

Capturing quantitative user feedback using virtual questionnaires in virtual reality

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goal & purpose



- collection of user feedback in virtual reality (VR) offers several advantages

- preservation of presence
- avoidance of media breaks
- additional digitalization not needed

▶ unwanted influences on the results of questionnaire instruments are prevented

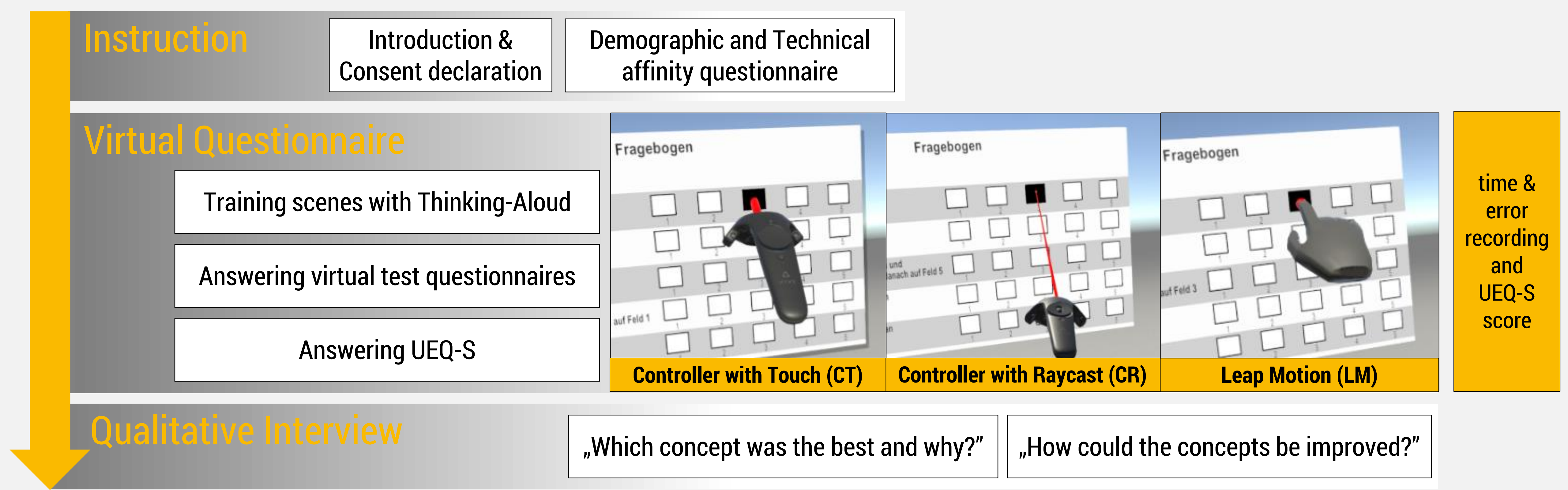


- design of virtual questionnaires and corresponding interaction concepts for VR represents a new field of research
 - empirical user study that examines which interaction concepts are suitable for answering questionnaires in VR
 - examined input modalities are handheld controller and gesture control



- comparison of different interaction concepts with regard to usability
 - effectiveness, efficiency, satisfaction are carried out using objective and subjective parameters

study design



outcomes

Figure 1 Time comparison *M* and *SD* (n = 21)

