally, hypothetical distance refers to the likelihood or uncertainty of an event happening or that an object or person can be accessed. The farther an object, event, or person is perceived to be on these dimensions, the more likely it is to be construed at a higher level of abstraction. But the opposite is also true, if the level of construal is high then the psychological distance of an event, object, or person is perceived as far and if the level of the construal is low then the psychological distance is perceived as near.

Although in CLT psychological distance concerns objects, events, and people, we for the purpose of our research on social presence, only involve psychological distance in relation to people and places – the latter (places) becomes clearer when we discuss telepresence theory. As already been noted, CLT is not a media theory, so it does not consider the role of the various communication media within this theory. However, the suitability of CLT for the comprehensive framework of social presence is based on three reasons that will be elaborated upon: (1) social presence is inextricably linked with psychological distance; (2) social presence is affected by the individuating impressions of the other persons, which are essentially the construals of these people; and (3) the causal direction of psychological distance to construal may also be reversed opening possibilities to reduce psychological distance. In regard to the first reason, we do see a link between social presence and psychological distance as did many others (e.g., So and Brush, 2008; Lee, 2010). In line with the observations made by So and Brush (2008), we concur that research in distance education should move beyond perceiving distance solely as a lack of physical proximity and place greater emphasis on the psychological aspects of distance (p. 319). These researchers posed several pertinent questions regarding learners' perceptions of psychological distance, the factors influencing these perceptions, the impact of such perceptions on learning, and effective strategies for minimizing psychological distance (p. 319). They approached these inquiries through the lens of transactional distance theory (Moore, 1997), which explores how psychological and communication distance can lead to misunderstandings in teacher-student transactions (Moore and Kearsley, 1996). However, the theory does not explicitly define psychological distance whereas CLT does. CLT draws explicit attention to psychological distance and how this affects people's behavior and thinking. Concerning the second reason, it was alluded in the previous section that social presence is affected by the individuating impressions of the other persons. In CLT, psychological distance is affecting the level of abstractness of objects, events, or people; this abstractness is reflected in the construal that is the mental representation of those objects, events, and people (Trope and Liberman, 2003, 2010). Consequently, the mental representations we form of other people, or in other words, the individuating impressions we hold of them, are essentially the construals of these individuals. Also, we may state that construals as a result of the process of impression formation, are not only influenced by the accumulation of messages over time as is suggested by SIP theory, but also by the psychological distance we feel to other persons as CLT suggests. This insight gained from CLT underscores its importance in understanding social presence. The third reason for including CLT into the comprehensive framework of social presence stems from its assertion that the causal direction of psychological distance to construal can be reversed, thus, the level of abstractness of the construals or how detailed the individuating impressions of other persons are, is affecting the psychological distance we feel with these other persons. In other words, if information sources are available to reduce the level of abstractness of the construals/impressions we form about other persons making them more detailed and concrete, then the psychological distance with them will also be reduced (Weidlich et al., 2023). Returning to SIP theory, accumulated messages over time are one of these sources. Also, the non-verbal cues about the other persons transmitted via the CMC-tools of the virtual learning environment may form another source. Because individuating impressions of other people determine social presence, we hypothesize that ultimately high levels of social presence reduce psychological distance. We may say that social presence is bridging psychological distance. This would

support earlier findings on how social presence alleviates feelings of social isolation and loneliness (Kreijns et al., 2022).

5 Telepresence theory

Above, we defined telepresence as the psychological phenomenon in which, to a certain extent, in technology mediated communication one perceives being "present" in another place, which can either be mentally constructed from transmitted cues, a remote physical location mediated by a computer, or a computer-generated 3D virtual environment. The definition is compatible with the many other definitions of telepresence, in particular for the case where the other place is mediated or generated by computers. For instance, Steuer (1992) defined telepresence as "the experience of presence in an environment by means of communication medium" (p. 6), Green and McAllister (2020) defined it as "the feeling of "being there" in a mediated or virtual environment" (p. 1), and Waterworth et al. (2015) as "the feeling of being located in a perceptible external world around the self" (p. 36). Note that in this regard and in contrast to SIP theory, telepresence theory was primarily relying on the synchronous transmission of sensory information like visuals and sound. Yet, asynchronous text-based communication can also induce telepresence experiences, particularly when messages convey details about the sender's surroundings and locations.

