



Aalto University
School of Science

CS-E5250 Data-Driven Concept Design

5 ECTS

Quantitative Data Analysis
Assignment 2

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Background: Recently, 16 users took part in an exploratory study on collaboration in virtual reality. The aim of the study was to investigate different methods of communication between users in an *asymmetric* setup, where one user is immersed in virtual reality and the other remains in the real world. The primary focus was on how to preserve the immersed user's sense of presence during the interaction.

After each of the five PUZZLEs, the users filled a three-question questionnaire about their subjective experiences.

Assignment 2: Quantitative Data Analysis

Your task: Using real data from the in-session questionnaires, perform a quantitative analysis on how the users experienced the various methods of communication (conduits).

Pay attention to the overall appearance of the data to spot biases, and analyse relations and correlations between different variables and their distributions.

The experiment: overview

Pre-session setup (10 min)

Virtual reality cabin (30-40 min)

- Puzzles
- Conduits (communication methods)
- Questionnaires

Post-session interview

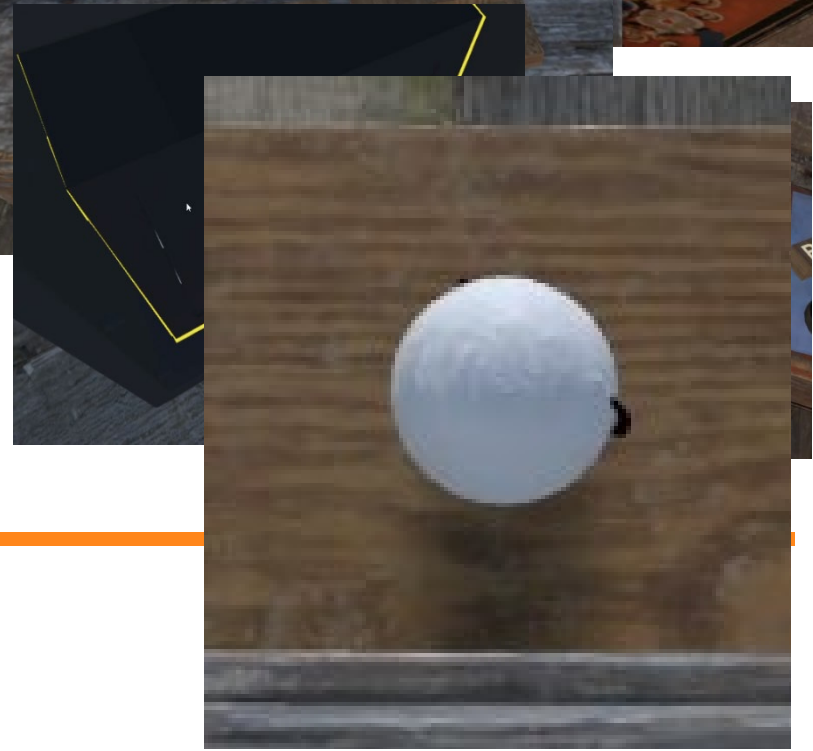
Experiment (statistical) setup

Asymmetric VR sense of presence study (N=16) as a within subjects repeated measurement experiment with five randomized and balanced conditions*. After each condition participants filled a three-question questionnaire. Background data includes participants' gender and prior experience with VR.

*The analysis does not need to consider the order of the conditions.

The experiment: puzzles

- Shapes puzzle
- Letters puzzle
- Red number box puzzle
- Blue number box puzzle
- Snowball puzzle

