Construct validation of the concepts social presence, emotional presence and connectedness and an application of Zajonc's social facilitation theory to social presence research

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Construct Validation of the concepts Social Presence, Emotional Presence and Connectedness and an Application of Zajonc's Social Facilitation Theory to Social Presence Research

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Abstract

'Social presence' is a frequently used concept in Presence research. However, as several authors have noted, it is also a problematic concept. A literature review reveals that some of the recent discussion about the definition of 'social presence' deals with the distinction between 'perceptual social presence' (the perceptual awareness that you are not alone) and 'connectedness' (the emotional feeling that you are not alone, that you are in touch with someone). In an experiment we have tried to establish discriminant validation of the concepts (perceptual) social presence and connectedness and convergent validation of emotional presence and connectedness. The results support the view that perceptual awareness is a discriminant property of social presence. They partially support the similarity between connectedness and emotional presence.

The experiment also explored the application of Zajonc's theory of social facilitation as a triangulation of the notion that perceptual awareness is a prerequisite for experiencing social presence. The results give limited support for a mere presence effect.

Keywords--- **Social Presence, Connectedness, Emotional Presence, Mere Presence, Social Facilitation**

1. Introduction

Since Short et al. [1] proposed their Social Presence Theory, the concept of 'social presence' has been applied in a wide variety of research domains. Although social presence as a concept may seem "deceptively intuitive" [2, p. 468], the concept has received many definitions, explanations and methods of measurement, making social presence a very broad and unclear notion. This lack of conceptual clarity that surrounds social presence research is not unproblematic, as it stimulates perfunctory uses and prevents sound measurement [2]. Several authors have attempted to clarify social presence. One clarification can be found Ijsselsteijn's [3] and Rettie's [4] research. Both researchers plead for a distinction between social presence and connectedness. This paper's first goal is to builds examine whether we can support the distinction between social presence and connectedness with evidence from experimental research.

Besides distinguishing between connectedness and social presence, this paper also aims to apply the social facilitation framework to social presence research. Social facilitation theory explains how (the awareness of) the 'mere presence' of (an)other(s) can have specific effects on human performance [5]. So far, the field of social facilitation research has paid little attention to the effects of mediated/virtual presence. Likewise, only few social presence researchers refer to or make use of social facilitation theory in their work. Given the strong theoretical foundations and academic history of the social facilitation framework [6], we argument that social facilitation theory offers interesting opportunities for further clarifying the concept of social presence, in particular the role of perceptual awareness as a necessary prerequisite of social presence. Therefore, the second goal of this paper is to examine the experimental results of an application of social facilitation theory to social presence.

2. Literature

Short et al. [1] originally gave a twofold definition of social presence: (1) "*the degree of salience of the other person in the interaction*" and (2) "*the consequent salience of the interpersonal relationships*" (p. 65). Social presence is referred to in a wide variety of disciplines, but we could state that, depending on the research domain, the focus is more on one rather than both of these two sub-definitions. While social presence, understood as the 'consequent salience of the interpersonal relationships', refers more to the domain of Interpersonal Communication, social presence, understood as 'the salience of another person in an interaction', refers more to the domain of Presence research.

2.1. Social Presence in Interpersonal Communication Research

Interpersonal Communication researchers [7,8] see similarities between Social Presence Theory, Media Richness Theory [9] and the Social Context Cues perspective [10]; the three theories are often mentioned together as the 'cues filtered out'-approach [11,12]. The 'cues filtered out'-approach adopts a rather negative position towards (new)

communication technologies: technology can not convey as many cues as face-to-face communication, and therefore technologically mediated interactions are inherently inferior to face-to-face interactions for achieving qualitative relational communication.

These 'pessimistic' communication theories came under fire at the end of the 1990's, when communication technologies such as the cell phone invaded private homes. A first series of criticisms suggests that computer-mediated communication is more suitable for interpersonal communication than is commonly thought. Culnan and Markus [11] already contested the idea that communication technologies are per se 'poorer' than face-to-face communication, stressing the new capabilities of computer-mediated communication that face-to-face communication cannot offer. Riva [13], for example, discusses theories such as Chance Theory that explain how users can benefit from strategic 'miscommunication' in computer-mediated communication that would not be possible in face-to-face communication (e.g., identity deception) (or see also the concept of hyperpersonal interaction [14]).

Not only do communication technologies possess new capabilities that non-mediated communication does not; theories such as the Social Information Processing model (SIP model) also "rejects the view that CMC is inherently impersonal and that because nonverbal cues are not available in CMC, relational information is therefore inaccessible to CMC users." [12, p. 40]. In conclusion, Interpersonal Communication research currently agrees on the value of communication technology to support and enhance relationships [15,16].