Initially, telepresence was researched in the context of teleoperations and performance in physical remote locations (Minsky, 1980; Sheridan, 1992), for example, locations that are hazardous for humans because of environmental radiation and, therefore, all manipulations with objects must be performed by robotics and haptics. Because teleoperations and task performance were the prime focus of the initial telepresence research, it did not consider social environments. Indeed, the remote locations were usually void of people. However, the advent of affordable video cameras and large TV screens for telepresence rooms has shifted the attention towards connecting distributed individuals. Recent studies, such as that by Standaert et al. (2016), have explored the effectiveness of telepresence as a business meeting mode compared to face-to-face and audio- and videoconferencing. It was found that telepresence communication outperformed audio- and videoconferencing but did not significantly differ from face-to-face interactions. Interestingly, Short et al. (1976) used similar communication media (face-to-face, audio- and videoconferencing, and telephone) for determining degrees of social presence conveyed in these media. Face-to-face interactions were found to convey the highest levels of social presence, followed by videoconferencing, and then audio-conferencing, with telephone interactions conveying the lowest social presence. This suggests some connection between telepresence and social presence. It is important to note that telepresence research extends beyond business meetings to include other domains, such as remote surgery (see for a systematic review: Barba et al., 2022), which emphasizes teleoperation and task performance. As mentioned earlier, apart from connecting remote physical locations, the interest in telepresence is also driven by the increasing use of computer-generated 3D environments. Here the focus is on the manipulation of virtual objects and even more on the social interaction between the virtual representations of others (i.e., the avatars) in mediated communication (Lu et al., 2015). Incorporating such 3D virtual environments into our future online platforms for group learning, which involve activities like transactive discourse, serious games, and object manipulation, necessitates careful consideration of human interaction. Specifically, when comparing the effects of ultra-realistic human-like avatars and simpler cartoon avatars on social learning, it becomes crucial to examine their potential to elicit varying levels of telepresence (and social presence).

6 Putting everything together

We have identified three theories that play a crucial role in enhancing our understanding of how the degree of perceived social presence of other persons can be affected while in online real-time, semi-synchronous, and asynchronous collaboration and communication; these three theories are: (1) social information processing theory (Walther, 1992, 1993); (2) construal level theory (Trope and Liberman, 2010); and (3) telepresence theory (Steuer, 1992). Together, with insights from the second perspective on social presence (i.e., "social presence as the perception being "real," determined by medium attributes, social contextual, and individual factors"), they form the comprehensive framework of social presence that is a fifth perspective on social presence and illustrated in Figure 1. The virtual learning environment enables all social interaction by means of its embedded synchronous and asynchronous communication and collaboration tools; the visual representation depicts this by the arrow going from "virtual learning environment" to "social interaction." When we focus on the second perspective on social presence, we see this perspective reflected by the influence of media attributes on social presence represented by the arrow going from "virtual learning environment" to "social presence." For instance, when students collaborate using a video conferencing system, the visual and audio cues transmitted through the medium directly impact their perception of social presence, as explained by Short et al. (1976). Similarly, if the collaboration takes place in a 3D virtual environment, telepresence experiences emerge (Faiola et al., 2013). Social presence motivates students to participate in the social interaction (Gunawardena, 1995; Tu, 2000); the arrow from "social presence" to "social interaction" is showing this. Conversely, social interaction reinforces social presence (Akcaoglu and Lee, 2016; Colen, 2022) as shown by the two headed arrow from "social interaction" to "social presence." In considering the social contextual (e.g., task type, demographics, conversation's topic, degree of interactivity) and individual factors (e.g., personality traits), researchers like Li et al. (2015) and Siriaraya and Ang (2012) have shown that these factors can significantly impact social presence perceptions. Despite their importance, they are nevertheless not shown in the visual representation to avoid clutter. Note that in the figure, processes (e.g., social interaction) are drawn as colored circles whereas variables influencing or be affected by these processes are drawn as rectangles.

Moving forward, we further elaborate on the visual representation in Figure 1. But before doing so, our focus shifts to the individual models linked with the theories (i.e., SIP, CLT, and telepresence). This approach aims to enhance the clarity of the comprehensive framework of social presence, particularly when integrating the individual models.

