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Boston
Massachusetts
June 18–June 21

Welcome

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Virtual Reality Rehabilitation for Patients with Shoulder Disorders

Umile Giuseppe Longo

Arianna Carnevale

Vincenzo Candela

Carlo Casciaro

Giuseppe Salvatore

Alessandra Berton

Emiliano Schena

Marco Carli

Vincenzo Denaro





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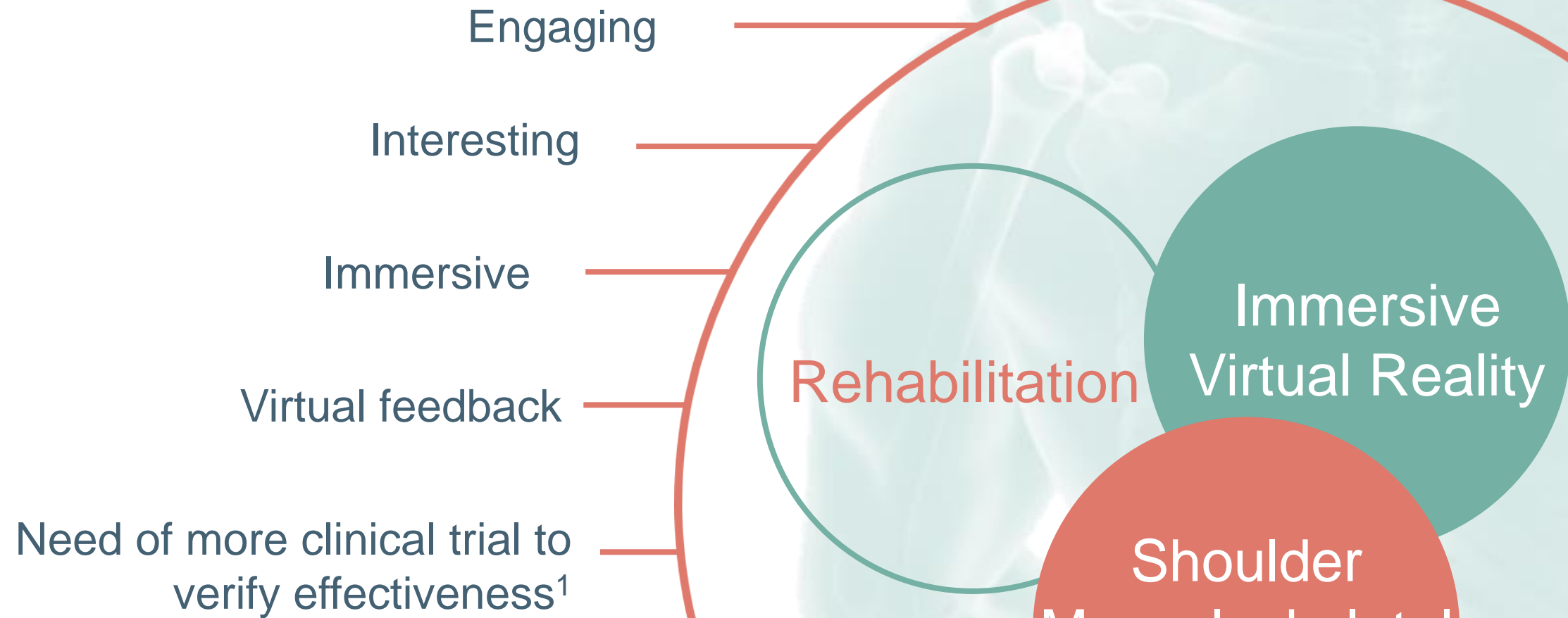
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Disclosures

Nothing to disclose



Background



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Aims

Performance evaluation of OQ2 in terms of translational and rotational accuracy

Evaluation of the usability and acceptability of a custom immersive virtual reality (iVR) shoulder rehabilitation program



