

Testing the Social Presence Aspect of the Multimodal Presence Scale in a Virtual Reality Game

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Introduction

- **Presence** is a **key variable of VR**, often generalized as „sense of being there“ [1], but a more differentiated perspective necessary: **physical, social and self presence** [2].
 - Makranksy, Lilleholt & Aaby [3] developed Multimodal Presence Scale (MPS): 15 items based on [2].
 - Goal: **Examine context validity of MPS, social presence aspect as focus.**
 - Modified **presence questionnaire** by Witmer and Singer **to examine congruent validity** [5, 6].
- Q1: Is the MPS sensitive enough to detect changes in social presence** that should occur due to different degrees of realism in social interaction?
- Q2: Is the MPS specific enough to indicate only changes in social presence** and not physical or self-presence in conditions with different degrees of realism in social interaction?
- Q3: Does the MPS still correlate strongly with general measure of presence**, i.e. do they measure the same construct?

Multimodal Presence Scale

- **Developed by Makranksy, Lilleholt & Aaby [3], based on a theoretical framework by Lee [2].**
- Consists of 15 items, five each assessing physical, social and self-presence.
- **Available in English, Danish, and German.**
- Need to test sensitivity to various experimental conditions.

German MPS as PDF
At Researchgate

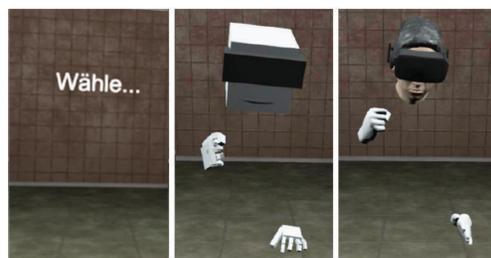


Method

- We conducted an experiment using a **VR simulation of a rock-paper-scissors game against a virtual opponents to assess changes in social presence.**
- From textual representation, to low polygon representation (366 polygons) to a high polygon representation (5420 polygons).
- **45 participants** (15 male, 30 female; age: $M = 23.49$, $SD = 4.18$, majority ($n = 28$) students of psychology)
- Game was rigged for consistent playing experiences (players won 4 times in the first round and 6 times in the following rounds).
- Largely no prior VR experience.
- Conditions differ in realism to influence social presence.



The virtual opponent (HighPoly condition) and the user avatar's hand



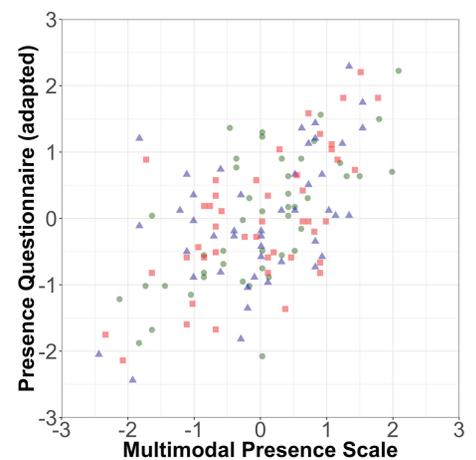
Text only LowPoly HighPoly

Assessing Social Presence

Die folgenden Aussagen beziehen sich auf Ihre Eindrücke in der virtuellen Umgebung. Wie haben Sie die virtuelle Umgebung erlebt?		Stimme nicht zu	Stimme eher nicht zu	neutral	Stimme eher zu	Stimme zu
Social Presence						
6	Ich habe mich in der virtuellen Umgebung gefühlt, als wäre ich in der Gegenwart einer anderen Person.	<input type="checkbox"/>				
7	Ich hatte das Gefühl, dass sich die Menschen in der virtuellen Umgebung meiner Anwesenheit bewusst waren.	<input type="checkbox"/>				
8	Die Menschen in der virtuellen Umgebung wirkten auf mich wie fühlende Wesen (mit Bewusstsein, lebendig).	<input type="checkbox"/>				
9	Während der Simulation gab es Momente, in denen das Computerinterface zu verschwinden schien, und ich das Gefühl hatte, direkt mit einer anderen Person zu arbeiten.	<input type="checkbox"/>				
10	Ich hatte das Gefühl mit anderen Personen in der virtuellen Umgebung zu interagieren statt mit einer Computer-Simulation.	<input type="checkbox"/>				

