A Novel VR Task for Poststroke Visuospatial Neglect: Co-Design & Early Experiences

Andrew Danso

Centre of Excellence in Music, Mind, Body and Brain (MMBB)

Department of Music, Art & Culture Studies

University of Jyväskylä

andrew.a.dansoadu@jyu.fi

UNIVERSITY OF JYVÄSKYLÄ

MUSIIKIN, MIELEN, KEHON JA AIVOJEN TUTKIMUKSEN HUIPPUYKSIKKÖ

CENTRE OF EXCELLENCE IN MUSIC, MIND, BODY AND BRAIN

Why VR: Systematic Reviews & Meta Analysis / Miksi virtuaalitodellisuus: systemaattiset katsaukset ja meta-analyysi

An effective tool for assessment & rehabilitation.

Effective vs. conventional rehab for walking, speed, balance & mobility.

Meta analysis shows significant benefits for VR + conventional rehab for upper limb training.

Laver KE, Lange B, George S, Deutsch JE, Saposnik G, Crotty M. Virtual reality for stroke rehabilitation. Cochrane Database Syst Rev. Nov 20, 2017;11(11):CD008349. https://doi.org/10.1002/14651858.CD008349.pub4

Solution: Co-Designing a Patient-Centred Tool

Premius
KUNTOUTUS

Original Paper

Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study

Andrew Danso[1], PhD; Patti Nijhuis[1], PhD; Alessandro Ansani[1], PhD; Martin Hartmann[1], PhD; Gulnara Minkkinen[2], MA; Geoff Luck[1], PhD; Joshua S Bamford[1], PhD; Sarah Faber[3,4], PhD; Kat R Agres[5], PhD; Solange Glasser[6], PhD; Teppo Särkämö[1,7], PhD; Rebekah Rousi[8], PhD; Marc R Thompson[1], PhD

[1]Centre of Excellence in Music, Mind, Body and Brain, University of Jyväskylä and University of Helsinki, Jyväskylä and Helsinki, Finland
[2]Department of Music, University of Jyväskylä, Jyväskylä, Finland
[3]Simon Fraser University, Burnaby, Canada
[4]University of Toronto, Toronto, ON, Canada
[5]Centre for Music and Health, Yong Siew Toh Conservatory of Music, National University of Singapore, Singapore, Singapore
[6]Melbourne Conservatorium of Music, The University of Melbourne, Melbourne, Australia
[7]Cognitive Brain Research Unit, Department of Psychology, Faculty of Medicine, University of Helsinki, Helsinki, Finland
[8]School of Marketing and Communication, Communication Studies, University of Vaasa, Vaasa, Finland

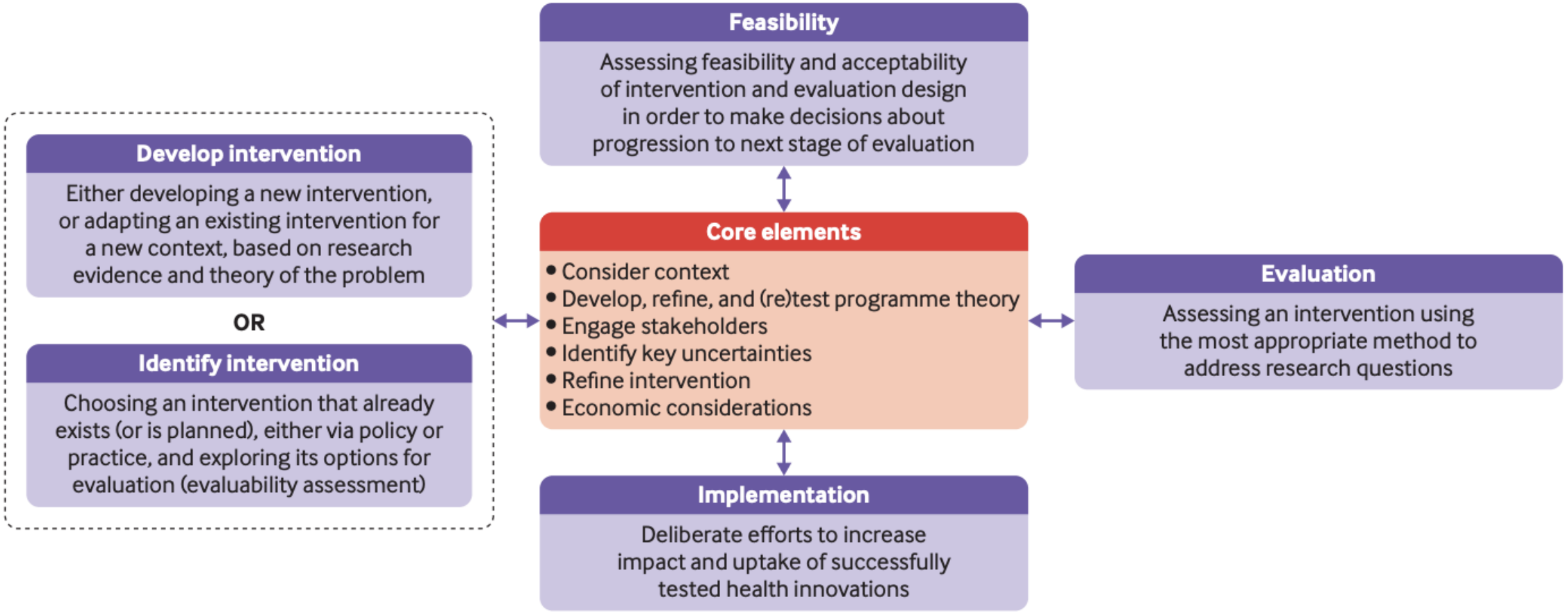
Corresponding Author:

Andrew Danso, PhD
Centre of Excellence in Music, Mind, Body and Brain
University of Jyväskylä and University of Helsinki
Seminaarinkatu 15, Jyväskylän yliopisto
Jyväskylä and Helsinki PO Box 35, FI-40014
Finland
Phone: 358 406643034
Email: andrew.a.dansoadu@jyu.fi

Uuden virtuaalitodellisuustehtävän kehittäminen ja käyttäjäkokemukset aivohalvauksen jälkeisen visuospatiaalise neglectin kuntoutuksessa: eksploratiivinen tapaustutkimus

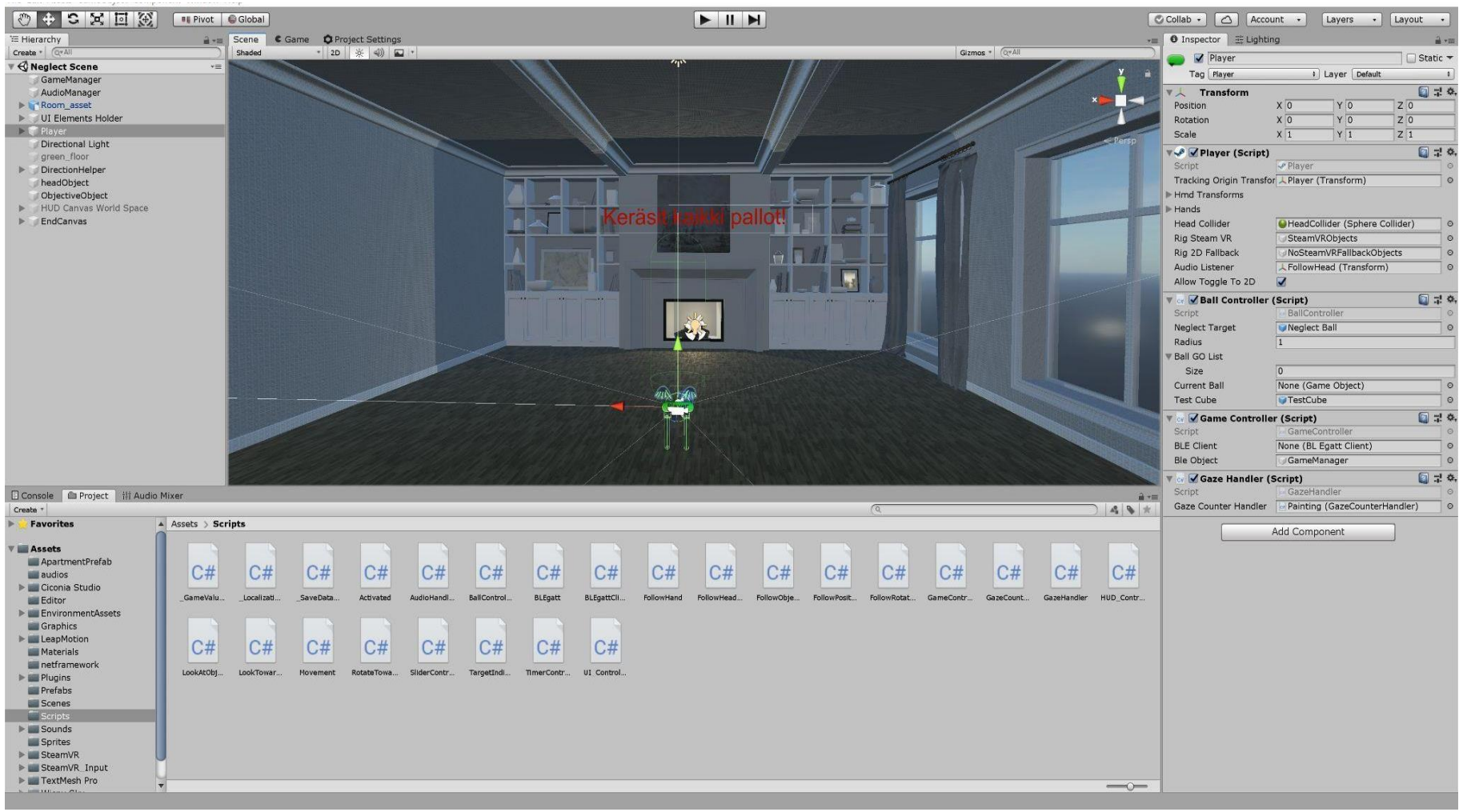
Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Medical Research Framework for complex interventions



Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., ... & Moore, L. (2021). A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. bmj, 374.

Unity 3D Virtual Room Design

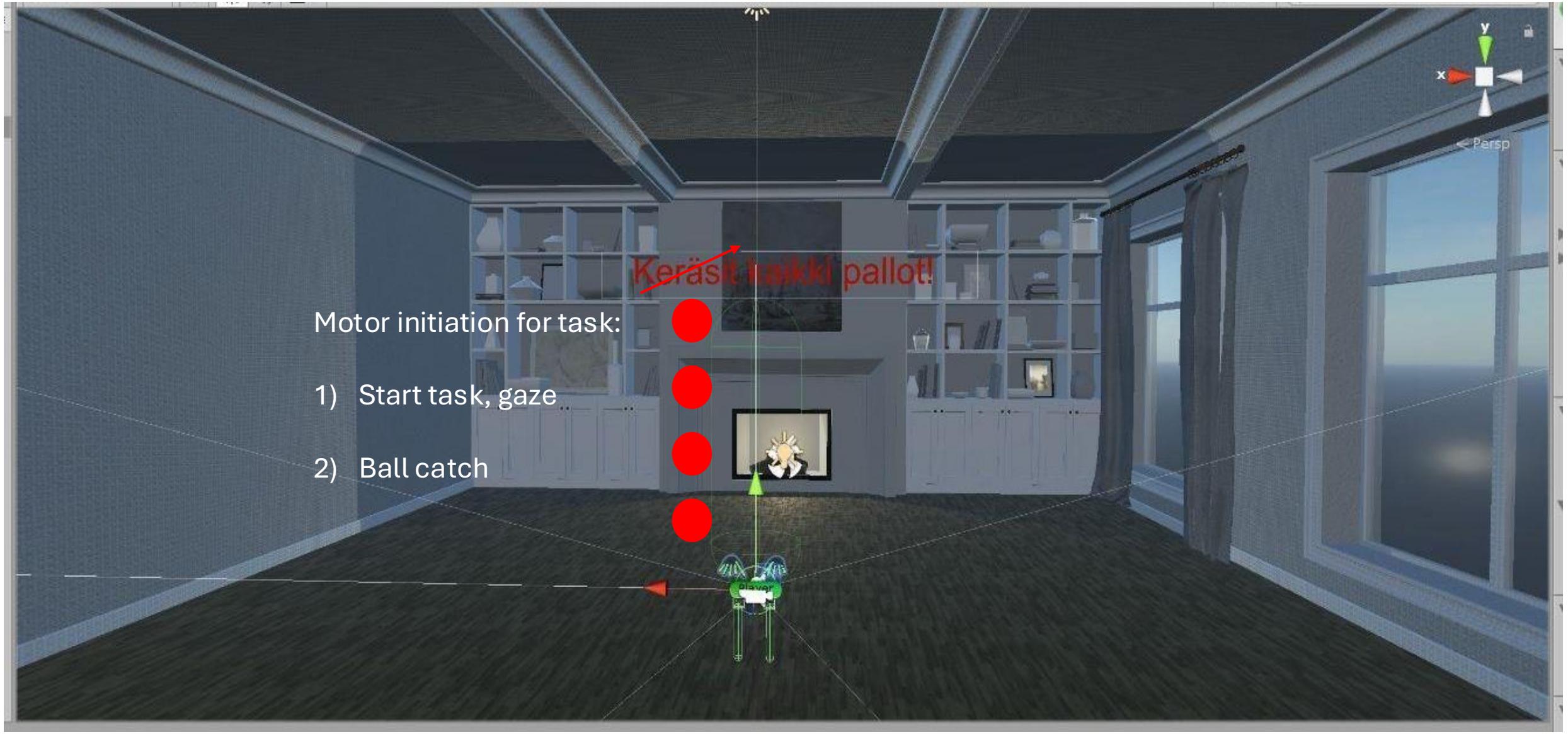


Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Unity 3D Virtual Room Design

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Unity 3D Virtual Room Design



Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Directional Cues / Suuntaavat vihjeet