**Oculus Quest 2
(OQ2)**



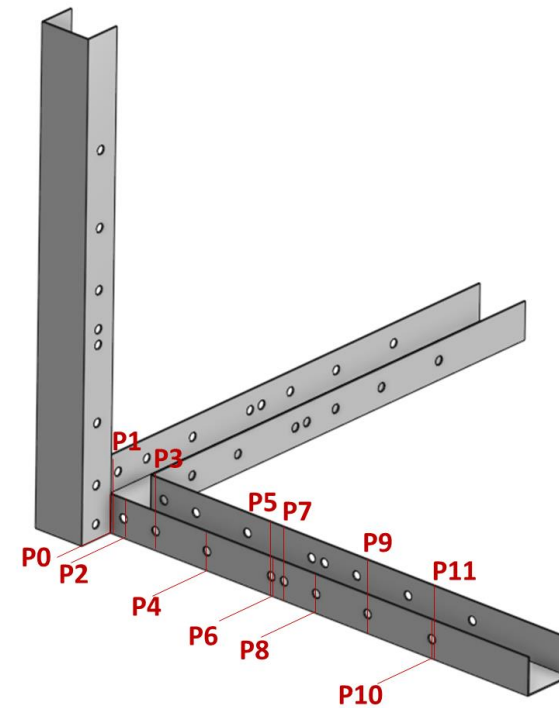
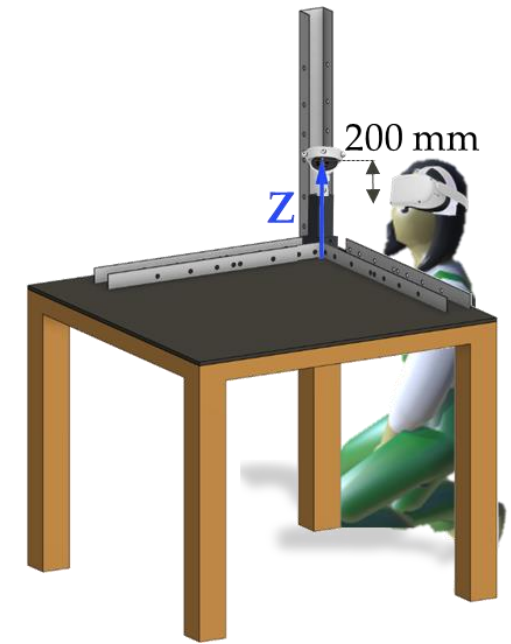
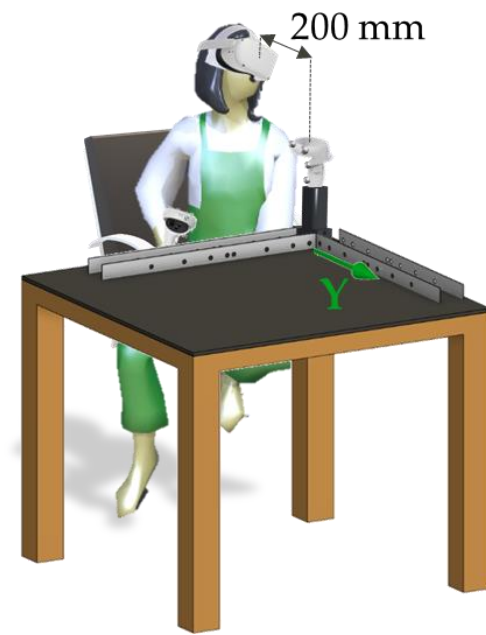
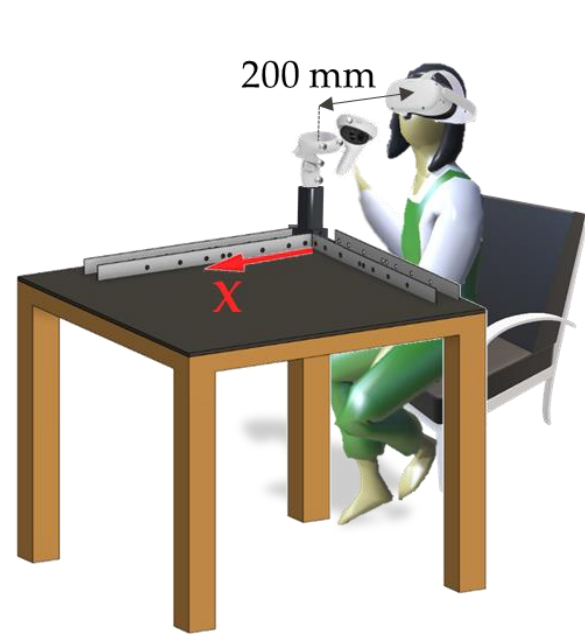
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Methods