To begin with, the visual representation of Walther's (1992, 1993, 1996) SIP theory is depicted in Figure 2 using the terminology of CLT. It shows on the left-hand side the process of impression formation producing the construals of the other persons, which are

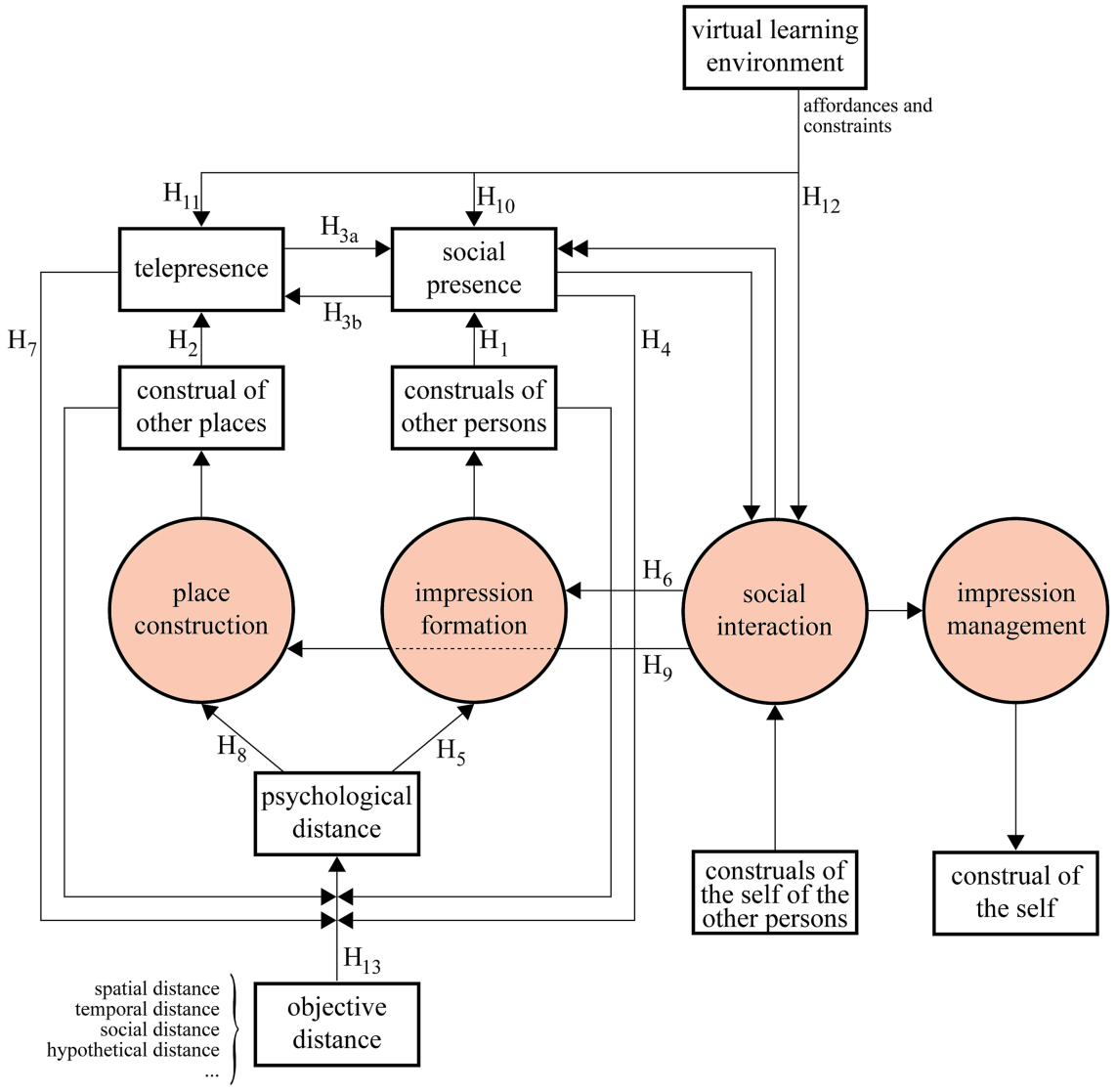

FIGURE 1
Visual representation of the comprehensive framework of social presence with hypotheses H1-H13 laid out in the discussion.

the individuating impressions of them. On the right-hand side, the figure shows the process of impression management resulting in the construal of the self that potentially may lead to a hyperpersonal impression as perceived by other persons. Construals of the self of other persons affect how individuating impressions of these persons are formed. Also shown in Figure 2 is the prominent role of social interaction which enables impression formation and management to take place.