So what then, has Interpersonal Communication research to offer for a better understanding of the concept of social presence? First of all, it is important to note that - although authors such as Walther set out from a rather negative view on Social Presence Theory, their criticism is directed mostly towards the way Short et al. operationalized social presence (as a subjective quality of the medium) [7]. Interpersonal Communication theories focus on the characteristics of interpersonal communication. They do not answer the question *if*, and *to what degree*, technology makes other persons salient in mediated communication. However, recent Interpersonal Communication research does confirm the idea that communication technologies are social instruments that can be used to connect to others emotionally and personally [17,18]. In this sense, Interpersonal Communication research supports the idea that there is an emotional component to mediated communication (connectedness) besides a perceptual one (social presence).

2.2 Social Presence in Presence Research

If we think of social presence in terms of Short et al.'s first subdefinition, as 'the degree of salience of the other', social presence seems to refer more to the (psychological) experience of the user *while* using a medium, than either the qualities that one ascribes to the medium or the characteristics of the actual interpersonal communication. From our point of view, Presence research offers a more suitable concept of social presence to the description of the 'salience of others'.

Lombard and Ditton [19] give an overview of all the operationalizations of 'Presence' in the existing literature. They found 6 different ways of conceptualising this construct, but common to all is the fact that Presence suggests that there is a "perceptual illusion of nonmediation" (p.5). This means that when the user thinks, feels and acts in a context without being conscious or aware that the context is created through technology, he experiences Presence.

Lombard and Ditton distinguish two broad categories of presence [19]: 'Physical Presence' (or the sense that you are physically present in a virtual environment) and 'social presence' (or the sense that you are together with someone who is actually not there). Biocca et al. [2] wish to further clarify the concept of social presence and constructs one operationalization that offers a better understanding of technology mediated communication and allows the development of sound measures for social presence. Considering all the previous definitions, Biocca et al. eventually come to see the same two broad conceptualisations of Presence as Lombard and Ditton. The first is 'Telepresence' or the sense/illusion of a space that actually is not there, the second is 'social presence' or the sense that you are together with someone who is not actually there. social presence is a psychological construct, "a transient phenomenological state that varies with medium, knowledge of the other, content of the communication, environment, and social context."[2]. This definition illustrates that social presence is a complex phenomenon, and that measurements of social presence have to take into account more than the 'subjective qualities' of the medium. Furthermore, empirical evidence from Presence research suggests that Presence is not an all-or-nothing phenomenon but a continuum [20]. Users can shift gradually from no experience of (Social) Presence at all to an absolute experience of (Social) Presence.

Biocca et al. [2] classify different definitions of social presence into three larger categories: copresence (sensory/perceptual awareness of another person), psychological involvement (e.g. the experience of intimacy/immediacy of the other, perceived access to another intelligence) and behavioural engagement (the negotiating of relationships with others through behavioural interactions). However, as some researchers have noted, there is a gap in current social presence research concerning the concept of 'connectedness' [3,21]. Increasingly, technologies are being developed that focus on eliciting an affective state of connectedness in the user with very limited or no perceptual information about the other user being processed (e.g. awareness systems, e.g. [22]). One can feel connected to someone else, without this person being necessarily 'present' (real or virtual/mediated), or without necessarily being in

interaction with him/her. While this experience of 'connectedness' could fall under the category of psychological involvement, it does not require 'social presence' or the perceptual awareness of another person [21]. The simple awareness of an object that carries a symbolic relational function (e.g. looking at a picture of a loved one) may suffice to elicit feelings of connectedness (see figure 1). Results from in-depth interviews support the idea of connectedness as a different construct than social presence [4].

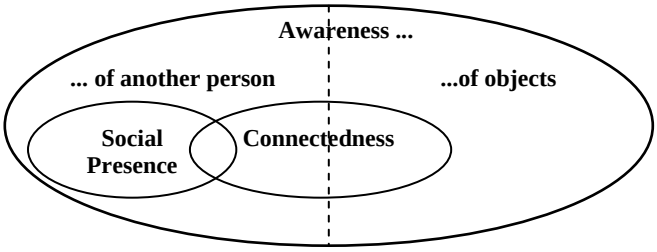

Figure 1: Connectedness (from Rettie, [19])

2.3 Research Questions (I): Social Presence versus Connectedness

The formerly "neglected" concept of connectedness [4] is increasingly becoming a key concept in communication technology research. As a result, there is a need for a clear conceptual distinction between connectedness and social presence.