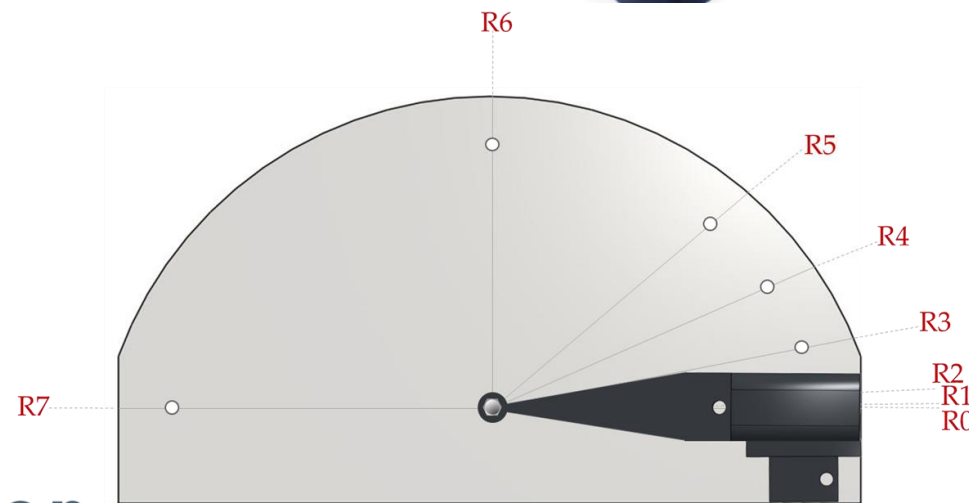
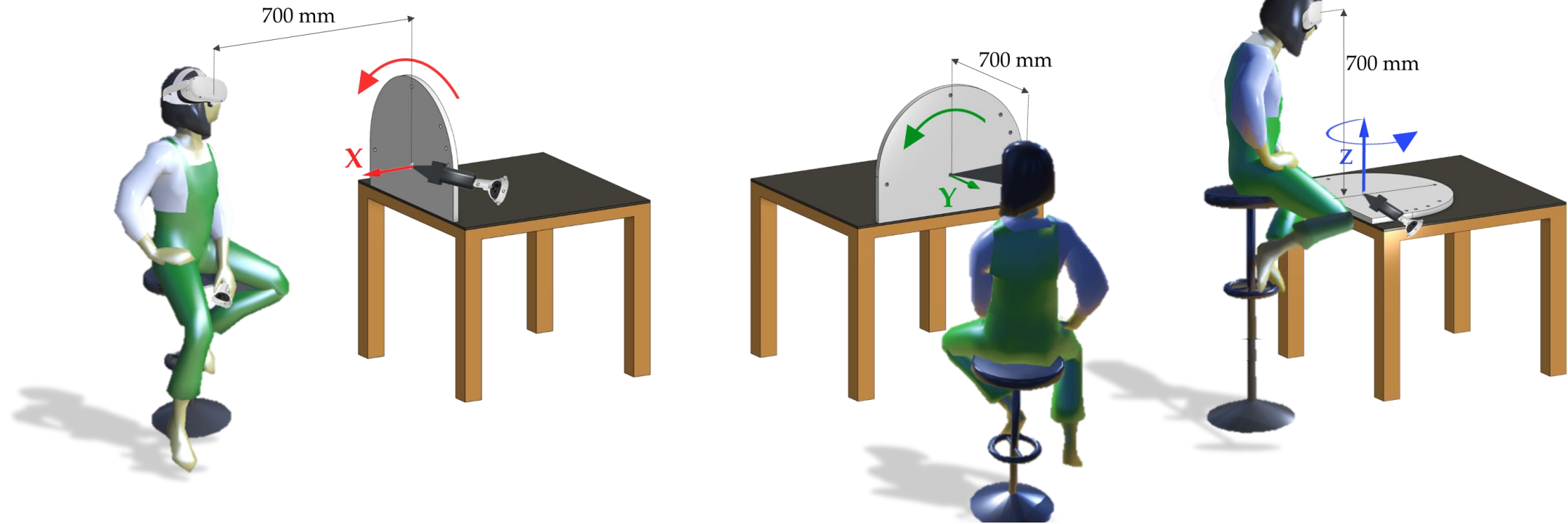
Translational Accuracy²