In regard to CLT, we incorporated (see Figures 3, 4) the image presented by Wilson et al. (2013) depicting the Simplified process model of construal-level theory (the image is on p. 632 of Wilson et al. (2013), which they used to understand the impact of virtuality on distributed groups. This Simplified process model of construal-level theory is a chain that starts with "objective distance," how it affects "psychological distance," and how this then affects "abstract construal," resulting in "effects of the construal." This chain, indeed, captures the central tenets of CLT of Trope and Liberman (2010).

Regarding the connection between CLT and social presence, Wilson et al. (2013) emphasized that abstract construals have a significant impact on individual behavior and group dynamics because "distance alters *perceptions of distributed group members* [italic by authors]" (p. 629). Hence, we have relabeled "effects of the construal" by "social presence" since "perceptions of distributed group members" align with the notion of social presence. It is hereby worth noting that Wilson et al. (2013) probably were not aware of social presence theory when they conducted their study which may explain why they did not mention it. To ensure our focus remains on persons rather than objects or events, we relabeled "abstract construal" by "construals of other persons" in our framework.

The image of Wilson et al.'s (2013) Simplified process model of construal-level theory depicts an arrow that is drawn from "psychological distance" to "abstract construal" (i.e., "construals of other persons"). This arrow represents the process in which the abstract construals of the other persons are formed; in our visual

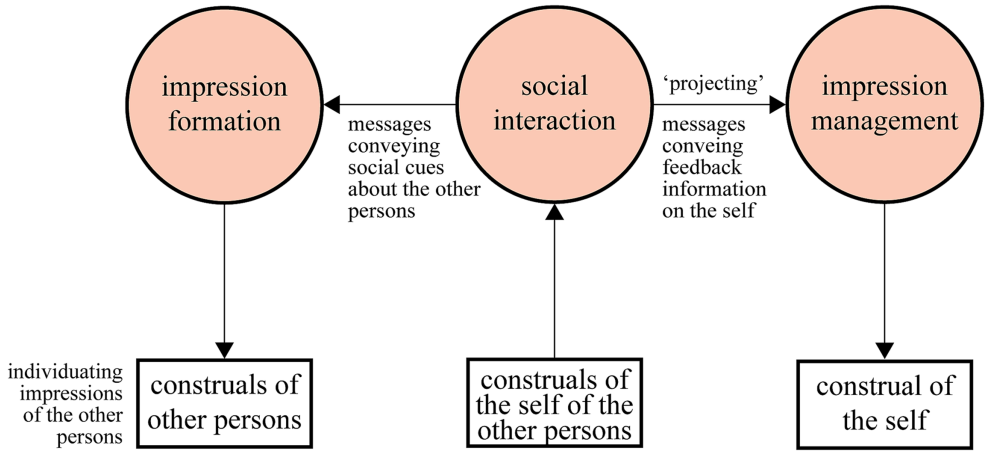

FIGURE 2
Model of Walther's (1992, 1993, 1996) SIP theory.

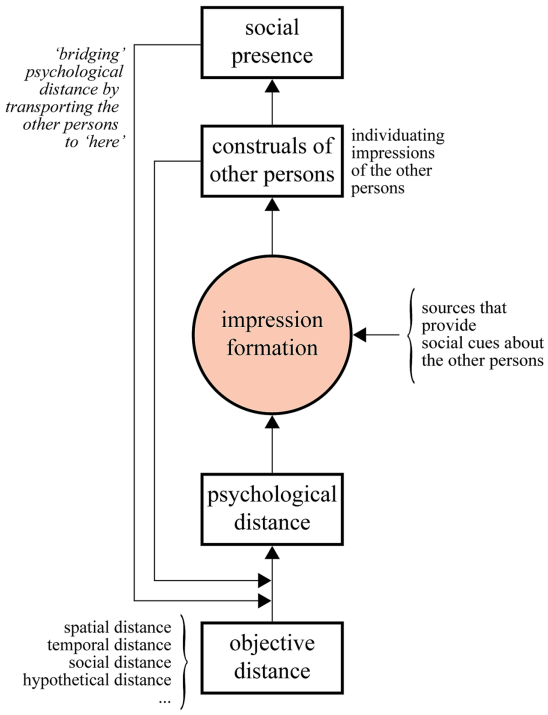

FIGURE 3
Wilson et al. (2013, p. 632, p. 637) model of CLT applied to social presence.

representation, this process is identified as the process of impression formation when the terminology of SIP theory is used.