Results

- Preliminary results already published in [4].
- **Physical presence:** Post-hoc tests (Bonferroni corrected) show **significant differences between condition Text and LowPoly** ($p = .04$), and **Text and HighPoly** ($p < .001$), but not between 2 and 3 ($p = .54$).
- **Social presence:** Post-hoc tests show **significant effects between all conditions** (Text and LowPoly: $p = .002$, Text and HighPoly: $p < .001$, LowPoly and HighPoly: $p = .004$).
- **Self-presence: no significant effect** between the conditions were found.
- **Total scale:** Post-hoc tests show **significant differences between condition Text and LowPoly** ($p = .001$) and **Text and HighPoly** ($p < .001$), but not between LowPoly and HighPoly ($p = .09$).
- **Witmer and Singer questionnaire:** post-hoc tests show **significant differences between condition Text and HighPoly** ($p = .007$), but not between Text and LowPoly ($p = .36$) or LowPoly and HighPoly ($p = .42$).
- **Correlation between questionnaires:** **Strong positive correlations were found for all three conditions** (cond 1: $r = .69$, $p < .001$; cond 2: $r = .51$, $p < .001$; cond 3: $r = .62$; $p < .001$).



z-standardized values for MPS and PQ in conditions (abstraction levels) Text (green circle), LowPoly (blue triangle) and HighPoly (red square)

Conclusion and Discussion

- **Q1: Differences regarding social presence were found as expected. Subscale was sensitive enough** to detect differences among the conditions.
- **Q2: The virtual representation of the player was always the same. Thus, no differences in self-presence were found.** Differences were found for physical presence - **condition Text impedes physical presence.**
- **Q3: Positive correlation of Witmer and Singer questionnaire and MPS, both measure a similar overall construct. The strength of MPS is its sensitivity and specificity.**
- With 5 items for social presence and 15 items in total, the **MPS is highly economical for use in VR research.**
- **Article examines social presence only.** The other two aspects of presence should be examined as well.

References

- [1] Carrie Heeter. 1992. Being There: The Subjective Experience of Presence. *Presence: Teleoperators and Virtual Environments* 1, 2 (1992), 262–271. <https://doi.org/10.1162/pres.1992.1.2.262>
- [2] Kwan Min Lee. 2004. Presence, Explicated. *Communication Theory* 14, 1 (2004), 27–50. <https://doi.org/10.1111/j.1468-2885.2004.tb00302.x>
- [3] Guido Makranksy, Lau Lilleholt, and Anders Aaby. 2017. Development and validation of the Multimodal Presence Scale for virtual reality environments: A confirmatory factor analysis and item response theory approach. *Computers in Human Behavior* 72 (2017), 276–285. <https://doi.org/10.1016/j.chb.2017.02.066>
- [4] Torben Volkmann, Daniel Wessel, Nicole Jochems, and Thomas Franke. 2018. German Translation of the Multimodal Presence Scale. In *Mensch und Computer 2018 - Tagungsband*, Raimund Dachselt and Gerhard Weber (Eds.), Gesellschaft für Informatik e.V., Bonn.
- [5] Lennard Willer. 2017. *Verbesserung der Präsenz und Immersion einer VR-Trainingsimulation für Rettungskräfte*. Bachelor Thesis, University of Lübeck, Lübeck.
- [6] Bob G. Witmer and Michael J. Singer. 1998. Measuring Presence in Virtual Environments: A Presence Questionnaire. *Presence: Teleoperators and Virtual Environments* 7, 3 (1998), 225–240.

Authors at the Conference



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