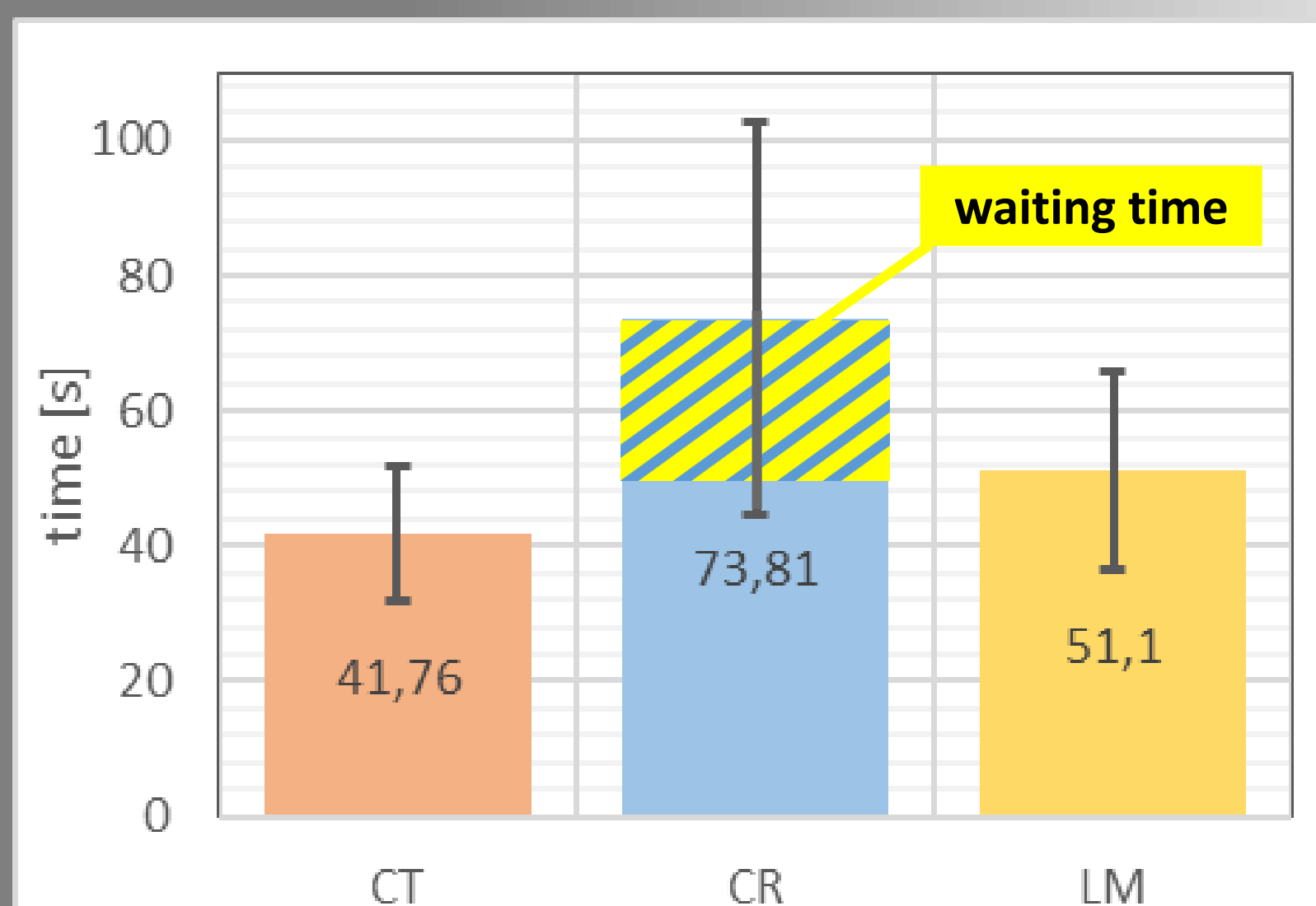


Table 1 error comparison (n = 21)

error	<i>M</i>	<i>SD</i>
CT	1.48	2.21
CR	1.10	1.00
LM	1.86	2.58

Table 2 pragmatic quality comparison (n = 21)

pragmatic quality	<i>M</i>	<i>SD</i>
CT	1.71	1.21
CR	0.67	1.31
LM	0.89	1.56

Table 3 hedonistic quality comparison (n = 21)

hedonistic quality	<i>M</i>	<i>SD</i>
CT	1.39	1.11
CR	1.48	1.01
LM	1.63	0.86

- CT is fastest interaction modality
- CR is slower, but there is also a waiting time of 1 second until click confirmation instead of a keystroke
- total time of CT without waiting time is 48.81s (7.05s slower than CT)
- total time of LM is slower (6.15s) than CT and CR
- most errors were made with LM according to Caggianese et al. (2019) & Gusai et al. (2017)
- CR is the most accurate
- no correlation between technical affinity and time or error comparison has been found

Favourite interaction concept:

Controller-Touch (CT) (57%)

- speed and distance to the questionnaire
- fast error correction

Leap Motion (LM) (33%)

- no additional hardware in the hands
- interesting, exciting, new

Controller-Raycast (CR) (9%)

- high precision & intuitiveness
- pleasant distance and good clarity

discussion & outlook

- selection of input modalities and interaction design have an influence on usability and user rating
- CT is the most efficient and CR the most accurate
- users prefer CT, which goes along with pragmatic evaluation
- hedonic quality plays a subordinate role in the user evaluation
- interaction designs were limited and should be expanded
- visual and tactile feedback may also be relevant
- comparison should be made between traditional and virtual approaches in order to verify the impact of the concept

knowledge sharing

- Caggianese, G., Gallo, L., & Neroni, P. (2018). The Vive controllers vs. Leap motion for interactions in virtual environments: A comparative evaluation. In International Conference on Intelligent Interactive Multimedia Systems and Services, pp. 24-33, Springer, Cham.
- Gusai, E., Bassano, C., Solari, F., & Chessa, M. (2017). Interaction in an immersive collaborative virtual reality environment: a comparison between leap motion and HTC controllers. In International Conference on Image Analysis and Processing (pp. 290-300). Springer, Cham.
- Schrepp, M., Hinderks, A., Thomaschewski, J. (2017). Design and Evaluation of a Short Version of the User Experience Questionnaire (UEQ-S). In IJIMAI 4 (6), pp. 103-108.