In Figure 3, a visual representation of the chain is depicted with the new labels and the process of impression formation – note again that we draw processes as colored circles such as the one representing "impression formation." Wilson et al. (2013) saw objective distance not limited to spatial, temporal, social, and hypothetical distance and suggested other forms of distances such as cultural, linguistic, and experiential distance. Therefore, we list the first four distances in this figure and added "…" as a placeholder for all those other relevant distances. We also added an extra arrow in the figure to "impression formation" so to express that there could be numerous additional sources offering social cues regarding other persons, which could potentially impact this process. For instance, Walther's (1992, 1993, 1996) series of accumulating messages serves as an example of such influences.

In their Simplified process model of construal-level theory, Wilson et al. (2013) did not draw a back loop from "abstract construal" (i.e., "construals of other persons") to the arrow from "objective distance" to "psychological distance," nor did they do so for "effects of construal" (i.e., "social presence") (Figure 3). However, these feedback loops were depicted in the image representing the Expanded process model of construal-level theory (the image is on p. 637 of Wilson et al. (2013) where they moderate the influence of "objective distance" on "psychological distance." Although Wilson et al. (2013) included "contextual factors" as a mediator within the feedback loops, we did not do so. The first feedback loop (arrow originating from "construals of other persons") is explained from with CLT, in that when we form low level construals of the other persons, the psychological distance also becomes low thereby suppressing the influence of "objective distance." The second feedback loop (arrow originating from "social presence") complies with current social presence theory: the higher perceptions of social presence, the more one feels in proximity with other persons, and may even feel connected to them and closeness, thereby suggesting a lower psychological distance, thus, again by suppressing the influence of "objective distance." In a way, we might interpret this as the transportation of the other person to "here." Hence, a high degree of social presence is "bridging" psychological distance (see also: Breves and Schramm, 2021).

In the above, we have elaborated on the connection of CLT and social presence (Figure 3). The connection between CLT and telepresence (Figure 4) follows the same line of thought. Instead of the other persons, it is now the abstract construal of the remote physical place or the computer-generated 3D virtual environment that is the focus. We relabeled "effects of the construal" by "telepresence" and "abstract construal" by "construal of other places" in our visual representation for the same reasons as with the connection between

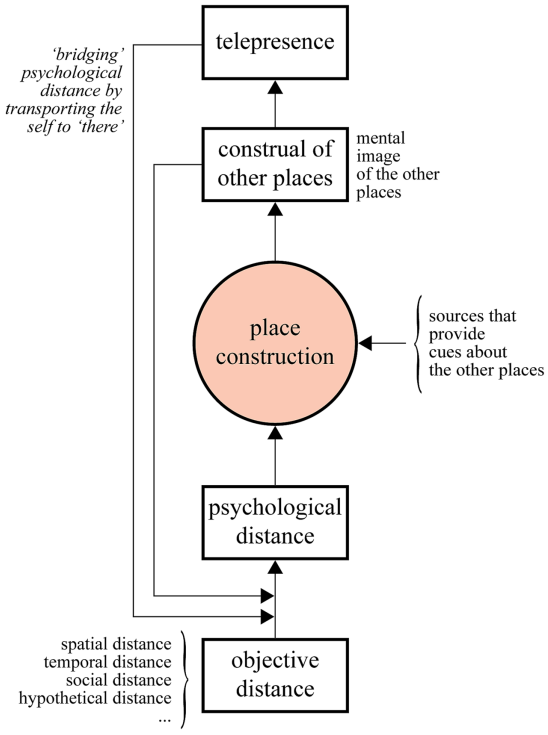

FIGURE 4
Wilson et al. (2013, p. 632, p. 637) model of CLT applied to telepresence.

CLT and social presence. We further replaced the arrow from "psychological distance" to "abstract construal" (i.e., "construal of other places") from Wilson et al. (2013). Simplified process model of construal-level theory by a circle representing "place construction," the process in which the other place is constructed in the mind.

The two feedback loops can also be found here. Both feedback loops suggest that high experiences of telepresence and of the construal of the other places will result in lower psychological distance with respect to the remote physical place or the computer-generated 3D virtual environment. In regard to telepresence, we might interpret this as the transportation of the self to "there." Thus, a high degree of telepresence is "bridging" psychological distance to the other place.

We now integrate the individual models into a visual representation of the comprehensive framework of social presence. This integration is shown in Figure 1.

