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Natural Interaction in Virtual Reality: Impact on the Cognitive Load

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01 Introduction

Controller constraints¹

- Hold it in a certain manner
- Have it available
- Learn the button to action mapping



Natural interaction

Natural User Interface² → cognitive load

02 Related Work

Hand gestures



Problem: Cognitive load not evaluated

03 Objective

Design more natural interactions in virtual reality:

- 1 Compare **gestural interaction** to traditional **controllers**
- 2 Evaluate their respective impact on the **cognitive load**

04 Experimental Evaluation

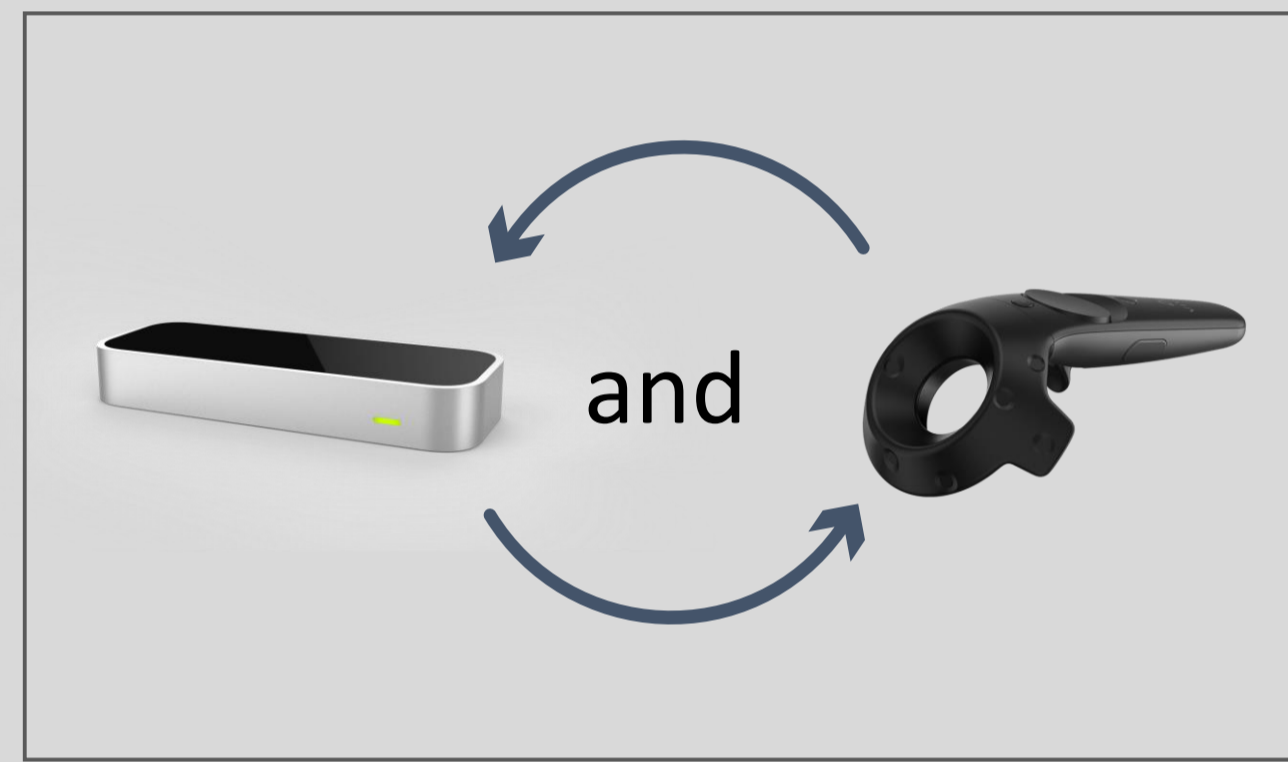
Participants: 11 experimented users / 8 novice users