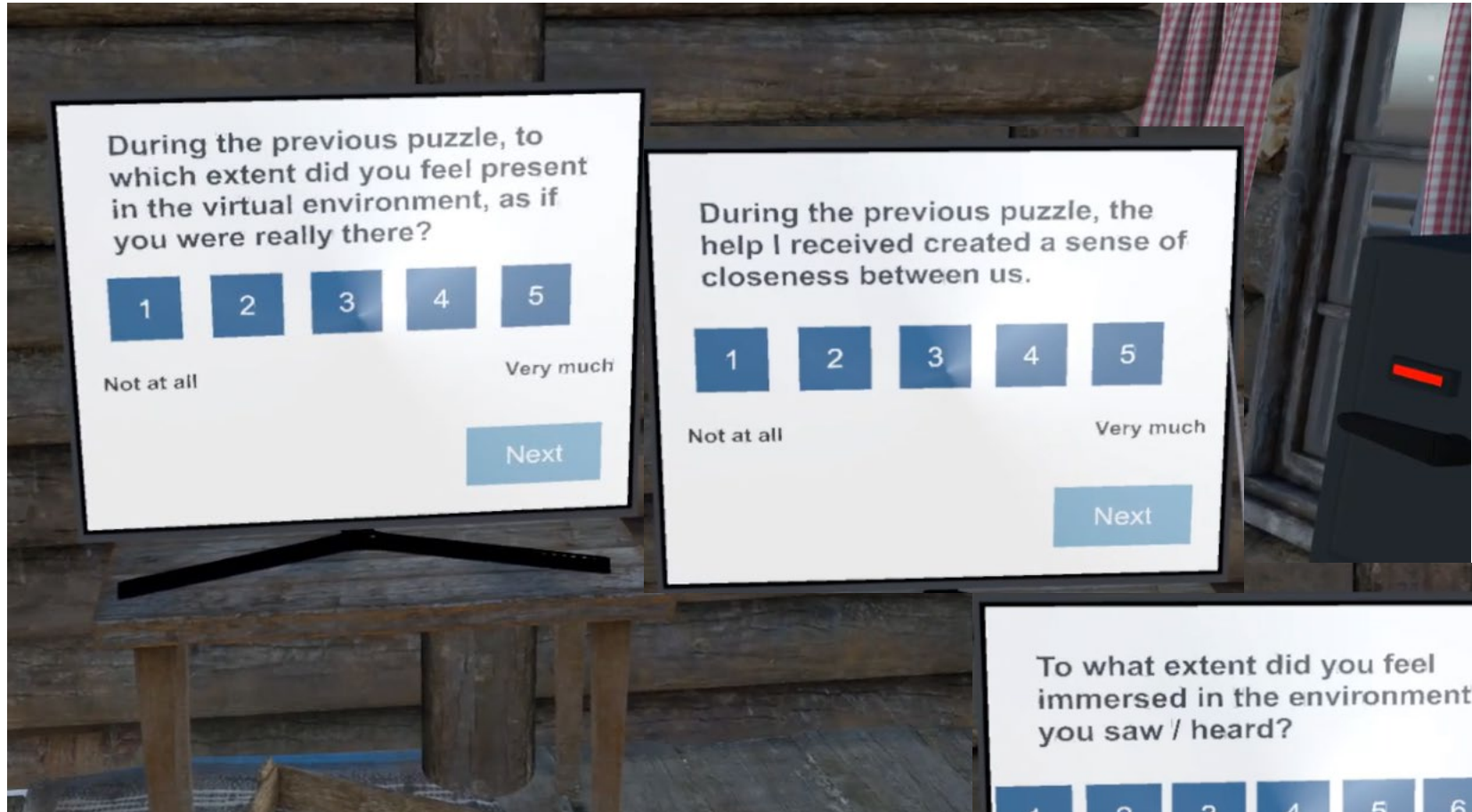


The experiment: conduits (communication methods)

