

Creating a Social Presence Measure: Self-Rated Behaviors that Indicate Mediated Presence

Scott Christen

Michelle T. Violanti

Jennifer Morrow

University of Tennessee, USA

Abstract

This study involved the creation and validation of a self-rated social presence measure. Study 1 utilized focus groups to create items. The focus group participants were presented with a set of items based upon past literature; through discussion of these items, a preliminary measure was created. Study 2 involved an exploratory factor analysis on the preliminary measure to eliminate items that did not work well with each other. This reduced the measure from 54 to 23 items. Study 3 validated a 21-item self-rated measure of creating a social presence (PSP), which can be used to determine if people have difficulty projecting themselves as real individuals willing to interact with other online communicators.

Keywords: computer-mediated communication (CMC), instrument development, focus groups, exploratory factor analysis (EFA), confirmatory factor analysis (CFA)

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Online education continues to rise—more than 6.9 million students enrolled in online courses that comprised about thirty-five percent of all degree-granting postsecondary institutions' offerings prior to the COVID-19 pandemic (Ruiz & Sun, 2021). Online education has been reported to increase access for all students. For those with minority identities, data show online education can potentially have a negative effect on completion rates (Garret, 2018). To counter this negative effect, instructors must critically examine their pedagogical strategies and student-instructor communication choices in online classes (Driscoll et al., 2012; Garrison et al., 2003). When students do not perceive the instructor and other students as real, exhibiting social presence, they have lower motivation (Cole et al., 2017; Richardson & Swan, 2003), feel more isolated (Phirangee, 2016) and may avoid learning class material (Titsworth et al., 2010). Online educators who utilize affective communication demonstrate that they are real individuals, which encourages reciprocity by students (Swan & Shih, 2005) and promotes cohesion (Fall et al., 2010).

Online educators need to understand social presence and pedagogical strategies that promote social presence in the online class because the perception of social presence increases students' satisfaction and perceived learning (Collins et al., 2019; Richardson et al., 2017; Song et al., 2019), which have been linked to student persistence, retention, motivation, and success (Richardson et al., 2017). Social presence also has a central role in online teaching because it affects the student's ability to think, understand, and discuss course material (Armellini & De Stefani, 2015, Kucuk & Richardson, 2019). Instructors in both workplace training and educational environments need to use pedagogical strategies that promote social presence to help learners feel connected to each other if they are going to discuss ideas and work together (Armellini & De Stefani, 2016; Kear et al., 2014; Kozan, 2016). When instructors create a social presence within the class, students want to connect with their instructor more than their peers (Lowenthal & Dunlap, 2018). Making connections is at the heart of social presence theory. The purpose of this study is to depict the theoretically grounded process of creating and validating a self-assessment social presence measure for instructors and students.

Social Presence Theory

Social presence was first conceptualized as the perceptions, feelings, and reactions that are established in a computer-mediated communication (CMC) interaction, such as online education (Biocca et al., 2003; Garrison et al., 2000; Lowenthal & Snelson, 2017; Tu & McIsaac, 2002). To initiate/maintain a true interpersonal connection, online educators need to establish a social presence (Harms & Biocca, 2004; Kehrwald, 2008). More recently, Lowenthal and Snelson (2017) have questioned the veracity of including affect in such a definition as this would be more of an indicator of immediacy or connection than social presence. For this investigation, social presence is the degree of interpersonal connection established when communicators are using CMC, which is at the heart of what it means to be a social being. Creating connection in the online learning environment has been linked to successful outcomes for students, especially the connection between student and instructor (Collins et al., 2019; Richardson et al., 2017; Song et al., 2019). To create this connection, CMC users must project a persona of being open and willing to communicate with other CMC communicators (Biocca et al., 2003; Biocca, Harms, et al., 2001; Kehrwald, 2008; Swan & Shih, 2005). The social presence connection intensity can vary (Biocca et al., 2003), and is based upon the CMC users' communication skills (Kehrwald, 2008).

Social presence goes beyond perceptions and involves the actions performed to project a social presence (Paquette, 2016). Communicators establish social presence by using affective, interactive, and cohesive communication (Caples, 2006; Rourke et al., 1999). Affective communication includes messages that share emotions, disclose personal information, and/or display computer-mediated paralinguistics (Caples, 2006; Garrison et al., 2000; Garrison & Akyol, 2012; Rourke et al., 1999). Interactive Communication refers to indications the communicator is open to receiving and attending to others' messages (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). The third way users create social presence by adapting to CMC is cohesive communication, which enhances feelings of being connected to another individual through vocatives and phatics.