	Translational displacement [mm]	ΔP [mm]
P0	0	0
P1	5	5
P2	20	15
P3	70	50
P4	150	80
P5	250	100
P6	255	5
P7	270	15
P8	320	50
P9	400	80
P10	500	100
P11	505	5

Methods

Rotational Accuracy²



	Rotational displacement [°]	ΔR [°]
R0	0	0
R1	1	1
R2	3	2
R3	10	7
R4	20	10
R5	40	20
R6	90	50
R7	180	90



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Methods

Usability and Acceptability questionnaires

Acceptability questionnaire

7-point Likert scale³

- Q1. I found OQ2 easy to wear
- Q2. I felt very confident in OQ2
- Q3. I felt very safe in OQ2
- Q4. OQ2 was easy to control
- Q5. I found OQ2 comfortable
- Q6. I enjoyed my experience in OQ2
- Q7. I would like to use OQ2 on a weekly basis
- Q8. I would recommend OQ2 to a colleague
- Q9. I felt a sense of wellness after using OQ2 (mentally or physically)
- Q10. OQ2 exceeded my expectations
- Q11. The size of OQ2 did not bother me
- Q12. I can see the benefits of using OQ2 regularly
- Q13. I would like to see OQ2 more accessible to those who need it

Usability questionnaire

5-point Likert scale⁴

Utility

- Q1. Are sessions with video games more entertaining?
- Q2. Have the games been interesting to you?
- Q3. Do the games meet a real need?
- Q4. Would you continue use the games if you could?
- Q5. Would you use the games at home?

Playability

- Q6. Have the games been intuitive to play and easy to understand?
- Q7. Do you think the patient can be able to play without therapist's support?
- Q8. In case you have been helped, has the support been important?
- Q9. Has the graphic design of the games been adequate?
- Q10. Are the element used in therapy sessions adequate?

Use mode

- Q11. Have you been able to perform all the games successfully?
- Q12. Have single-handed exercises been simple to perform?
- Q13. Have the exercises with both hands been simple to perform?
- Q14. Have the games taken little effort from you?
- Q15. In general, the difficulty level of the game is adequate?