This paper intends to contribute to concept development concerning social presence and connectedness by experimentally validating both concepts as separate constructs with their respective properties. The following research questions led to the experimental research design described below:

RQ 1: *Can we determine discriminant validity between social presence and connectedness based on perceptual awareness (social presence requires perceptual awareness of another person, while connectedness can occur without the perceptual awareness of another person)?*

Considering the properties that are currently ascribed to connectedness (e.g. "the feeling to be in touch" [3], "an emotional experience" [21]), we also question whether connectedness can be understood as 'emotional presence' (as opposed to social 'perceptual' presence).

RQ 2: *Can we determine convergent validity between emotional presence and connectedness?*

2.4 Social Facilitation Theory

As we already mentioned in the title and the introduction, the second goal of our study is an application of the social facilitation framework to social presence research. If the social facilitation framework can be successfully applied, this would provide us with extra evidence that perceptual presence is a prerequisite property of social presence.

Social facilitation, also known as the 'mere presence effect', was originally defined by Zajonc [5]. The mere presence effect refers to the fact that the 'mere presence' of another person affects our performance in such a way that the person's dominant response has a higher probability to be brought out [5,6]. Tasks that are easy for us are those where the dominant response is adequate to the task. Easy tasks should therefore be performed better (i.e. faster, more correctly) in the presence of another than in isolation. This effect is called 'social facilitation'. Tasks that are difficult for us are tasks where the dominant response is not the best or correct one; therefore difficult tasks are performed worse (slower, with more errors) in the presence of another than in isolation. This effect is known as 'social inhibition'. Surprisingly, only a few researchers have investigated whether mediated 'mere presence' can generate social facilitation or inhibition, and the little available research seems limited to organizational psychology studies investigating the effectiveness of computer monitoring to enhance the performance of employees (e.g. [23]). These limited results suggest that a mediated mere presence effect can manifest itself if there is a strong evaluation component (the subject is aware that he/she is electronically monitored by a supervisor to assess his/her performance) [24,25]. Outside organizational research, Hoyt et al. found evidence for a social inhibition effect when in the presence of an avatar-audience [26]. However, when no evaluation apprehension is induced, a recent study from Lee et al. [27] illustrates that mediated presence without the evaluative component does not elicit a mere presence effect. In both of these studies the 'present other' is an avatar.

2.5 Research Questions (II): Social Facilitation applied to Social Presence

Except for the avatar-studies cited above, Zajonc's social facilitation theory doesn't seem to have been applied anywhere else in the field of social presence research. Social facilitation theory is relevant for social presence research however: it focuses specifically on the *mere* awareness of another person and how it generates an effect. Therefore, if we find a mere presence effect between the 'real presence' conditions and the 'symbolic presence' conditions (and this effect remains absent in the 'stranger-friend' conditions), then we have stronger evidence that the perceptual awareness of another person is a (discriminating) property of social presence, and that this property can be measured/operationalized by applying Social facilitation theory.

This second goal of our experiment can be translated in the following research question:

RQ3: *Can we apply social facilitation theory to measure social (perceptual) presence?*

3. Methodology

3.1 Experimental design

Participants were recruited from an undergraduate communication course. We employed a 2x2 experimental research design in which a 'partner' axis was crossed with a 'type of presence' axis. Regarding the 'partner' axis, the participant took part in the experiment with either a 'friend' or with a 'stranger'. The 'type of presence' axis was manipulated by letting the participant perform the computer task either in the 'real presence' of the other participant or in the presence of a picture of the stranger/friend ('symbolic presence').

		TYPE OF PRESENCE	
	CON-DITION	**Symbolic** (picture)	**Real** (person)
PARTNER	**Friend**	1: Picture-friend	2: Presence-friend
	Stranger	3: Picture-stranger	4: Presence-stranger

Figure 2. 2x2 Experimental Design

To disguise the goal of the experiment, we presented two apparently different experiments to the participants: one experiment for which participants had to register alone (these participants were randomly assigned to the stranger-conditions and came to the experiment with a female[1] confederate 'stranger') and another experiment for which the participants could only register together with a female friend (these participants were randomly assigned to the friend-conditions and came to the experiment with their friend). Participants could only register for one of the experiments. The fact that many participants wanted to register for both, suggests that participants were unaware that both experiments were in fact one.