Research has defined social presence and found it enhances online learning, but what has not been researched is how to identify or train people who lack the ability to project a social presence. Previous social presence instruments only measure people's perception of social presence (Bangert, 2009; Biocca & Harms, 2002; Biocca, Burgoon et al., 2001), not the participant behaviors that create social presence. Because they do not measure an individual's behaviors, we cannot determine whether a single person, small group of people, or everyone created this feeling of being connected. While measuring perceptions of social presence is important, it limits our understanding of how social presence is created and who is responsible for creating it. Additionally, there are questions about the validity of the social presence measure used in the community of inquiry, which also highlights the need to be able to identify people who have issues with projecting a social presence (Dempsey & Zhang, 2019). To address this gap, we need to develop and validate a theoretically grounded social presence behaviors self-rating measure to identify individuals with issues projecting a social presence.

Study 1: Measurement Development Focus Groups

Focus groups operate in the initial stage of instrument development for several reasons. They allow participants to review and ensure items represent the domain of interest, can be comprehended easily, provide face validity and potentially improve a measure's reliability (Morgan, 1997; Ritchie & Lewis, 2005; Stewart et al., 2007). Focus groups help a researcher discover the domains to measure, the potential indicators of the domains, and proper wording of items (Morgan, 1997). According to previous research, the domains of social presence are *affective*, *cohesive*, and *interactive* communication (Garrison et al., 2000; Garrison et al., 2003; Rourke et al., 1999). Because three domains and several indicators of those domains have been defined previously, the focus groups enhanced the wording of items within each domain and developed additional items as needed.

Participants

Focus group size affects the quality and depth of discussion (Morgan, 1997; Ritchie & Lewis, 2005; Stewart et al., 2007). Although there is no standard, experts recommend that a focus group should consist of at least 5 and no more than 12 participants to be manageable and ensure everyone can participate fully (Morgan, 1997; Ritchie & Lewis, 2005; Stewart et al., 2007). Ten participants were recruited for each focus group session. The number of recommended focus groups is three to five to allow the researcher to find redundancy while maintaining control (Morgan, 1997). Redundancy occurs when new sources of information do not bring forth new categories of information (Patton, 2002). There were seven focus groups

with 62 total participants. Groups had participants ranging in age from 19 to 33 years old ($M = 20.82$, $SD = 2.73$) and 42% of participants were female. Focus group members self-selected into the seven available time slots that ranged over three days with times in the morning and afternoon for maximum flexibility.

The participants, who received extra credit, were recruited from general education communication classes to obtain a cross section of the student population. The participants were recruited for ease of access and purposive sampling with the goal of ensuring that all had experience with the phenomenon central to the research investigation (Patton, 2002). Because college students tend to be early adopters of CMC and use it more than the general population (Jones et al., 2002), recruiting college students increased the likelihood they were frequent CMC users. Just over 62 percent rated themselves as somewhat frequent to frequent CMC users.

Procedures

Focus groups met in a vacant classroom and were seated in a circle to enhance conversational style. The focus group meetings consisted of five sections. The first section (welcoming) included explaining the purpose and obtaining signed consent. The second through fourth sections were discussions concerning the three indicators of social presence (affective, interactive, and cohesive). During these three sections, participants were given a document containing the indicator's definition and a list of potential items for that indicator. Order bias, where topic or item sequencing affects the participants' responses (Easton et al., 2003), was minimized by rotating the three sections (Onwuegbuzie & Leech, 2007). The moderator then asked the participants to provide input on the item wording. The moderator and a research assistant took notes of the items discussed; after review, the notes were used to adjust the items' wording and add items participants suggested. The fifth section (closing) involved answering participants' questions and ensuring extra credit was recorded correctly.

The preliminary 30 items were developed from a review of literature concerning social presence (Biocca et al., 2003; Biocca, Harms et al., 2001; Caples, 2006; Garrison et al., 2000, 2003; Kehrwald, 2008; Swan & Shih, 2005). Previous research identified three domains of social presence and the researcher provided the participants with short definitions prior to discussing each section. The definitions served as a reference point so participants could review the proposed measure's preliminary items.