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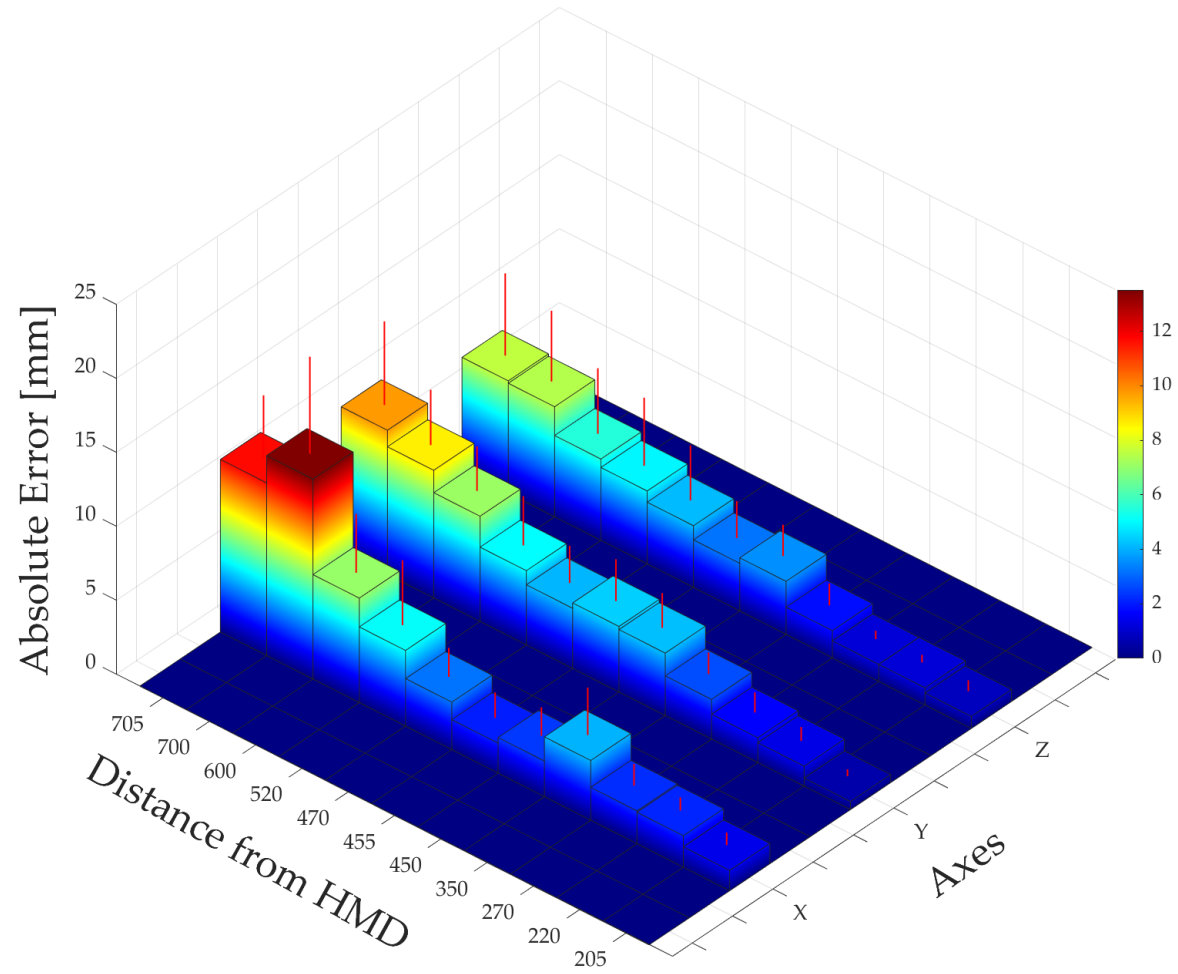


