3D Technologies for Spatial Neglect in Post-Stroke Rehabilitation: a systematic review protocol

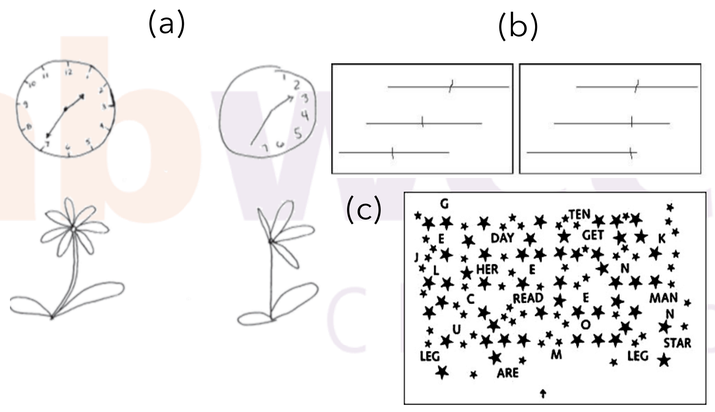
Alice Finocchi[1], Daniele Somma[3,4], Silvia Campagnini[1], Ester Marra[1], Maria Anna Szczepanska[1], Samuele Pinna[1], Alessio Fasano[1], Francesca Cecchi[1,2], Egidio Falotico[3,4], Andrea Mannini[1]*

1 IRCCS Fondazione Don Carlo Gnocchi onlus, Firenze, Italy.
2 Department of Experimental and Clinical Medicine, University of Florence, Italy.
3 The BioRobotics Institute, Scuola Superiore Sant'Anna, Pontedera, Italy.
4 Department of Excellence in Robotics and AI, Scuola Superiore Sant'Anna, Pisa, Italy.

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What is Unilateral Spatial Neglect?

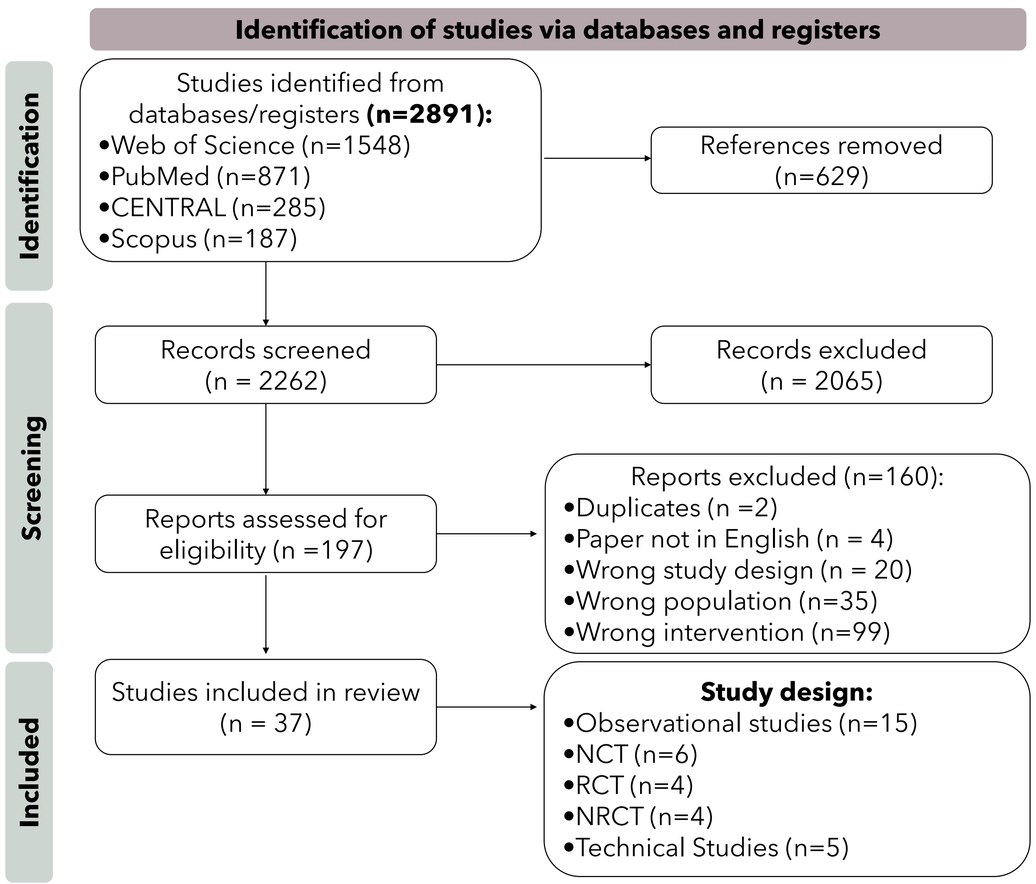
Unilateral Spatial Neglect (USN) is a neuropsychological condition that occurs following damage to one cerebral hemisphere (e.g., after a stroke). It leads to a deficit in attention and awareness toward contralateral space [1] (a).



Conventional Assessment

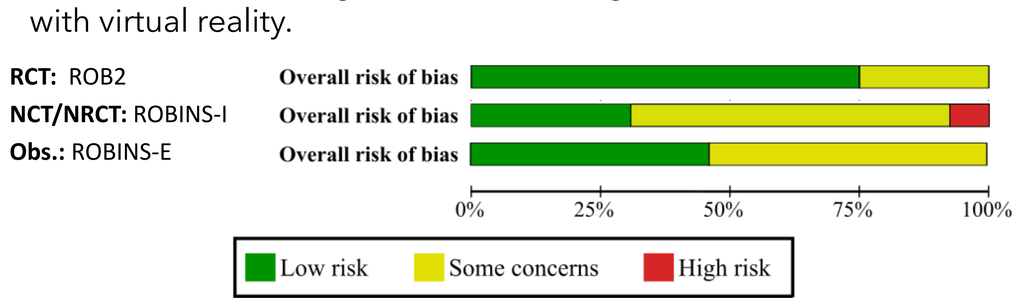
Conventional methods[2], including line bisection[3] (b) and star cancellation tasks[4] (c), have been widely used but fail to capture the complexities of real-world 3D interactions. Despite this disorder affecting functional abilities in daily activities, little attention has been given to its evaluation in three dimensions, particularly in **quantifying its impact on spatial depth**.