Participants were asked to read through the items individually and given highlighters and pens to make notes on their individual copies of any item(s) that they had difficulty comprehending. After the participants had lowered their pen and highlighters, the moderator asked which items, if any, were confusing or needed to be adjusted. Individual participants would then discuss the issues they had with the items, which would lead other participants to include their thoughts. All 7 focus groups evaluated the original 30 items, of which several items consistently emerged as problematic. The moderator asked each focus group member to provide suggestions that would clarify the item for future participants. Once the discussion stagnated in a focus group, the moderator brought up suggestions made by earlier focus groups.

Focus Group Results

Affective Items. For the affective section, participants reviewed 10 initial items. Affective communication refers to emotions, experiences, and the use of paralinguistics to share emotion (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). Issues emerged around items

that involved paralinguistics, the use of abbreviations, and nonstandard grammar to transfer nonverbal communication.

All seven focus groups identified the term “text speak” as being confusing. Several participants in multiple focus groups asked for clarification of the phrase. The term “lol” (laugh out loud) was provided as an example of text speak to help clarify the issue. Students were asked if they could provide another term and “text slang” was offered, but this term could not be agreed upon by subsequent focus groups. After the focus groups had discussed the issue in-depth, all remaining focus groups agreed that this term was not suitable. Since the example “lol” helped the participants to understand the term “text speak,” “lol” was added as an example.

The second issue involved the term “icon.” A participant asked if the question was referring to the term “emoticon.” When this issue was brought up in subsequent groups, the moderator asked if the term “emoticon” would be a better fit and they agreed it improved the clarity. All items containing the term “icon” were reworded with the term “emoticons.” The remaining affective items were discussed by the focus groups, but none of the participants identified any other clarity or relevance issues.

Interactive Items. Interactive communication, which refers to indications that the communicator is open to receiving and attending to messages, garnered only one confusing item. Participants in all focus groups had issues with the term “quote.” Through discussion with the participants, the word “quote” was determined to be too strong of a term. Several participants stated that they would never quote someone specifically. After the discussion seemed to stall, the moderator asked all focus groups about the phrase “referencing past conversations” because this phrase was created to capture the same information as the term “quote.” All participants agreed that the phrase “referencing past conversations” increased clarity. Thus, the phrase “referencing past conversations” replaced “quote.” All focus groups reviewed the remaining items, but the participants did not identify any other issues with clarity or the concept.

Cohesion Items. Social presence theory predicts that cohesion is established by using first names, personal pronouns, and the use of small talk (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). Only one issue arose, and it concerned the use of first names. Participants in all seven focus groups had issues with the items that discussed the use of first names in CMC. Participants stated they rarely use names when they communicate with others via CMC because the name of the person with whom they are communicating usually appears on the phone or computer screen. Upon reflection, items concerning first names were retained since previous literature has suggested it is an important aspect of presence (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). The focus groups reviewed all other cohesive items but did not find any issue with the items relating to cohesive communication.

Modified Version of Scale. After the initial items were updated to reflect the focus group findings, additional items that were consistent with the same content and wording suggested by the focus groups were created for each section of the proposed measure. Originally, the focus group participants were given 30 items (available from the first author), 10 from each subsection. Because the goal was to create a new measure, additional items were created to ensure the construct was captured (Pett, Lackey, & Sullivan, 2003). There are an infinite number of items that represent any abstract construct; it is the goal of measurement theory to identify items that best capture the construct of interest (Nunnally & Bernstein, 1994). Focus groups were used to identify symbols that best represent constructs and synonyms for those symbols were used to create new items. Using the 30 items agreed upon by the focus groups as templates, an

additional 23 items were created to reflect original items. For example, the original item “I encourage others to send me computer-mediated messages” was used to create “I let people know that they can send me computer-mediated messages.”

After the focus groups, to better capture the affective communication domain of social presence, an additional 12 items were added. Six of the items concerned the idea of sharing emotions and/or experiences. The next six items that were added involved the concept of paralinguistics. An additional eight items were added to the interactive communication subsection. These items revolved around the concepts of initiating or responding to messages. Due to the discussion by the participants in several of the focus groups, four items were added that involved the use of pictures and informal language. These items were not added to the original hypothesized areas of affective, cohesive, or interactive communication because it could not be determined where the items should fit. This process brought the initial social presence behavior conceptualization to 53 items.