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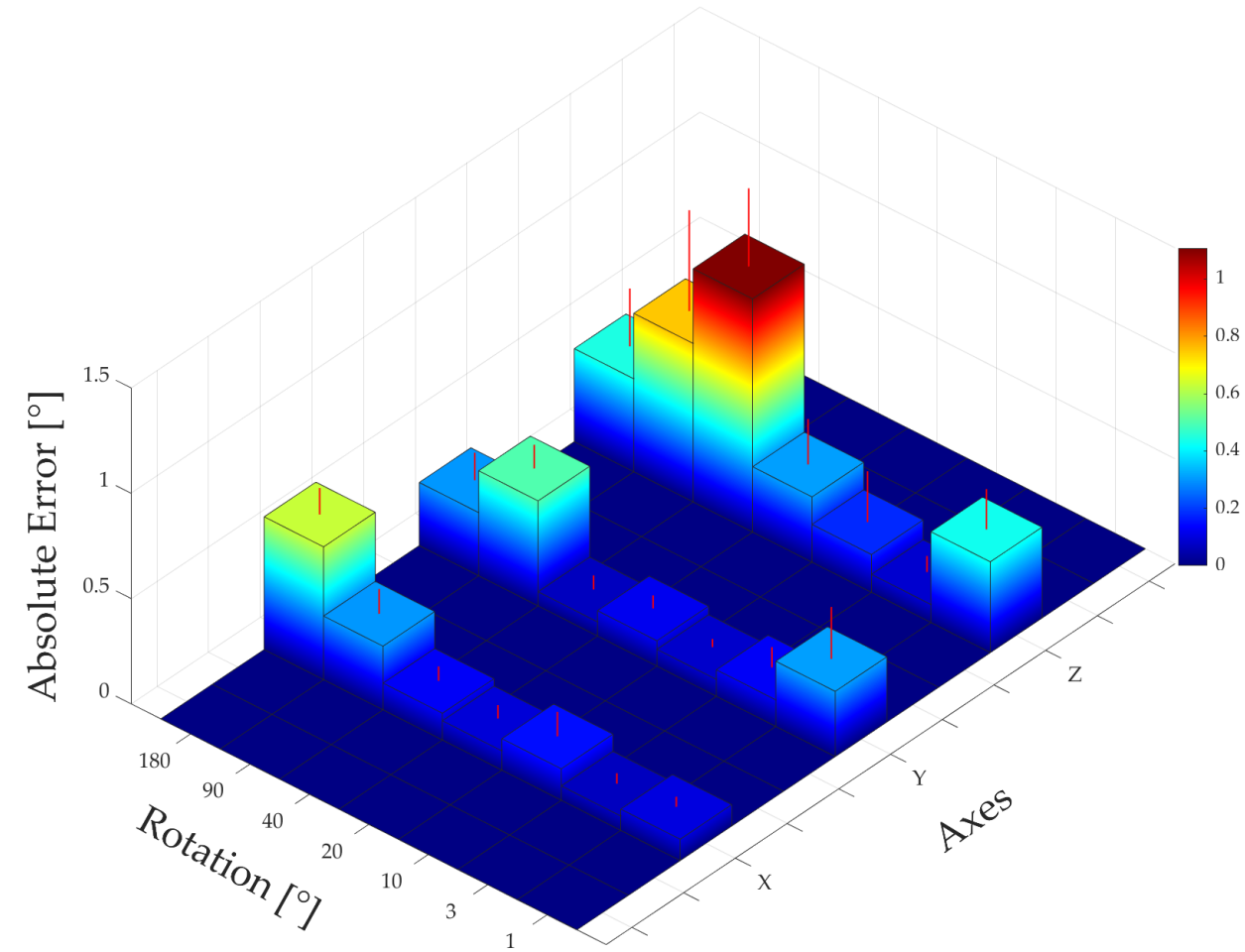
Results