In the 'stranger' conditions the session was set up in such a way that a fake 'random selection procedure' always indicated the confederate as the one whose picture was taken (picture-stranger condition) or who had to be 'merely present' (presence-stranger condition); the participant always had to perform the computer task. In the 'friend' conditions the student participant was overtly assigned to the computer task, while the accompanying female friend was photographed or had to be 'merely present'.

In the 'symbolic presence' conditions a close-up picture was taken and projected on a laptop directly facing the participant while he/she was performing the computer task. In the 'real presence' conditions the stranger or friend was instructed to sit besides the participant during the task and to observe him/her with the explicit instruction not to communicate during the task.

After finishing the computer task, an on-screen message instructed the participant to close the laptop (in the 'symbolic presence' conditions) or to ask the other participant to leave (in the 'real presence' conditions). Next the participant filled out a questionnaire with items measuring Social (perceptual) Presence, emotional presence and connectedness.

The respective research questions can be translated into the following hypotheses:

RQ 1: *Can we determine discriminant validity between social presence and connectedness based on perceptual awareness?*

H1: There will be a main effect of type of presence on social presence: the 'symbolic presence' conditions will score lower on social presence than the 'real presence' conditions. There will be no effect of the partner on social presence.

H2: There will be a main effect of the partner on connectedness: the 'stranger' conditions will score lower on connectedness than the 'friend' conditions. There will be no effect of the type of presence on connectedness.

RQ 2: *Can we determine convergent validity between emotional presence and connectedness?*

H3: There will be a higher correlation between emotional presence and connectedness than between connectedness and social presence or between emotional presence and social presence.

3.2 Sample

All participants were recruited from an undergraduate communication course at the Katholieke Universiteit Leuven, Belgium. Participants received partial course credit in exchange for participation. 129 students participated in the study. As is typical for communication courses, only 27.1% (N=35) of the participants were males and 72.9% (N=94) were females.

The picture-stranger condition consisted of 35 participants (27.1%), the picture-friend condition of 28 (21.7%), the presence-stranger condition of 37 participants (28.7%) and the presence-friend condition of 29 participants (22.5%). Although it appeared easier to show up alone than with a friend, this distribution is not significantly distorted

[1] To keep as many variables under control as possible, the stranger in the experiment was continuously played by the same confederate. Because of this confederate's gender (female), participants in the 'friend' conditions were instructed to bring a female friend.

($X^2(3)=1,822$, p=0,622). Males and females were also equally distributed over these conditions ($X^2(3)=0.801$, p=0,849).

3.3 Dependent measures

3.3.1 Social Presence, Emotional Presence and Connectedness items

As described above, dependent measures were collected in the form of social presence, emotional presence and connectedness items administered in a questionnaire that followed the computer task. The items administered were:

social (perceptual) presence:
1. I had the feeling that someone was PHYSICALLY with me in this room.
2. I was under the impression that someone else was PHYSICALLY present while I was performing the task.
3. I felt PHYSICALLY alone during the task.

emotional presence:
1. I had the feeling that someone was EMOTIONALLY with me in this room.
2. I was under the impression that someone else was EMOTIONALLY present while I was performing the task.
3. I felt EMOTIONALLY alone during the task.

connectedness:
1. To what extent did you feel connected to the other participant during the task?
2. To what extent did you feel support while you were performing the task?
3. To what extent did the (photographic or real) presence of the other participant help you?
4. To what extent did the (photographic or real) presence of the other participant make you feel less lonely?

All items were presented with a 7-point Likert scale, ranging from "not at all" (1) to "completely" (7).

3.3.2 Computer task

We set up the computer task in such a way that it intended to measure a 'mere presence effect'. Four measures in the computertask can serve as dependent variables to establish a mere presence effect. First of all, the computer task consisted of two subtasks. The first was a 'difficult' task (similar to that used by Schmitt et al.[28]): the participant had to enter an access code, which is made up of the participant's student-number spelled backwards (an 8 digit number). In between each digit the participant had to spell the subsequent letters of his/her first name (if the name is shorter than 8 digits, the participant repeats it, if the name is longer than 8 digits the participant stops after at the 16th digit). For example: if the name is Mary and the student number is s1234567, the correct access code is: 7M6a5r4y3M2a1rsy. Both the reaction time to complete this task as a measure of correctness were collected as dependent variables.

After entering the access code, the second subtask consisted of an 'easy' lexical decision task (deciding as fast as possible whether an on-screen word exists or not). Before the participant could start the real lexical decision task, he/she had to practice on a trial set until performance was sufficient (50% correct) to ensure that the task was 'easy'. 15 nonwords and 25 words were shown in the lexical decision task. As for the 'difficult' task, again reaction time and a measure of correctness were collected.