Experimental task



Replace 9 cubes in the right position and orientation

Randomized trial

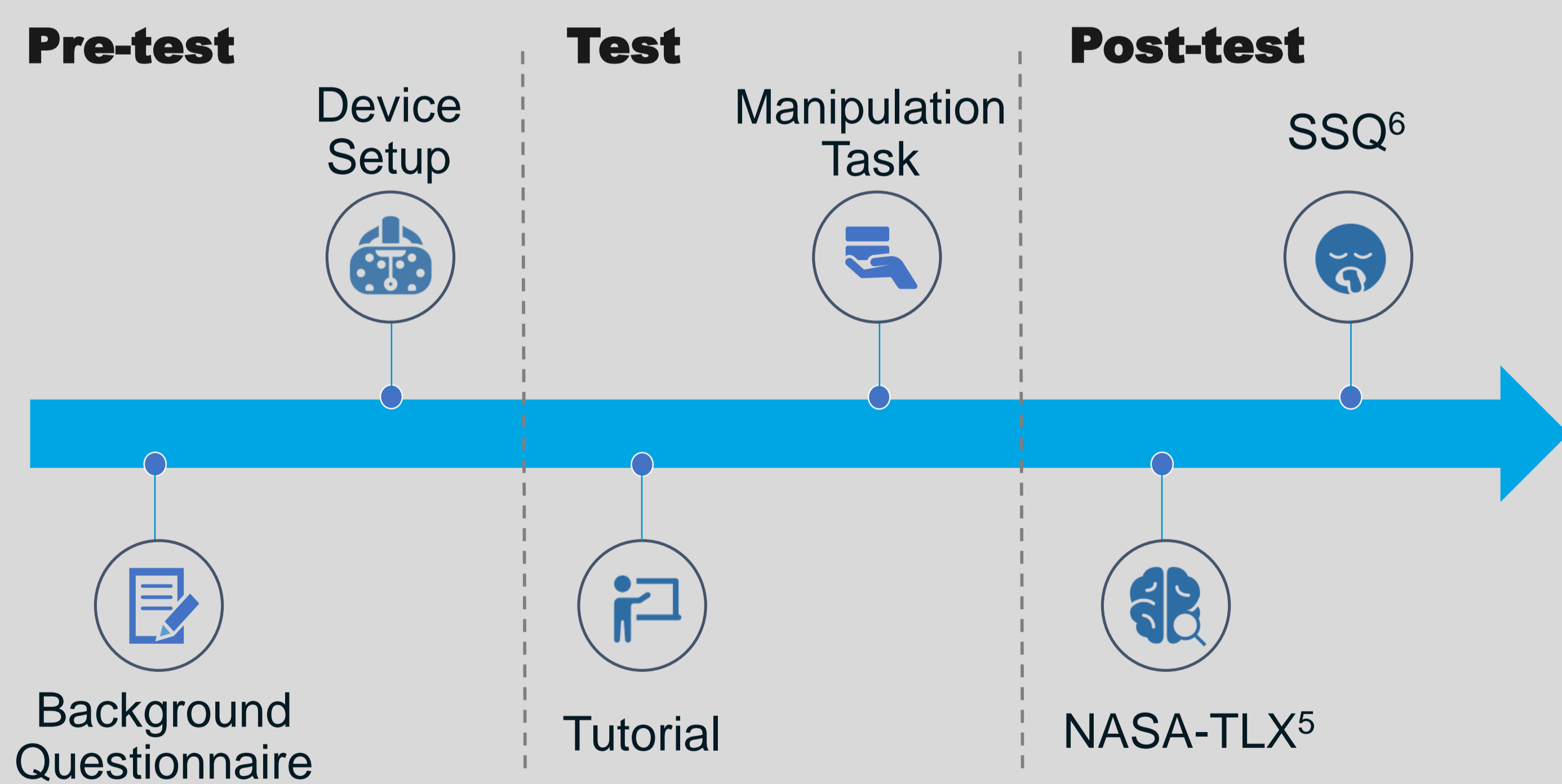


Leap Motion® and controllers

Measures

Objective: performance	Subjective: cognitive load (NASA-TLX ⁵)	
Execution time (seconds)	Mental demand	Performance
Number of user's errors	Physical demand	Effort
Number of detection errors	Temporal demand	Frustration