Study 2: Exploratory Factor Analysis (Construct Validity)

Exploratory factor analysis (EFA) is used when the total number of factors needed to fully explain the relationships among items is unknown and the researcher needs to examine the fundamental structure of the construct (Pett et al., 2003). EFA compares the items in terms of best fit to account for the most variance (Nunnally & Bernstein, 1994). Thus, an EFA identifies items that work well together and items that need to be eliminated from a measure. The EFA procedure was chosen over a Confirmatory Factor Analysis (CFA) because there have been issues concerning the definition of social presence (Armellini & Stefani, 2016). Although a CFA is a more rigorous test of a measure (Allen, Titsworth, & Hunt, 2009), there must be a supported definition and theoretical factor structure to run a CFA (Byrne, 2016). The EFA was chosen to ensure that the items did work well with one another.

Participants

Participants were recruited via general education courses and were offered either research credit or extra credit to participate in the study. The number of participants needed for an EFA is currently open for debate (Pett et al., 2003); however, 300 participants has been suggested as a good rule of thumb (Tabachnick & Fidell, 2000). Because the study constitutes an investigation of CMC, high CMC users were needed as study participants. College students tend to use CMC more than the general population (Jones et al., 2002). Therefore, recruitment of high CMC users took place on college campuses. A total of 400 participants completed the survey and were used in the study. Over 82 percent of the participants identified themselves as moderate to frequent CMC users. When asked about their experience with CMC, 78 percent of the participants ranked themselves as experienced or very experienced. Additionally, 54 percent rated themselves as experts or near experts with CMC. The sample comprised 48 percent females and 52 percent males, and they ranged in age from 19 to 63 years-old ($M = 23$; $SD = 6.24$).

Procedures

Participants were provided a hyperlink to an online questionnaire containing a description of the study, a consent form, and 116 survey questions with 53 being directly related to the EFA. Other items were included as part of a larger study and not analyzed with these data.

The survey included the social presence self-assessment items and demographic questions concerning CMC use. The questionnaire took approximately 20 minutes to complete.

EFA Results

Social presence’s three overarching domains of affective, interactive, and cohesive communication in online discussions (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999; Swan & Shih, 2005) led to this measure’s creation to determine whether all aspects of social presence were being captured. An exploratory factor analysis using Principal Axis Factoring with Direct Oblimin rotation was used. This method was appropriate because the underlying factors should theoretically be correlated (Allen et al., 2009; Pett et al., 2003). To ensure that the items in the identified matrix have a relationship, Bartlett’s test of sphericity was conducted. The test was statistically significant, $X^2(253) = 3,244.19, p < .001$ The Kaiser-Meyer-Olkin measure of sampling adequacy result was .94, which is considered an excellent sample size (Pett et al., 2003). Items that did not load $>.32$ on any of the components were deleted (Tabachnick & Fidell, 2000), and any items that loaded on multiple factors without a difference greater than .2 were also deleted (Hair, 2010). This reduced the measure to 24 items. ($\alpha = .93$). An examination of the Scree Plot showed there was a distinctive difference between the three-factor and the five-factor solutions. To determine which solution to use, the measure was forced into three-factor and five-factor solutions. An examination of the three-factor and five-factor solutions showed that the five-factor solution aligned with previous theoretical assumptions more than the three-factor solution. That is, the three-factor solution placed affective items on the same factor as cohesive items, while the five-factor solution separated affective, cohesive, and interactive items on different factors. Thus, the theoretically consistent, five-factor solution was chosen (see Table 1 for descriptive statistics).

Table 1
Factor Correlations and Reliability

	Sharing	Paralinguistics	First Names	Small Talk	Alpha
Sharing					.88
Paralinguistics	.440				.71
First Names	.413	.280			.83
Small Talk	.649	.380	.306		.75
Interacting	.756	.303	.508	.539	.83

Note. All correlations are statistically significant ($p < .001$) and include 400 participants.

Since the use of paralinguistics involves informal language and non-alphabetic symbols to display emotions, theoretically it should factor with sharing of emotions and/or experiences. After the EFA, the results showed that Affective communication contained two separate factors, which strongly suggest that the CMC users view the sharing of emotion through text as something different from showing it via paralinguistics. This varies greatly from past research and needs further investigation.