- Disembodied voice
- Yelling
- Walkie talkie
- Video call
- Outlines
- Sunlight



The experiment: questionnaires



Experiment data

CS-E5250DDCD_anon_Cabin_data.xlsx

Participant	Puzzle	Conduit	Q1	Q2	Q3			During the previous puzzle...			
P1	Shapes	Voice	4	3	7		Q1	"To which extent did you feel present in the virtual environment, as if you were really there?" 1-5			
P1	Blue numbers	Yelling	5	3	6		Q2	"The help I received created a sense of closeness between us." 1-5			
P1	Letters	Walkie talkie	5	4	7		Q3	"To what extent did you feel immersed in the environment you saw / heard?" 1-7			
P1	Red numbers	Video Call	5	5	7						
P1	Snowball	Outlines	5	5	7		Participant	Gender	Experience with VR (1=No experience, 2=Some, 3=Lots)		
P2	Blue numbers	Voice	4	4	6		P1	F	2		
P2	Shapes	Outlines	5	4	6		P2	F	2		
P2	Red numbers	Video Call	4	4	5		P3	M	3		
P2	Letters	Walkie talkie	3	4	4		P4	M	2		
P2	Snowball	Yelling	4	3	6		P5	F	1		
P3	Letters	Voice	4	5	7		P6	F	1		
P3	Blue numbers	Outlines	4	4	7		P7	M	1		
P3	Snowball	Yelling	4	5	7		P8	M	2		
P3	Red numbers	Video Call	3	4	6		P9	M	2		
P3	Shapes	Walkie talkie	4	3	7		P10	M	2		
P4	Letters	Voice	4	-	6		P11	M	2		
P4	Blue numbers	Yelling	4	3	6		P12	F	1		
P4	Snowball	Walkie talkie	4	4	4		P13	M	3		
P4	Red numbers	Video Call	4	5	4		P14	M	2		
P4	Shapes	Outlines	4	3	6		P15	F	2		
P5	Shapes	Voice	5	4	6		P16	F	3		
P5	Blue numbers	Outlines	5	5	6						
P5	Snowball	Video Call	5	5	7						
P5	Letters	Sun	5	3	6						
P5	Red numbers	Yelling	5	5	6						
P6	Shapes	Voice	4	2	5						

The experiment: in-session questionnaires

- 16 participants (7 females, 9 males)
- Three questions:
 - "To which extent did you feel present in the virtual environment, as if you were really there?" (1-5) *
 - "The help I received created a sense of closeness between us." (1-5) **
 - "To what extent did you feel immersed in the environment you saw / heard?" (1-7) ***

* Bouchard, S., Robillard, G., St-Jacques, J., Dumoulin, S., Patry, M. J., and Renaud, P. (2004). "Reliability and validity of a single-item measure of presence in VR," in Proceedings Second International Conference on Creating, Connecting and Collaborating through Computing, (Ottawa, ON: IEEE), 59–61. doi: 10.1109/HAVE.2004.1391882

** Nowak, K. & Biocca, F. (2003). The Effect of the Agency and Anthropomorphism on Users' Sense of Telepresence, Copresence, and Social Presence in Virtual Environments. *Presence Teleoperators & Virtual Environments*. 12. 481-494. 10.1162/105474603322761289.

*** Lombard, M. & Bolmarcich, T. & Weinstein, L. (2009). *Measuring Presence: The Temple Presence Inventory*.

Assignment 2

This is an individual assignment

Deliverable due in two weeks, Monday 1.2.2021

- Provide answers to the proposed questions and create your own hypotheses
- Return your SPSS Statistics .sav file, and all SPSS syntax & outputs (as a pdf)

Detailed instructions available on MyCourses. **Please read before starting.**

Assignment 2, problems to solve

Install SPSS, and create a data set in data editor.

1. What to do with the missing data, and why?
2. Which conduit created highest sense of closeness to the participants?
3. Which variables had highest and lowest standard deviation, and what does it mean?
4. Create a graph to illustrate the participants' Q3 responses, what can you see in there?
5. Is the dataset gendered? Does participant's gender correlate with any other variables, and what does it mean?
6. Is sense of immersion stronger for people with more experience in VR? Use Q3 results for this.
- 7.-8. Define two meaningful hypotheses about the experiment and prove them using appropriate inferential test. For each:
 - formulate a hypothesis to test, outlining why this aspect is important (why to test, what does it mean)
 - justify the use of chosen test and provide SPSS syntax and output