Note first in this visual presentation that "telepresence" and "social presence" mutually influence each other (*cf.*, Venkatesh and Johnson, 2002; Nowak and Biocca, 2003). Note further that we have added the virtual learning environment because its affordances (e.g., sociability) and constraints determine how the social interaction; that is, the communication and collaboration will take place in the different modes and modalities, and how it affects telepresence – especially when technologies like goggles enable individuals to explore remote locations visually – as well as social presence perceptions and expressions, and the emergence of a sound social space (Kreijns et al., 2022). We further drew an arrow from "social interaction" to "social presence" because according to Tu (2000), "Social presence is required to enhance and foster online social interaction, which is the major vehicle of social learning" (p. 27). Additionally, we have included a two-headed arrow from "social interaction" back to "social presence" to signify the reinforcement of social interaction, particularly when it proves to be vivid and productive.

Finally, note that the comprehensive framework does omits the virtual learning environment and its direct influences on social presence, telepresence, and social interaction for stalled episodes in blended and hybrid learning scenarios; a stalled episode is the period of time during a learning session when the communication is interrupted or not taking place. Subsequently, impression formation and impression management will also be stalled during these episodes. If these periods are very long, they may result in the fading of construals of other places and of other persons.

7 Discussion

This contribution specifically explores the relationship between social presence on the one, and SIP theory, CLT, and telepresence theory on the other hand, an integration of theories that has yet not been attempted in existing literature. This comprehensive framework has the benefit of providing a theoretically grounded and comparatively thorough account of how social presence emerges and can be facilitated and sustained in a variety of learning scenarios and across diverse technologies and environments.

However, like all frameworks, the comprehensive framework of social presence should be supported by empirical evidence that confirms the hypothesized relationships. In our case, it means that specifically the connections between social presence and the three underlying theories (i.e., SIP theory, CLT, and telepresence theory) need empirical studies as we can already build on empirical evidence substantiating the validity of SIP, CLT, and telepresence. Regarding SIP theory, there is empirical evidence available that supports the theory (Walther and Burgoon, 1992; Walther, 1993; Parks and Roberts, 1998; Utz, 2000; Ramirez and Zhang, 2007). Interestingly, Ramirez and Zhang (2007) conducted a study on the effects of modality switching on relation communication; that is, the influence of meeting face-to-face after varying lengths of relational interaction via text-based CMC tools and vice versa. They used both social presence theory as formulated by Short et al. (1976) thus, pointing to the first perspective on social presence (i.e., "social presence as the perception of being "real," determined solely by medium attributes") and SIP theory, with particular emphasis on the hyperpersonal component (Walther, 1996). They confirmed that both theories hold; social presence theory (first perspective) was predicting low relational communication in the early stages of CMC while SIP theory predicted high relational communication in the later stages of CMC and that the formed impressions were idealized. Also, overall effects of switching modalities in early and later stages of relational communication were as expected by the two theories. Ramirez and Zhang (2007), therefore, concluded that their findings contributed to the support of SIP theory and the hyperpersonal perspective.

In relation to CLT theory, this theory has amassed a substantial body of empirical evidence across diverse fields (Soderberg et al., 2015). These fields encompass consumer behavior (Eyal et al., 2009; Sordi et al., 2022), motivation (Trope and Liberman, 2003), decision-making (Raue et al., 2015), climate change (Wang et al., 2019), interpersonal distance (Liviatan et al., 2008; Norman et al., 2016), and impression formation. In the context of the latter, the application of

CLT to impression formation diverged from SIP theory, which elucidates the development of individualized impressions over time through cumulative messages. Instead, CLT was employed to understand how individuals construct their perceptions of others based on the presently available information about them (Liviatan et al., 2008; McCrea et al., 2011; Hess et al., 2018). These researchers found on the one hand that individuals with abstract construals of others tend to emphasize their broader and central features and are more prone to being influenced by stereotypes, and on the other hand, those with concrete construals of others tend to focus on specific details and are less susceptible to stereotypes.

Regarding telepresence, there exists empirical evidence supporting the notion that immersing oneself in remote locations and 3D virtual environments elicits feelings of telepresence (Raminez-Lopes et al., 2016; Standaert et al., 2016). While no research is available that investigates the relationship between telepresence and social presence, there is research that considers telepresence and social presence both as independent variables on a number of outcomes. See, for example, on involvement of consumer brand engagement (Algharabat et al., 2018), exemplification in health messages (Westerman et al., 2015), and perceived enjoyment, perceived value, and behavioral intention in virtual golf simulators (Lee et al., 2013).