The use of inclusive pronouns was predicted to indicate cohesive communication. Cohesive communication involved the feelings of being connected to another individual, and it consisted of vocative and phatic communication (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). Vocatives was defined as the use of personal pronouns (we, us, our) and the use of

first names; however, this study eliminated the use of inclusive pronouns. The act of looking for signs of connection in CMC discussion transcripts may have led the original researchers to become biased. Another option could be that personal pronouns may be a little too subtle for the users of CMC to identify. To determine if personal pronouns is in fact a component of social presence theory, additional research is needed.

The other aspect identified as vocatives was the use of first names, which factored out separately from the use of small talk or phatic communication. This created two separate factors for cohesive communication, which differs from previous research (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). Items concerning use of first names were almost eliminated due to discussion with the focus groups. Several participants stated they did not use first names in CMC because the technology tends to include the name of the interactants on the screen, eliminating the need to include first names when using CMC. When asked about other CMC channels, such as email, the focus groups stated they used first names when they knew the other interactants' first names. However, several examples brought up by the focus group participants referenced situations in which the use of first names would be inappropriate, such as contacting a professor. Since there were conflicting ideas concerning the decision to retain the items, the researcher based the decision upon the weight given to the topic in prior research. Considering the results of the measure, the decision to retain the cohesion items concerning first names was justified.

The third area, interactive communication, involved using indicators that demonstrated to other CMC users the sender was open to receiving and attending to messages (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999). CMC users demonstrate interactive communication by asking/answering questions and referencing past conversation, thus showing other communicators they are open to interacting. This area contained one factor that corresponds with previous research.

The EFA identified five factors and reduced the measure from 53 to 23 items. The five factors identified by the EFA are open to interacting, use of paralinguistics, use of first names, use of small talk, and the sharing of emotion and experience. This five-component solution accounted for 62 percent of the variance.

Study 3: Confirmatory Factor Analysis

Participants

A total of 331 participants completed the survey using the same recruiting and data cleaning techniques and procedures as study 2. Any sample size over 200 participants for a CFA is considered large (Kline, 2005). The sample of participants was comprised of 55 percent females and 45 percent males, and they ranged in age from 19 to 62 years-old ($M = 23$; $SD = 6.77$). Specifically, for the CFA, over 85 percent of the participants identified themselves as moderate to frequent users of CMC. When asked about their experience with CMC, 71 percent of the participants ranked themselves as experienced or very experienced. Additionally, 55 percent consider themselves expert or near experts with CMC.

Procedures

Participants were provided a hyperlink to an online questionnaire containing a description of the study, a consent form, and 80 survey questions. The preliminary self-assessment social presence behavior measure (23 items): the Harms & Biocca (2004) job satisfaction scale (8 items), the M.I.N.D. the labs social presence measure (36 items), the Watson (2007) CMC

anxiety measure (8 items); and demographic questions concerning age, sex, and CMC knowledge (5 items). The questionnaire was randomized to prevent order bias and took approximately 20 minutes to complete. Because students were offered extra/research credit for participation, the participants entered a code that allowed list-wise data deletion, to minimize skewed results and address participants' technical difficulties (e.g., power or internet outages), if someone participated more than once.

Instruments and Measures

CMC apprehension (CMCA) refers to anxiety concerning sending and receiving messages via a computer-mediated system (Brown et al., 2004; Scott & Timmerman, 2005). The scale (Scott & Timmerman, 2005) had 10 items and was considered reliable ($\alpha = .79$). Watson (2007) dropped 2 of the original 10 items to improve reliability ($\alpha = .81$). For this study, the Watson (2007) version of the CMCA scale was used. The CMCA measure has been found to predict the use of new communication technologies in organizational settings (Scott & Timmerman, 2005), visits to social networking sites, and updates to the user's profiles (Watson, 2007). There is a negative relationship between CMC apprehension and social presence (Wrench & Punyanunt-Carter, 2007), which indicates construct validity.

The Abridged Job in General Scale (AJIG) measures global job satisfaction (Russell et al., 2004) and correlates with a person's identification and commitment to the company (Russell et al., 2004). With eight items, the measure has achieved acceptable reliability ($\alpha = .85$) and shown construct validity (Russell et al., 2004). Theoretically, no relationship between a person's job satisfaction and ability to project oneself as a socially present individual should exist, which allows for discriminant validity testing.