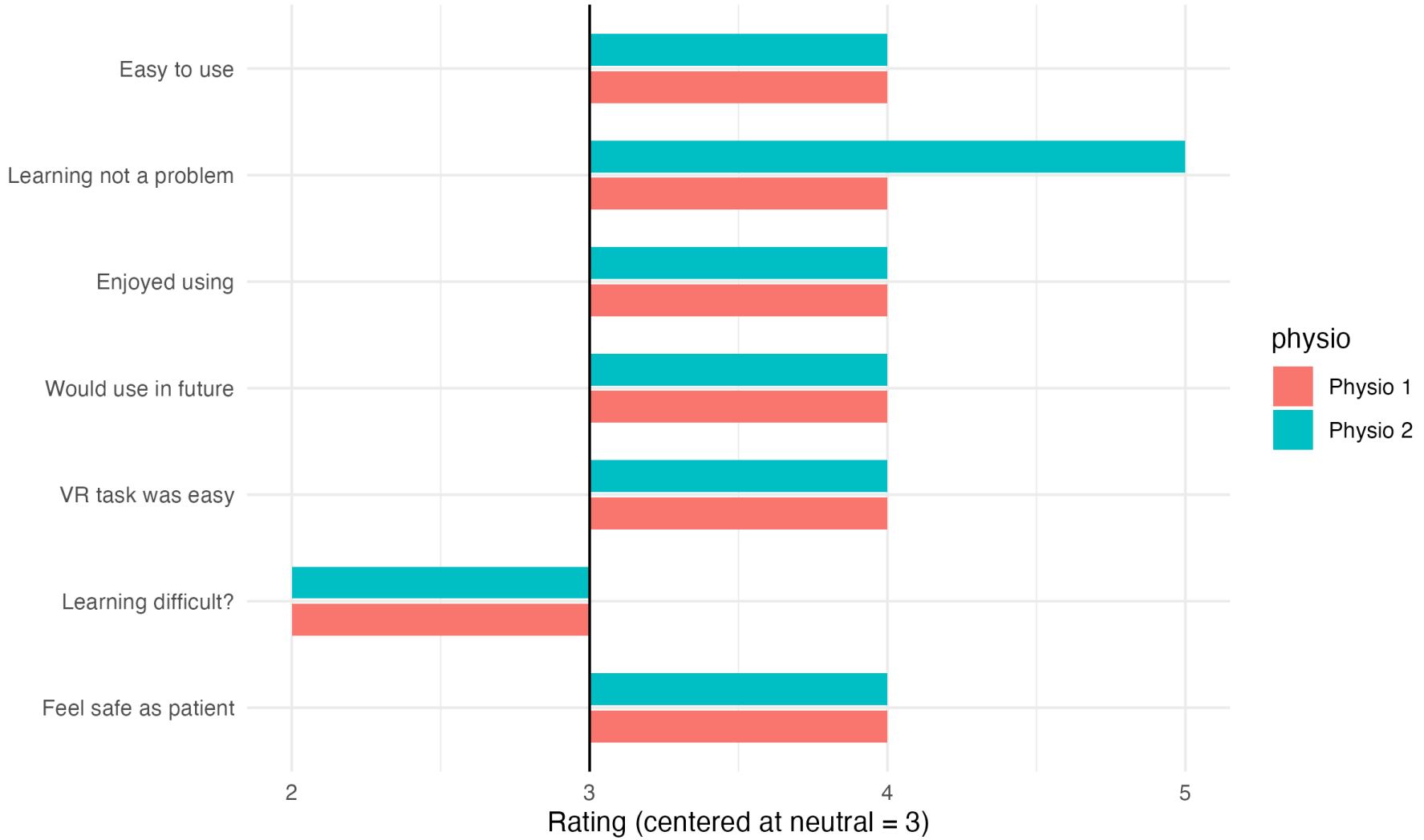
Cue / Suuntaavat vihjeet =

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Initial usability results with Premius physiotherapists’

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Questionnaire results from 2 trainee physiotherapists.



Likert rating 1 – 5

Patient Test Results

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Patient A

Male

46 Years old

Visuospatial Neglect, received VR Intervention 1 year after the stroke (in 2022).