However, as stated earlier in this article, it is surprising that the majority of the empirical research related to these three theories seldom takes into account the educational context of online, hybrid, and blended learning. Therefore, from the propositions of the framework, we have generated testable hypotheses for future research studies that are situated in these educational contexts, for instance 3D immersive environments such as those that are metaverse-based (Kye et al., 2021; Singh et al., 2022; Samala et al., 2023).

We formulated the following hypotheses detailing the central constructs of the framework (see also Figure 1):

> *H1*: Levels of construal of other persons influence perceptions of social presence.
>
> *H2*: Levels of construal of other places influence telepresence perceptions.
>
> *H3*a: Experiences of telepresence affect social presence.
>
> *H3*b: Vice versa, social presence experiences contribute to telepresence.

Looking at individual components of the framework, we can specify more detailed hypotheses for the social presence component:

> *H4*: Psychological distance between other persons and the self can be bridged by enhancing social presence.
>
> *H5*: Variations in psychological distance arising from the learning context or scenario, which in turn establish the objective distance, affect levels of construal via the process of impression formation.
>
> *H6*: In addition to psychological distance, the process of impression formation is further influenced by the quantity and quality of social interaction enabling the accumulation of messages conveying social emotional cues of the other persons.

Analogous hypotheses emerge from the telepresence component of the model:

> *H7*: Psychological distance between the other places and the self can be bridged by enhancing telepresence.
>
> *H8*: Variations in psychological distance arising from the learning context or scenario, which in turn establish the objective distance, affect construal of the place via the of process place construction.
>
> *H9*: The process of place construction is influenced by the quantity and quality of social interaction enabling the accumulation of messages revealing cues of the other places.

The virtual learning environment plays a central role in the framework as it directly influences three main constructs:

> *H10*: Verbal and non-verbal cues about the other persons that are identifiable through the virtual learning environment influence social presence perceptions (e.g., by using a video-conferencing tool).
>
> *H11*: Non-verbal cues about the place that arise from the virtual learning environment influence telepresence perceptions (e.g., by using an immersive environment).
>
> *H12*: Affordances and constraints of the virtual learning environment and the communication media influence the degree of social interaction (e.g., the virtual learning environment offers only discussion).

Finally, there is the relationship between objective distance and psychological distance:

> *H13*: Variations in objective distance dimensions as established by the learning context or scenario, influence psychological distance perceptions.

Our future work will therefore concentrate on testing the hypotheses thereby validating the comprehensive framework of social presence. Also – and inspired by Short et al. (1976) who assessed social presence in face-to-face settings – we will probe the framework for face-to-face group learning and for classroom teaching, thus, extending the applicability of social presence beyond online, hybrid and blended modes for these learning scenarios. Thereby, to further elucidate the role of social presence in all the scenarios and settings, we will draw upon various pedagogical

theories, including attachment theory, educational style, teacher personality, expectations and attributions, and transactional theories in which the perception of students and the teacher would play a role.

8 Conclusion

In this article, a comprehensive framework of social presence is presented. The visual representation of the framework serves as an etiological model to describe, explain, and predict perceived levels of social presence in online, hybrid, and blended learning given that the framework is based on the well-established SIP theory, CLT, and telepresence theory.

The advantage of the comprehensive framework is that it allows us to understand varying degrees of social presence while in (pseudo) real-time and asynchronous communication and collaboration using a variety of different communication media ranging from text-based (e-mail, instant text messaging) to immersive (3D computer generated, a physical remote place). Another, and perhaps more important, advantage of the comprehensive framework of social presence is that it allows for a deeper insight in what causes levels of social presence, which may lead to the development of more effective instruments teachers and students can use to establish to some extent desired levels of social presence (see for the latter: Weidlich et al., 2022). Lastly, the comprehensive framework of social presence, which places a strong focus on the perceived "realness" of other persons, seeks to purify the concept of social presence, by taking this emphasis – that is core to Short et al.'s (1976) original definition – as its starting point and setting aside alternative definitions and interpretations of social presence developed later. Doing so, social presence is distinguished from its consequences, preventing the two from being erroneously merged, as illustrated by the example of considering social space as a facet of social presence.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

KK: Writing – original draft, Writing – review & editing. JY: Writing – review & editing. JW: Writing – original draft, Writing – review & editing. AW: Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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