The M.I.N.D. lab social presence measure is based upon the definitions and reviews of other measures of social presence (Biocca, Burgoon et al., 2001) and is being used to establish concurrent validity. The researchers created an initial pool of 80 items narrowed down to 69 items to improve content and face validity (Harms & Biocca, 2004). A pilot test and factor analysis eliminated items that did not factor together eliminated 33 items and retained 36 items (Harms & Biocca, 2004) with acceptable reliability ($\alpha = .81$). The confirmatory factor analysis provided support for the six factors: co-presence (sense of being in an online environment with another person), attention allocation, perceived message understanding, perceived emotional interdependence, and perceived behavioral interdependence (Harms & Biocca, 2004). The measure has criterion validity to the extent that it can tell the difference in social presence between face-to-face interactions and mediated interactions (Harms & Biocca, 2004). It failed, however, to find a difference in different forms of mediation, specifically video- and text-based mediation (Harms & Biocca, 2004).

CFA Results

CFA involves a test of internal consistency followed by a test of parallelism. Each of the five factors identified in the EFA was tested with the AMOS maximum likelihood parameter estimation algorithm. An examination of the standardized residual covariances was conducted if the model fit did not meet the standards of a close to approximate fit established by Kline (2005). This was done to determine if any items were greater than 2.58 (Byrne, 2016), which is a sign of internal consistency issues within the measure.

The item “I use punctuation like capitalization to communicate my feelings” from affective communication was removed due to internal consistency issues. All 22 remaining items were retained.

To determine if the model was second-order unidimensional or multidimensional, a CFA tested both models and indicated they were a close to approximate fit (Kline, 2005), but the multidimensional model was a better fit [$\chi^2(220, N = 331) = 345.82, p = .01$. RMSEA = .053 (90% CI: .045–.062), GFI = .91] than the second order unidimensional model [$\chi^2(184, N = 331) = 376.240, p = .01$ RMSEA = .056 (90% CI: .048–.064), GFI = .90]. The multidimensional model had lower chi square and RMSEA values and the GFI was higher than the unidimensional model; however, the differences between the fit of the unidimensional and multidimensional models were very small. To help determine which model was preferred, an examination of the reliability of the entire measure (unidimensional) and the subsections (multidimensional) were examined. The unidimensional model ($\alpha = .92$) had subsections between .71 and .88. Since the subsections of the multidimensional model have acceptable reliability, lower chi-square and RMSEA values, and the GFI was higher than the unidimensional model, the multidimensional model was chosen. See Tables 2 and 3 for descriptive statistics and correlations.

Table 2
Descriptive Statistics

Measure	Mean	S.D.	Min.–Max.	Skew	Kurtosis	Cronbach's α
Social Presence Measure	4.56	.97	1.70-7.00	-.059	.049	.92
M.I.N.D. Labs Social Presence	4.57	.83	1.00-7.00	-.159	2.00	.95
AJIG	2.53	.47	1.00-7.00	-1.13	-.754	.83
CMC Anxiety	4.40	.86	2.00-7.00	.183	-.206	.77
CMC Experience	5.82	1.03	2.33-7.00	-.789	-.009	.78

Table 3
Correlations

Correlations: Observed

Factor	Correlations			
	Social Presence	Job Sat	MIND	CMCA
Job Satisfaction	.09			
M.I.N.D. Labs Social Presence	.51*	.08		
CMC Anxiety	.40*	-.10	-.11	
CMC Experience	.32*	.21*	.22*	.36*

Note. * $p < .01, N = 400$

Table 3, Cont. Correlations: Corrected for Attenuation due to Measurement Error

Factor	Correlations			
	Social Presence	Job Sat	MIND	CMCA
Job Satisfaction	.10			
M.I.N.D. Labs Social Presence	.55*	.09		
CMC Anxiety	.52*	-.13	-.14	
CMC Experience	.38*	.26*	.25*	.50*

Note. * $p < .01$, $N = 400$

A test of parallelism, using CFA, was conducted on all four measures to establish concurrent and discriminant validity. The model fit did not meet the standards of a close to approximate fit (Kline, 2005); an examination of the standardized residual covariances from all the measures was conducted and any item causing an internal consistency issue was removed. One item was removed from the preliminary measure, reducing the measure to 21 items. The finalized version of the measure showed a close to approximate fit according to Kline (2005) [$\chi^2(161, N = 331) = 283, p < .05$. RMSEA = .046 (90% CI: .036–.055), GFI = .92].