Functional capacity:

Mobile with an electric wheelchair or manual wheelchair.

Toimintakyky:

Liikkuu sähköpyörätuolilla tai manuaalisella pyörätuolilla.

Activities of Daily Living Score = 70

Patient B

Female

37 Years old

Neglect symptoms, received VR Intervention 4 years after the stroke (in 2022).

Functional capacity:

Fully mobile and walking with a walking stick.

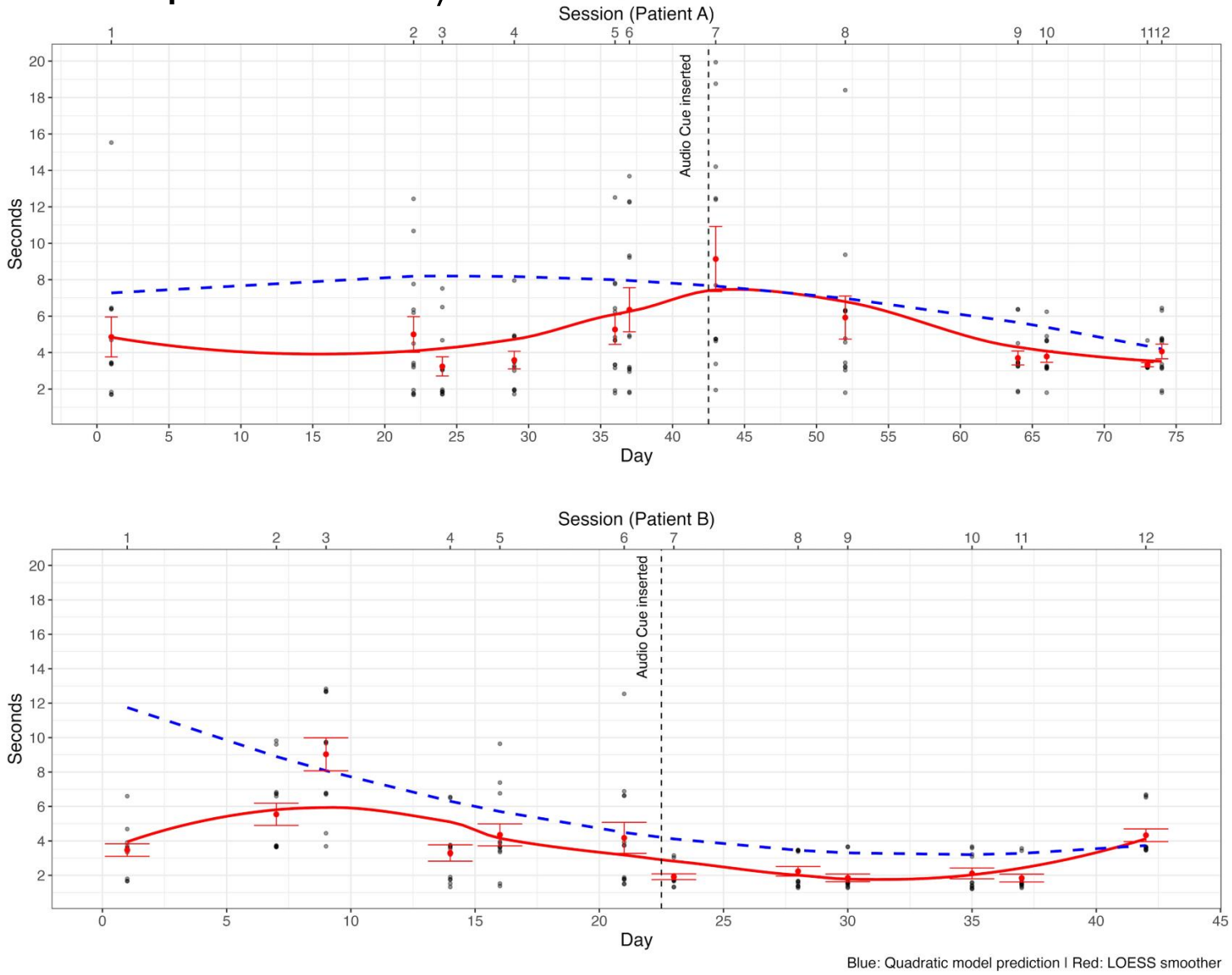
Toimintakyky:

Täysin liikuntakykyinen ja kävelee kävelykepin avulla.

Activities of Daily Living Score = 95

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Patient VR Task Completion Time / Potilaan virtuaalitodellisuustehtävän suoritusaika



Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Patients' Subjective Experience / Potilaiden subjektiiviset kokemukset

Patient A / Potilas A

"No difference in my condition"

"The VR task was fun and interesting"

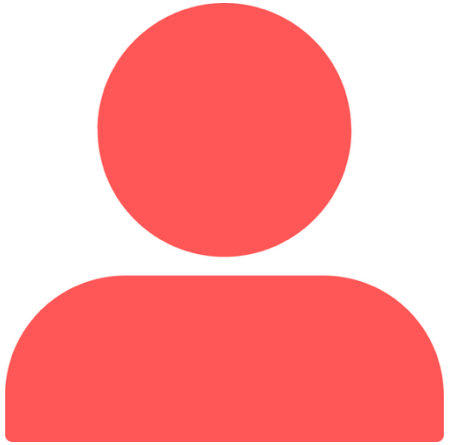
"The rehabilitation experience was different from my normal physiotherapy experience"

"Tilassani ei ollut eroa."

"VR-tehtävä oli hauska ja mielenkiintoinen."

"Kuntoutuskokemus oli erilainen verrattuna tavalliseen fysioterapiakokemukseeni."

Patient B / Potilas B



"Shifting weight to the left at the end of the period was easier, and slightly more successful"

During this period, I started walking without support, without a walking stick"

"Walking has become more confident"

"Painon siirtäminen vasemmalle jakson lopussa oli helpompaa ja hieman onnistuneempaa."

"Tänä aikana aloin kävellä ilman tukea ja ilman kävelykeppiä."

"Kävelemisestä on tullut varmemman tuntuista."

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Future Directions

The system was feasible and safe to use.

Both patients reported a positive experience.

Unintended benefits: The audio cue provided a calming effect.

Future Directions

One size does not fit all patients: A story of 2 different trajectories.

Patient profiles matter: Different outcomes between Patient A & B may influence outcomes from VR-based training.

Large scale testing, full scale RCT or crossover, comprehensive functional measures.

Objective eye-tracking measures.

References

Danso, A., Nijhuis, P., Ansani, A., Hartmann, M., Minkkinen, G., Luck, G., Bamford, J. S., Faber, S., Agres, K. R., Glasser, S., Särkämö, T., Rousi, R., & Thompson, M. R. (2025). Development and User Experiences of a Novel Virtual Reality Task for Poststroke Visuospatial Neglect: Exploratory Case Study. JMIR XR and Spatial Computing, 2, e72439–e72439. https://doi.org/10.2196/72439

Laver KE, Lange B, George S, Deutsch JE, Saposnik G, Crotty M. Virtual reality for stroke rehabilitation. Cochrane Database Syst Rev. Nov 20, 2017;11(11):CD008349. https://doi.org/10.1002/14651858.CD008349.pub4

Reel-Example: Hemineglect: https://www.youtube.com/watch?v=FII7GsBHok8&ab_channel=InstantNeuro

Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., ... & Moore, L. (2021). A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. bmj, 374.

Virtual Reality in Physical Therapy by Neuro Rehab VR - Clip from the show Information Matrix TV: https://www.youtube.com/watch?v=xGfsAnWu5os&ab_channel=NeuroRehabVR