Procedure



05 Preliminary Results

NASA-TLX Results (Leap Motion® vs. controllers)

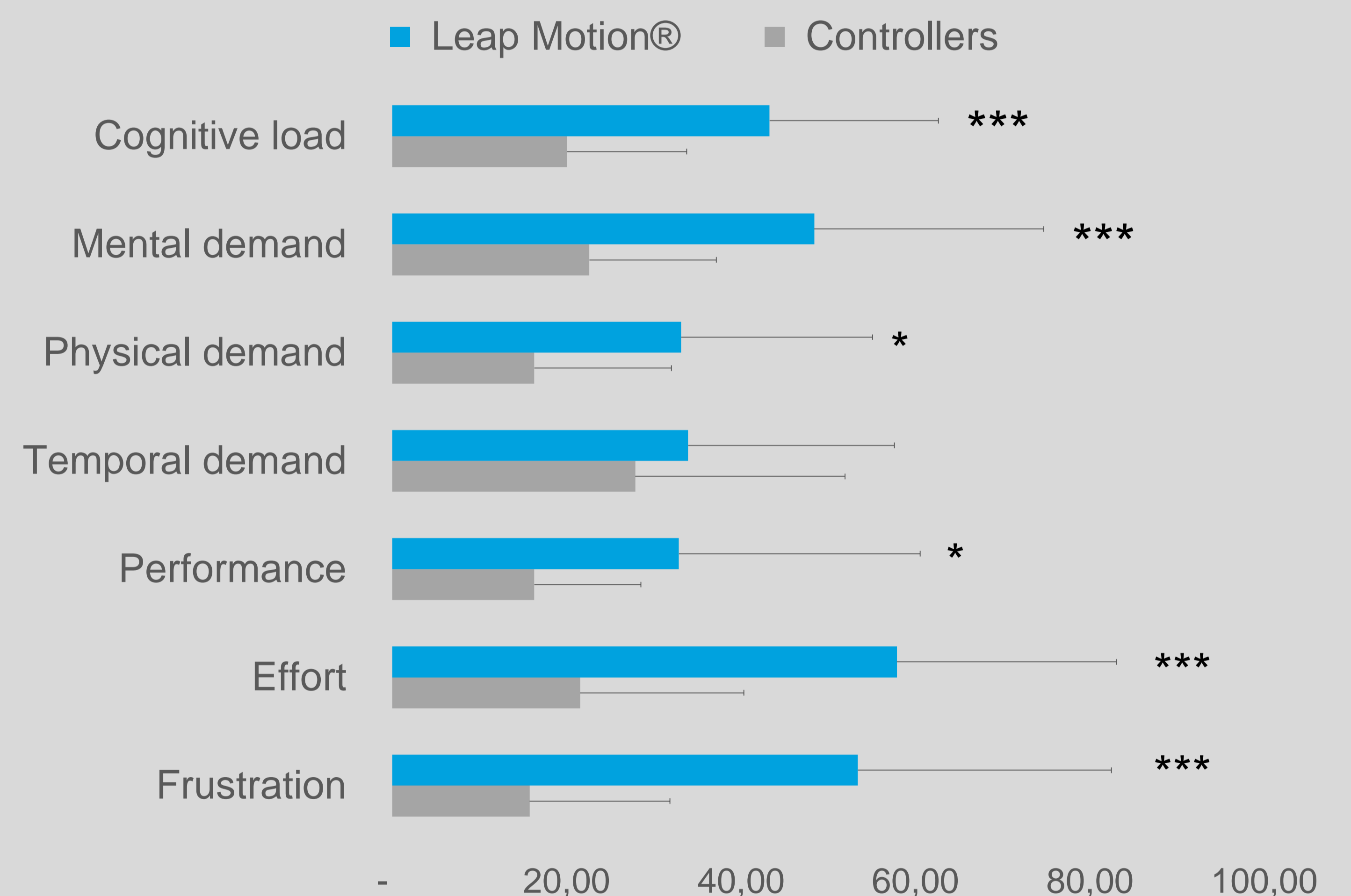


Figure 1: Cognitive load results obtained with NASA-TLX for Leap Motion® and controller groups, for both novice and expert participants

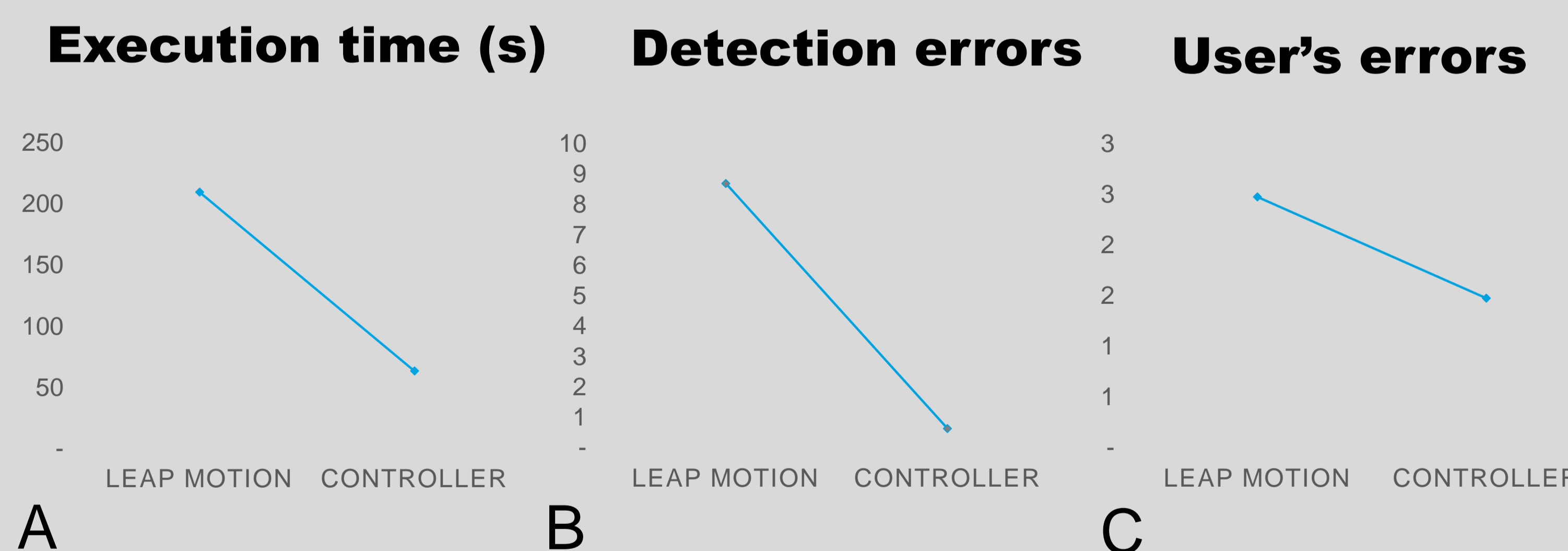


Figure 2: Performance results for Leap Motion® and controller groups, for both novice and expert participants: A) execution time, B) detection errors, C) user's errors

05 Discussion and conclusion

Limitations

- Reliability of Leap Motion®
- No continuous hand tracking
- No haptic feedback⁷

Perspectives

- Haptic gloves
- Other hand tracking sensors
- Other cognitive load measures⁸ (eye-tracking...)

06 References

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