The CMC anxiety measure was used to establish convergent validity because of its negative relationship with social presence (Wrench & Punyanunt-Carter, 2007). Logically, as social presence increases, anxiety due to the use of CMC should decrease. The CMC anxiety measure is calculated differently than other anxiety measures. Specifically, scores on the measure will be higher as anxiety lowers. This negative relationship between CMC apprehension and the social presence behavior measure was confirmed [$r(331) = .40, p < .001$; corrected for attenuation due to measurement error (\hat{r}) $\hat{r} = .52, p < .001$], with 25 percent of the variance in social presence being explained by CMC anxiety.

Discriminant validity was tested using AJIG; there should not be a relationship between job satisfaction and ability to project oneself as a social individual. As predicted, there was not a statistically significant correlation between AJIG identified after the test of parallelism and the social presence measure [$r(331) = .09, p > .05$. ; $\hat{r} = .10, p > .05$].

To establish concurrent validity, CMC usage demographics and the relationship between the M.I.N.D. Labs social presence measure and the preliminary self-assessment social presence behavior measure were examined. Participants were asked three questions concerning their experience, use, and knowledge concerning CMC. The three questions were combined to create the participants' CMC Experience score ($\alpha = .78$; $M = 17.45$; $SD = 3.096$). As experience with CMC increases, so should the participants' social presence [$r(331) = .323, p < .001$; $\hat{r} = .38, p = .000$] with CMC experience scores explaining 10.4 percent of the variance in social presence scores. Additionally, theory predicts that the M.I.N.D. Labs Social Presence Measure should be positively correlated with the preliminary social presence behavior measure [$r(331) = .55, p < .001$; $\hat{r} = .55, p < .001$]; social presence perceptions explained 30 percent of the variance in social presence behaviors.

Discussion

This series of studies creates and provides validity testing of a self-rated measure assessing an individual's ability to project a social presence. This measure's intended purpose is to identify individuals who have trouble initiating social presence, and the areas of social presence with which they have difficulty. This measure can be used as a tool in online education to screen and provide additional training to students and professors. In fact, it may be more

important to identify the professors who have issues because instructor involvement has been found to be a key component to creating social presence within online classes (Whiteside, 2015).

In Study 1, focus groups provided face validity by restructuring or borrowing items and using them outside the context in which they were intended (Morgan, 1997; Ritchie & Lewis, 2005; Stewart, et al., 2007). Participants clarified terminology and wording issues and provided guidance for study two. During the exploratory factor analysis, the preferred five-factor solution expanded social presence theory's three factors of affective, cohesive, and interactive communication. Interactive communication remained untouched. Affective communication split into sharing of emotions/feelings and paralinguistics. Focus group participants had difficulty with the terms associated with paralinguistics ("text speak" and "icon"). Since the purpose of paralinguistics is to replace nonverbal messages not transmitted via CMC, participants may have viewed text as a verbal component as in "sending a text" and paralinguistics as the nonverbal component. Cohesive communication split into small talk and first names while eliminating inclusive pronouns.

The original researchers (Caples, 2006; Garrison et al., 2000; Rourke et al., 1999) identified personal pronouns by analyzing CMC discussion transcripts to find telltale signs of connection, which may have been a specific context in which they were more prevalent than general CMC. The first-name items were almost eliminated during the focus groups because current technology makes them unnecessary by including them on the phone screen. When asked about other CMC channels, the participants did indicate that they use first names when they knew them and also indicated they are inappropriate in situations such as contacting a professor. The conflicting perspectives and theoretical justification led the researchers to keep the items, which may explain why the cohesive factor was severed.

The remaining 23 items were used in study three. In the confirmatory factor analysis and validity study, the CFA reduced the scale by two items due to internal consistency issues. The finalized scale showed concurrent validity with the CMC Users Experience survey and M.I.N.D. Labs Social Presence Measure (all three were strongly correlated with each other), discriminant validity with the AJIG job satisfaction measure (nonsignificant correlation), and convergent validity with the CMC Apprehension measure (strong correlation).