The research question concerning the mere presence effect can be translated in the following hypotheses:

RQ3: *Can we apply social facilitation theory to measure social (perceptual) presence?*

H4: For the 'difficult task' the performance (respectively the reaction time and the correctness) will be worse in the 'real presence' conditions than in the 'symbolic presence' conditions

H5: For the 'easy task' the performance (respectively the reaction time and the correctness) will be better in the 'real presence' conditions than in the 'symbolic presence' conditions

4. Results

4.1 Three factors: Social Presence, Emotional Presence and Connectedness

A maximum likelihood factor analysis (MLFA) with rotation (direct oblimin) was performed on the items in the questionnaire to see whether the three proposed factors would emerge. Initially, the MLFA extracted only two clearly identifiable factors (Presence and connectedness). A forced three-factor solution further split the Presence factor in the Social (perceptual) and emotional presence factor (see Table 1).

A correlation analysis reveals that the three factors are highly related, with the correlation between Emotional and Perceptual presence ($r=0.745$, $p<0.01$) stronger than that between emotional presence and connectedness ($r=0.663$, $p<0.01$), and that between Perceptual Presence and connectedness ($r=0.530$, $p<0.01$). This runs counter to what we expected (RQ2): the relationship between Social (perceptual) Presence and emotional presence is stronger than that between emotional presence and connectedness.

The Cronbach's Alpha for the different factors are very good ($\alpha_{\text{perceptual presence}}=0.93$, $\alpha_{\text{emotional presence}}=0.89$, $\alpha_{\text{connectedness}}=0.89$). Mean scores for each of the factors were calculated and retained as dependent variables for further analysis.

Table 1: Three-factor solution Emotional presence, Physical presence and connectedness

	Mean	S.D.	Factor Loading
emotional presence			
I had the feeling that someone was emotionally with me in this room.	3.75	1.98	,99
I was under the impression that someone else was emotionally present while I was performing the task.	3.67	2.04	,54
I felt emotionally alone during the task.	3.87	1.93	-,67
Social (perceptual) Presence			
I had the feeling that someone was physically with me in this room.	4.22	2.30	1,0
I was under the impression that someone else was physically present while I was performing the task.	4.04	2.30	,78
I felt physically alone during the task.	3.58	2.25	-,71
connectedness			
To what extent did you feel connected to the other participant during the task?	3.23	1.73	,92
To what extent did you feel support while you were performing the task?	2.93	1.70	,89
To what extent did the (photographic or real) presence of the other participant help you?	2.58	1.70	,81
To what extent did the (photographic or real) presence of the other participant make you feel less lonely?	3.63	1.87	,57

The MLFA also provides us with statistical information on the goodness of fit of the model. The model does not fit well ($X^2(18)=74.845$, $p<0.01$), but this test result should be interpreted with caution as many of our variables violated the multivariate normality assumption.

4.2 Results Social (perceptual) Presence, Emotional Presence and Connectedness

First, we will discuss the impact of the experimental manipulation on the factor scores for Social (perceptual) Presence, emotional presence and connectedness.

4.2.1 Social (perceptual) Presence

A 2x2 ANOVA lends support to our first hypothesis (H1): there is a main effect of type of Presence on the measure of Social (perceptual) Presence $F(1,125)=118,189$, $p<0,01$), and no effect of the partner present ($F(1,125)=0,004$, $p=0,950$). There is no interaction effect ($F(1,125)=0,903$, $p=0,344$).

These results are convincing support for our hypothesis concerning Social (perceptual) Presence.

Table 2: Pairwise comparison social presence

Condition	*Mean*	*S.D.*
Picture-friend	$3,29_a$	0,97
Presence-friend	$4,56_b$	0,80
Picture-stranger	$3,17_a$	0,69
Presence-stranger	$4,69_b$	0,43

Note: Means that share the same subscript are not significantly different ($p<0,05$)

4.2.2 Connectedness

A 2x2 ANOVA lends partial support to our second hypothesis (H2). There is a main effect of the partner on the measure of connectedness ($F(1,125)=8,934$, $p<0.01$), but there is also an effect of the type of presence on the connectedness measure ($F(1,125)=74,152$, $p<0,01$). There is no interaction effect ($F(1,125)=0,327$, $p=0,568$).

Interestingly, our hypothesis is both supported and undermined: there is evidence that, independent of the type of Presence, connectedness is higher when the partner is a friend. But connectedness is also higher in the conditions with 'real' presence than in those with 'symbolic' presence.