Translational and Rotational Accuracy²

Translational displacements - Absolute error



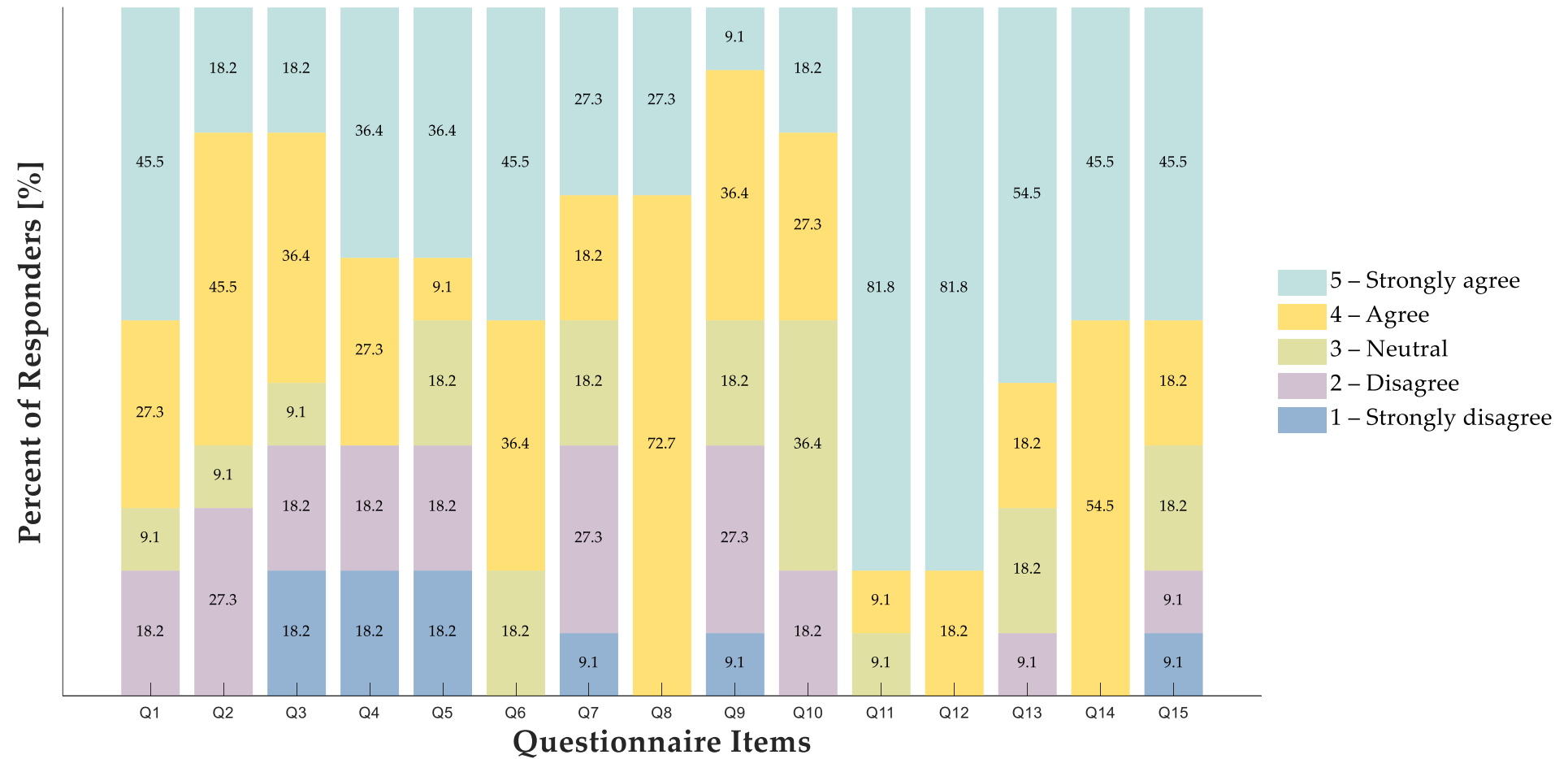
Rotational displacements - Absolute error