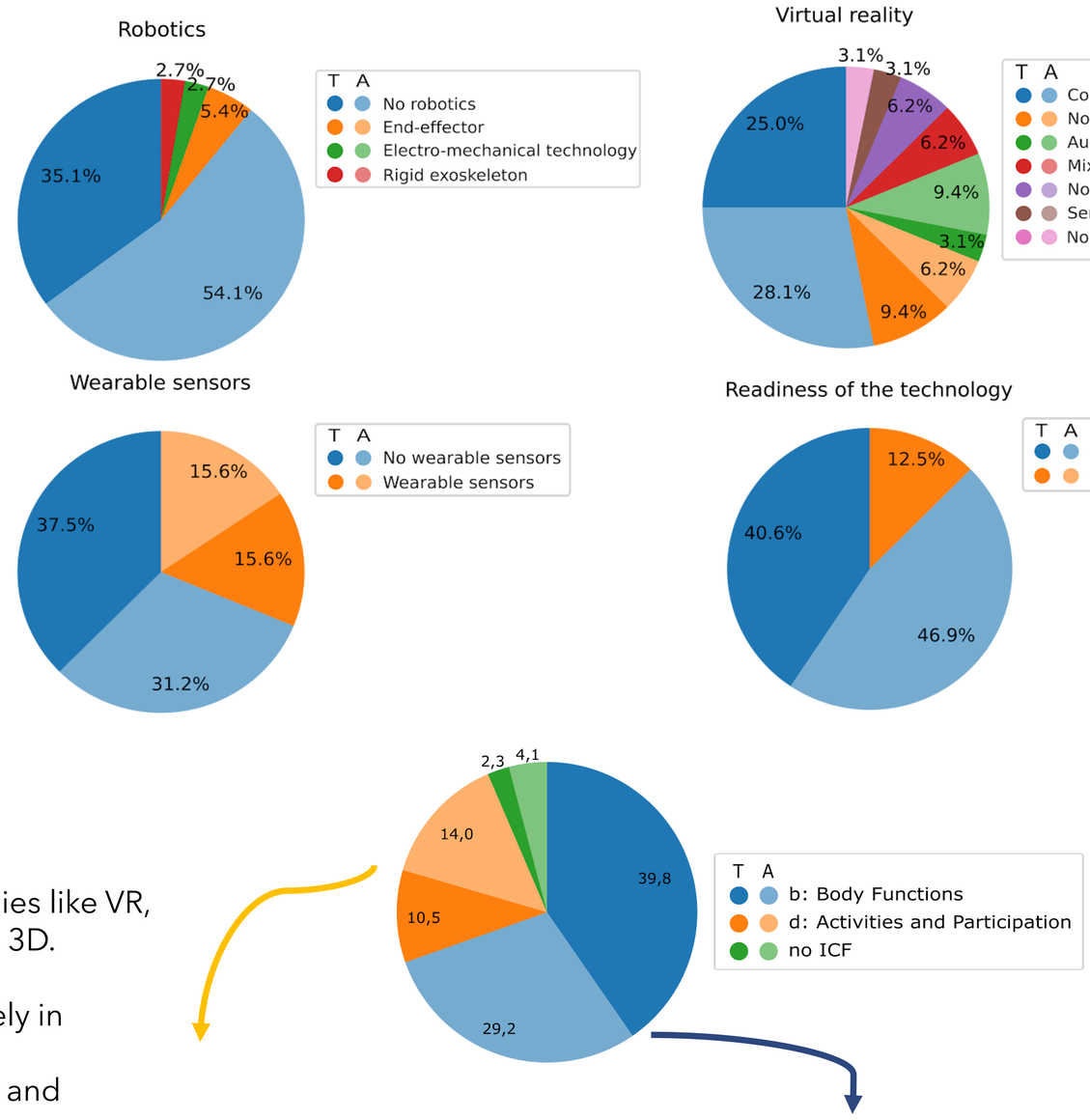
Systematic review



The review explores the state-of-the-art of electro-mechanical technologies like VR, robotics, and wearable sensors for USN assessment and rehabilitation in 3D.

- Only three studies employ **robotic** technology, and its use is exclusively in treatment-focused applications.
- Most of the studies use **VR-based solutions** due to their intuitiveness and ability to provide multisensory cues.
- In all studies involving robotic technologies, these are still combined with virtual reality.





Building on review results: an upcoming Clinical Trial





Type of study: Pilot, multicentric
Patients: 15 patients
Exclusion criteria: Presence of language deficits, presence of cognitive decline pre-existing the event, presence of severe visual and/or auditory deficits, orthopedic, neurological, or psychiatric impairments, epilepsy not controlled by antiepileptic drugs, behavioral disorders.
Protocol: The test will consist of the sequential and randomized presentation of target stimuli in three-dimensional space, mediated by a VR headset. The patient, holding the robot's end-effector, will need to reach the target stimuli. If the presented stimulus is not reached, the robot will follow the optimal trajectory to move in the direction of the stimulus. The timing and the amount of robot intervention constitute the3d assessment outcome.

References
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Contacts
Dr Andrea Mannini, amannini@dongnocchi.it