Table 3: Pairwise comparison connectedness

Condition	*Mean*	*S.D.*
Picture-friend	$2,97_a$	1,48
Presence-friend	$4,05_{b*}$	1,55
Picture-stranger	$2,09_c$	1,11
Presence-stranger	$3,38_{a*}$	1,33

Note: Means that share the same subscript are not significantly different ($p<0,05$)

Note: * The means are marginally significant from each other ($p=0,08$)

4.2.3 Emotional Presence

The 2x2 ANOVA results for emotional presence are similar to the results for connectedness. There is an effect of the partner ($F(1,125)=10,298$, $p<0,01$) on the measure of emotional presence, independent from the type of presence (no interaction: $F(1,125)=0,138$, $p=0,670$). Again, there is also a main effect of the type of presence ($F(1,125)=23,841$, $p<0,01$).

Table 4: Pairwise comparison emotional presence

Condition	*Mean*	*S.D.*
Picture-friend	3.35_{a*}	0,90
Presence-friend	$4,62_b$	0,57
Picture-stranger	$3,00_{c*}$	0,78
Presence-stranger	$4,13_d$	0,83

Note: Means that share the same subscript are not significantly different ($p<0,05$)

Note: * The means are marginally significant from each other ($p=0,07$)

All these results were checked for the possible influence of gender; it was found not to have an effect.

4.3 A mere presence effect?

As described above, data were also collected in a 'difficult' and an 'easy' computer task to check whether we could find a mere presence effect. For the 'easy' task, results showed no mere presence effect (H5: both the mean reaction time (Mean RT) (t(127)=-1.038, p=0,301) as the mean number of correct responses (Mean NCR) (t(127)=-0.377, p=0,707) did not differ significantly between the 'symbolic presence' and the 'real presence' conditions (Table 5).

Table 5: mere presence effect – easy task

	Response Time		Number of Correct Responses	
	Mean	*SD*	*Mean*	*SD*
Symbolic Presence	534.42msec	48.52	36.68	2.61
Real Presence	545.00msec	65.52	36.87	3.25

* $p < 0.05$

The difference between the 'stranger' conditions (*Mean RT*=533,15 msec, *SD*=63,00; *Mean NCR*=36,61, *SD*=3,38) and the 'friend' conditions (*Mean RT*=548,28 msec, *SD*=49,92; *Mean NCR*=37,00, *SD*=2,31) is also non-significant (*Mean RT*: t(127)=-1,482, p=0,141; *Mean NCR*: t(127)=-0,743, p=0,459).

For the 'difficult' task, each access code was judged correct (minimum of 14 correct digits out of 16) or wrong, and the reaction time for completing the task was measured. The mean RT did not reveal a significant mere presence effect (' symbolic presence' conditions: *Mean RT*=51,36 sec, *SD*=22,05; 'real presence' conditions: *Mean RT*=46,6 sec, *SD*=24,85; t(127)=1.151, p=0,252). The stranger-friend results are also non-significant ('stranger' conditions: *Mean RT*=49,42 sec, *SD*=25,93; 'friend' conditions: *Mean RT*=48,29 sec, *SD*=20,38; t(127)=0.268, p=0,789).

The correctness measure reveals a marginally significant mere presence effect: in the 'real presence' conditions only 56.1% of the participants gave a correct response, while in the 'symbolic presence' conditions 71.4% of the participants gave a correct response ($X^2(1)=3.287$, p=0.070). The same analysis between the stranger-friend conditions provides non-significant results (Table 6).

Table 6: mere presence effect – Difficult task

	condition	% with correct answer	X^2	df	p
social presence	***Picture***	56.1	3.287	1	0.070
	Presence	71.4			
Connected-ness	***Stranger***	63.9	0.007	1	0.932
	Friend	63.2			

Based on the previous results, we could conclude that we have little evidence for the fourth research question: only the correctness measure in the 'difficult' task suggests a mere presence effect (H4). This limited amount of support does not necessarily mean that there is little evidence for a mere presence effect. As Bond & Titus [29] note, 'easy' tasks often provide less convincing results than 'difficult' tasks. Also, the reaction time measurement of the 'difficult' task proved to be somewhat problematic, as some of the incorrect responses clearly required little time (e.g. simply typing in the student number without special attention to the previously given task, e.g. the *minimum RT* was 4,74 sec), while other participants made the difficult task even more difficult (e.g. by spelling their name backwards as well, e.g. the *maximum RT* was 132,23 sec). If we only take into account the correct access codes (N=82), the differences in mean reaction time between the 'symbolic presence' (M=53,20 sec; SD=19,27) and the 'real presence' conditions (M=53,80 sec, SD=24,17) are not significant however (t(80)=-0.126, p=0,900 (2-sided)).