Results

Usability questionnaire

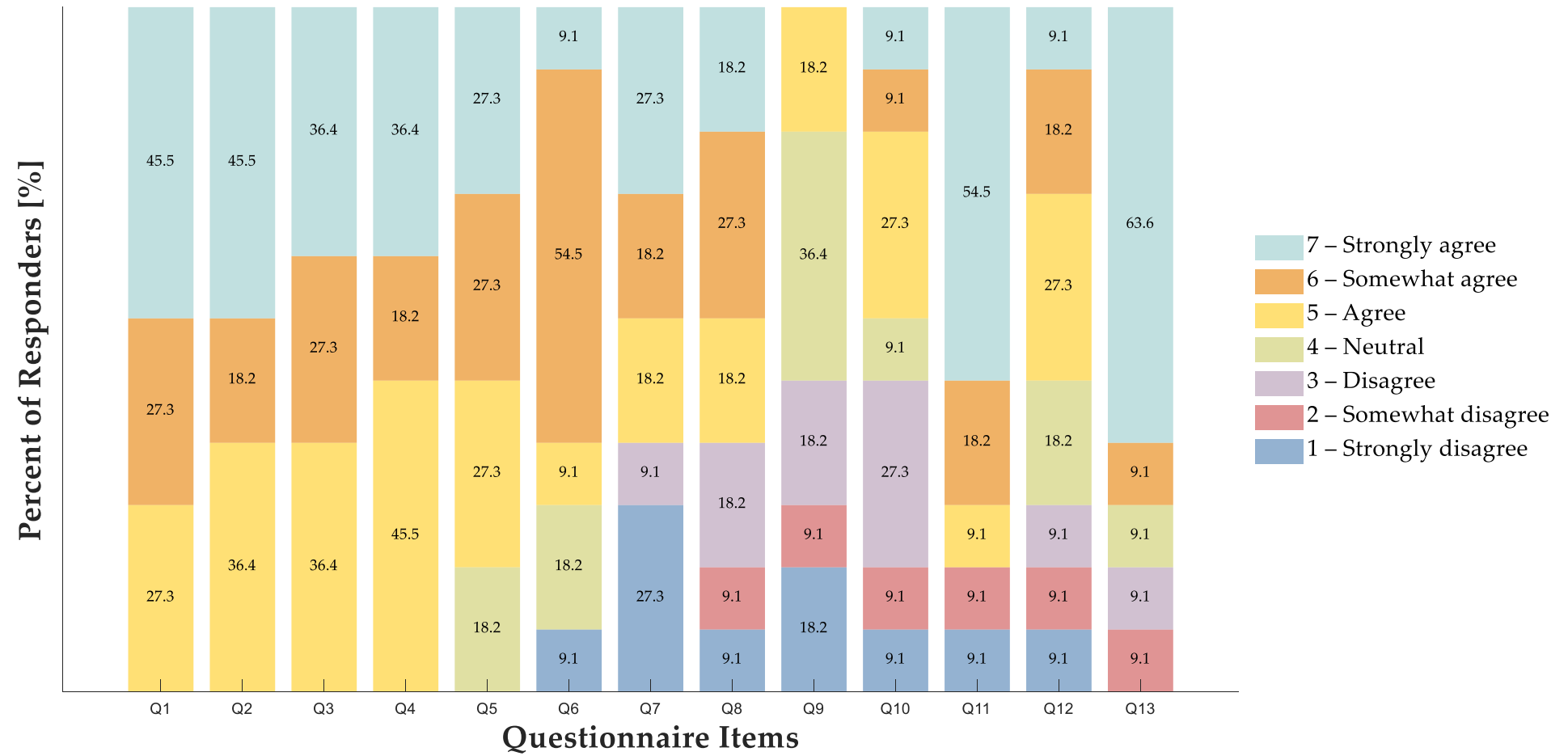
Physiotherapist Ratings on the Usability Questionnaire (n = 11)



Results

Acceptability questionnaires

Physiotherapist Ratings on the Acceptability Questionnaire (n = 11)



Discussion

- ▶ The results showed a mean absolute error of 13.52 ± 6.57 mm at 500 mm from the head-mounted display along the x-direction.
- ▶ The maximum mean absolute error for rotational displacements was found to be $1.11 \pm 0.37^\circ$ for a rotation of 40° around the z-axis.
- ▶ Most physiotherapists (73%) found the immersive VR application entertaining, although only 45% said the system could be used independently by patients without the support of a therapist.
- ▶ The future of VR systems in clinical settings is growing rapidly because of the high user engagement and its applicability in an unstructured environment.
- ▶ Future studies should strive to ensure the effectiveness of VR rehabilitation in reaching therapeutic goal settings.



References

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