Future Research and Limitations

The first limitation is the use of the purposive sample to recruit CMC users who are very experienced with CMC. The lack of participants with little CMC experience prevents us from investigating whether those with little CMC experience adapt the same way that experienced CMC users do. Future research needs to determine if the measure would be as helpful with individuals who refrain from interacting via CMC channels. Additionally, the sample should include both students and faculty who have experience with CMC and online education. Further research should be conducted concerning the five areas of social presence verified in this study. CMC scenarios could be created with varied levels of the five social presence areas identified. For example, a series of CMC scenarios using paralinguistics and textual references to emotion could be created. One scenario using both paralinguistics and textual references equally, two scenarios using either paralinguistics or textual reference to emotion, and two scenarios using both. The scenarios would then be ranked according to the level of social presence that the participants perceived. This would let us determine if paralinguistics or textual references varies with the level of social presence CMC users experience.

The relationship between social presence and CMC apprehension should be investigated as well. The two measures correlated according to theory but does CMC apprehension lower due to social presence? Users with high levels of apprehension who score low on social presence behaviors should be recruited. A series of trainings could be designed to lower CMC apprehension or increase social presence behaviors. An experimental design would allow researchers to assess the exact relationship between CMC apprehension and social presence.

The final limitation is due to the COVID-19 pandemic. This research was conducted before the pandemic forced most of higher education online. It would be prudent to include more demographic information asking about both the students' and faculty's experience with CMC and online education given the worldwide move to online emergency remote teaching.

Contributions and Implications

The measure can be used as a tool in online education to screen and provide additional training to students and faculty. In addition, the individual's scores on the subsections of the instrument can indicate area(s) of social presence needing improvement. Instructors could use the measure to assess the ability of their classes and assign groups based on communication ability, thus pairing students with social presence behaviors deficiencies with proficient students. In addition, online educators who have issues with social presence behaviors can be identified, which allows educational institutions to pick instructors who adapt well to the online environment as role models and trainers of others who do not have the same social presence behavior proficiencies. Research has shown that instructors training in social presence increase not only their use of social presence cues, but also their students' use of presence cues (Paquette, 2016). Since the role of the online instructor is critical in creating a positive classroom climate (Kaufmann et al., 2016), instructors must help the students feel they are more than a name on a roster (Cunningham, 2015; Jiang & Koo, 2020).

Declarations

The authors declare no conflicts of interest.

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Appendix A

Projecting a Social Presence Measure

Directions: The following scale concerns your behaviors when using computer-mediated communication. Computer mediated communication is the use of communication channels such as email, text messaging, social networks, chat, etc. Please respond to the following statements as they apply to your use of computer-mediated communication using the following scale:

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neither Agree nor Disagree	Slightly Agree	Agree	Strongly Agree

1. I tend to share my feelings with others via computer-mediated communication (*asp*)
2. I tend to disclose my past experiences and opinions with other online communicators. (*asp*)
3. When other online communicators share personal information, it improves the communication. (*asp*)
4. I initiate conversations concerning how others think/feel via computer-mediated communication. (*asp*)
5. I ask other people their opinion via computer-mediated communication. (*asp*)
6. I share my opinions via computer-mediated communication. (*asp*)
7. I discuss my thoughts and feelings when appropriate with others via computer-mediated communication (*asp*)
8. I over-use punctuations (!!!, ???, etc...) to convey my feelings. (*asp*)
9. I like it when others over use punctuation (!!!, ???, etc...) to convey feelings. (*asp*)
10. I use capitalization to stress certain points when using computer-mediated communication channels. (*asp*)
11. I like it when people refer to me by first name in computer-mediated communication if the communication channel does not automatically include my name. (*csp*)
12. I use small talk to make my computer-mediated messages more personal. (*csp*)
13. I usually include small talk in computer-mediated communication. (*csp*)
14. I enjoy it when people use small talk in computer-mediated communication. (*csp*)
15. If I know the other person's first name, I use that in my computer-mediated messages with them if the communication channel does not include it automatically. (*csp*)
16. I encourage others to use my first name in computer-mediated communication if the communication channel does not provide it automatically. (*csp*)
17. I like to send others computer-mediated messages. (*isp*)
18. I like to receive messages from others via computer-mediated communication. (*isp*)
19. I send messages to let others know that I received their computer-mediated message. (*isp*)
20. I ask others for their contact information so I can use computer-mediated communication to contact them later. (*isp*)
21. I let people know that they can send me computer-mediated messages. (*isp*)

Note. ASP = affective social presence; CSP = cohesive social presence; ISP = Interactive social presence