5. Conclusions

This paper discusses the results of an experiment that intended to shed light on the difference between social presence and connectedness by examining the construct validity of both concepts. Thus what does our experiment reveal about perceptual awareness as a discriminating property between Social (perceptual) Presence and connectedness (RQ 1)? The ANOVA supports our expectations regarding the measure of social presence. When people are in a situation where the perceptual awareness of another person is low (the 'symbolic presence' conditions), they experience significantly less 'social presence' than when they are in a situation where the perceptual awareness of another is very high (the 'real presence' conditions). Whether one is accompanied by (a picture of) a stranger or a friend makes no difference in the experience of social presence.

The results of the measure of connectedness are also support for our research question. Participants in the presence of a friend felt significantly more connected to the other participant than those who were in the presence of a stranger. Especially supportive for the discriminant validity hypothesis, is the finding that even if the friend is present only by means of a picture, the experienced connectedness during the task is still significantly stronger than when the picture displays a stranger; even in situations of low

perceptual awareness of another person, connectedness can still be elicited. This suggests that (1) perceptual awareness is not a necessary prerequisite for experiencing connectedness, while it is necessary for experiencing social presence, and (2) that social presence and connectedness are thus two different, yet complementary notions [3,4].

Interestingly, for the connectedness measure there was also a main effect of the type of presence. Although not explicitly expected beforehand, in our opinion the main effect of the type of presence does not reduce the discriminant validity between social presence and connectedness. It merely suggests that even the short amount of time that the participant spent with the stranger/friend before and during the experiment, could have been enough to elicit an overall stronger sense of connectedness in the 'real presence' conditions than in the 'symbolic presence' conditions. The idea of 'being in the situation together' may have been enough to lift the 'real presence' conditions to a higher level of connectedness.

Our second research question examined the convergent validity of emotional presence and connectedness. The exploratory factor analysis on the scores of the Likert-items resulted in an initial factor solution with two factors (Perceptual/emotional presence and connectedness). This again supports Rettie's proposition that Social presence and connectedness are separate constructs. emotional presence however, was initially not identified as a separate factor, and the emotional presence items had lower loadings on the connectedness factor than on the Presence factor (while we expected emotional presence to be similar to connectedness). A forced three factor solution did part Emotional from social presence, but correlation results still indicate a stronger relationship between the factor scores of Social and emotional presence than between the factor scores of emotional presence and connectedness. However, we need to note here that the items measuring social presence and emotional presence were formulated practically identically (and as statements), while the connectedness items were formulated as questions. This difference in wording (similar statements versus questions) might have been a stronger cause of the connection between factors than the meaning of the factors.

As mentioned above, the correlation between the two concepts is high, but not as high as the respective reliability of the separate constructs (which would contribute to convergent validity [30]). If we look at the results from the ANOVA however, the similarity between the results for connectedness and emotional presence is striking: both measures support a main effect of both the partner and the type of presence. When we look at the pairwise comparisons of the four conditions there are small differences though (e.g. for the connectedness measure there is a marginally significant difference between the presence-stranger and the presence-friend condition, while for the emotional presence measure there is a marginally significant difference between the picture-stranger and the picture-friend condition). Taking all these remarks into account, in our opinion the results are inconclusive to decide upon the convergent validity of connectedness and emotional presence.

To support the idea that perceptual awareness is a crucial factor for the experience of social presence, we triangulated the questionnaire-measure of social presence with measurements of Zajonc's mere presence effect (RQ3). Only the difficult task generated a social inhibition effect (which supports the idea that the perceptual awareness of another person was stronger in the 'real presence' conditions than in the 'symbolic presence' conditions). Although this may come across as partial evidence, we wish to stress that - based on previous mere presence research on mediated presence - the lack of an effect in the 'easy' task might have been caused by a poor choice of task – e.g. Bond & Titus [29] assume "that simple tasks demand minimal attention" (p. 184). It is questionable whether our simple task required little attention, since the participants had to decide within the timeframe of merely one second whether the on-screen word existed or not. In future research, a pre-test of 'easy' and 'difficult' tasks is advisable. Also, the lexical decision task did not provide immediate on-screen feedback about the accuracy of each response to the participant and his/her partner. The fact that the accuracy of the given response was not clearly visible to the participant and his/her partner, may have may have caused a tendency in participants to first of all respond as fast as possible (as time is a highly visible measure of success), and to care less about the accuracy of responses.

Given the tradition and the merits of mere presence research, we believe that the application of Social facilitation theory to social presence research should receive further attention. It can be applied both as a means of triangulation of social presence measurements and as a research tool to, for example, measure the effects of technological presence. As (Social) Presence researchers are more and more interested in *why* presence occurs [31], the explanatory framework of social facilitation theory (see Guérin [6] or Paulus [32]) also offers interesting points of view, some similar (e.g. the focus on arousal and attention allocation) and some new to Presence research (e.g. evaluation apprehension). We have to note however, that social facilitation theory is especially concerned with passive audiences [32]. Therefore we expect social facilitation theory to contribute more to research about the generated experiences of social presence in (passive) awareness systems than in mediated presence in which both actors interact with each other.

Unfortunately our experiment did not include a control condition in which participants performed the task completely solitary (a no social presence condition). The lack of a control condition, increases the possibility that we falsely ascribe found differences to our manipulations. Especially what concerns the mere presence effect, a control condition could have clarified whether the lack of significant differences between the presence and the symbolic conditions is an actual research result or whether it more likely results from a poor choice of task. Future applications

of the social facilitation framework in social presence research should (a) consider a solid pre-test of tasks and/or (b) include a no-presence control condition.

As mentioned above, all items also severely violated the assumption of multivariate normality (necessary for goodness of fit tests). Both the social (perceptual) presence and the emotional presence factor score suffered from severe kurtosis of the distribution. In hindsight this is not completely surprising given the nature of our operationalization of these concepts in statements with a 7-point Likert-scale (with neutral middle category). When inspecting the distribution of the factor scores, it appears that either one is perceptually or emotionally alone, or one is not: there are no or few counts of the neutral category and peaks at both ends of the Likert-scale. The connectedness score, on the other hand, was severely skewed with a large peak at the negative end of the scale (most participants feeling not connected). For some participants connectedness might have been undermined by the instruction not to communicate with their friend or with the stranger. These violations unfortunately prevent any evidence from goodness of fit tests, or the use of a confirmatory factor analysis approach [33]. A research design that allows for this would contribute to a deeper understanding.

Finally, one of the most important remarks to be made in light of our experiment, concerns our definition of social presence as 'perceptual awareness of another person'. This definition of social presence is very similar to Short et al.'s definition of the 'salience of another person'. The definition of social presence has been altered somewhat throughout the history of social presence research. Both Lombard and Ditton [16], and Harms and Biocca's definition [34] for example, include the concept 'mediation'. In the 'real presence' conditions of this experiment however, the partner's presence was not 'mediated' but real. If we follow a strict definition of social presence, we should ask ourselves if a social presence measure is appropriate in the first place. A replication study with e.g. video-based presence instead of actual presence might answer our research questions equally well, without violating this assumption of a more strict social presence definition.

Seond, it should be noted that recent social presence research has broadened the concept of social presence to a concept with multiple dimensions, of which 'perceptual awareness' is only one (e.g. [2]; [34]). Perceptual awareness of another person comes closest to the social presence dimension of 'co-presence', which can be understood as "the salience and accessibility of the other" [2, p. 462]. Biocca et al. however, see two other dimensions of social presence as well: psychological involvement and behavioural engagement.

Harms and Biocca [34] operationalize these three large categories into six validated subdimensions of social presence. Besides co-presence ("the degree to which the observer believes he/she is not alone and secluded" (p. 2)) five other dimensions of social presence are distinguished: attentional allocation, perceived message understanding, perceived affective understanding, perceived affective interdependence and perceived behavioural interdependence. With regard to our research, two remarks should be made here. First of all, in each of Harms and Biocca's social presence dimensions there is a focus on the symmetry of the relationship (stressing the importance of the other interactant's perceptions, emotions and behaviour). In the case of, for example, awareness systems (or our 'symbolic presence' conditions), the aspect of symmetry is difficult, if not impossible to acquire. Second, it is interesting to note that the first two dimensions (co-presence and attentional allocation) fit Biocca et al.'s [2] description of social presence as a 'transient psychological state', while the other subdimensions distinguished refer to aspects of the interpersonal communication between participants. Our experiment has treated both social presence and connectedness as 'states'. If social presence concerns aspects of interpersonal communication as well, we should ask ourselves how the subdimensions distinguished relate to each other, and how connectedness is related to the interpersonal communication dimensions of social presence.

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