POST-STROKE NEGLECT

VIRTUAL REALITY AND MUSIC THERAPY

A REVIEW

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INTRODUCTION

- **Post-stroke neglect is a common result of a right hemispheric stroke in the brain.** It often impairs neurological performance, motor performance of the limbs and perception.
- **No census on the most effective** intervention for post-stroke neglect.
- **Lack of research** exploring the combined use of Virtual Reality (VR) and auditory use to neutralise neglect bias.
- **Use of Virtual Reality with Musical Neglect Training** tasks may provide a music therapist and healthcare team with an effective tool to include during neglect rehabilitation.

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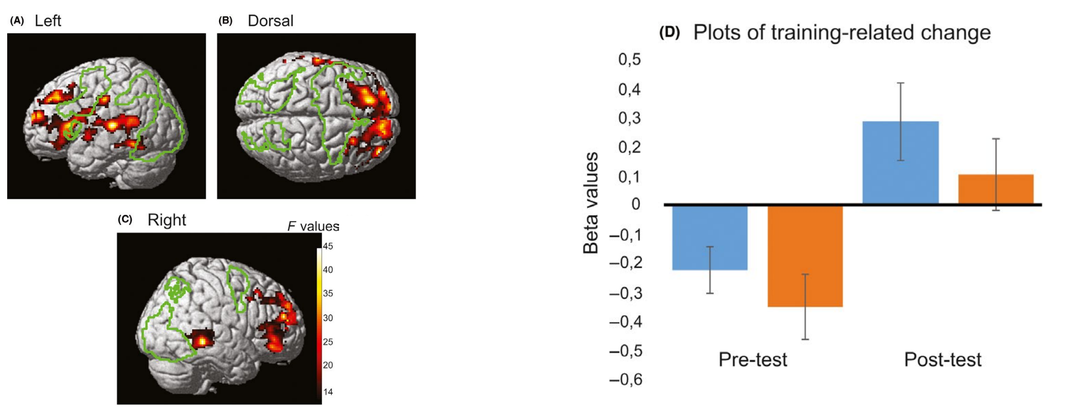
FOCUS

- This review summarises evidence of existing **VR and music therapy interventions, assessments and outcomes** in post-stroke and neglect populations.
- It explores potential **brain-behaviour relationships** in Virtual Reality and Music Therapy studies.

METHODOLOGY

- Published peer-reviewed primary studies on patients (>18 years old) diagnosed with **neglect, hemineglect, spatial neglect, paresis, and hemiparesis** using established criteria.
- Interventions include **VR practice** with specialists from relevant fields or **Music Therapy practice** by qualified Music Therapists.
- Outcomes measured by validated scales, clinical reports and case studies.

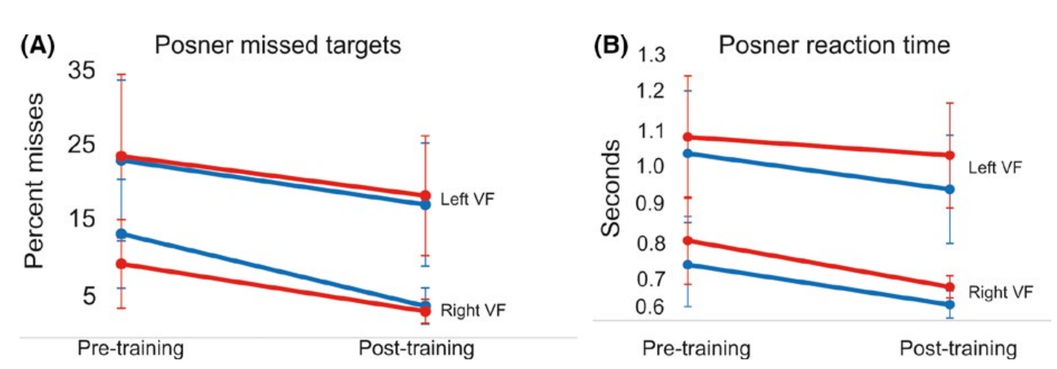
Potential Brain-Behaviour Relationships in Virtual Reality and Music-Intervention Studies



The difference in brain activity between the Posner cue condition (the VR task) and the resting baseline condition (when the brain is at rest).

- **Figures A – C: The green outline** represents the brain activation pattern during the Posner cue condition compared to the resting baseline condition before training.
- **The study found that after VR training, there was a significant increase in brain activity** (measured by Blood Oxygen Level Dependent signal intensity) in certain areas of the brain. These areas include the ACC (anterior cingulate cortex), DLPFC (dorsolateral prefrontal cortex), and the bilateral temporal cortex. These regions play a role in various cognitive functions.
- **Figure D:** The **blue** and **orange bar** colours represent different directions of visual focus (left or right).

Ekman, U., Fordell, H., Eriksson, J., Lenfeldt, N., Wåhlin, A., Eklund, A., Malm, J. (2018). Increase of frontal neuronal activity in chronic neglect after training in virtual reality. *Acta Neurologica Scandinavica*, *138*(4), 284-292.



Behavioural performance measures of a study involving the Posner fMRI task.

- **Figure A** focuses on the percentage of missed targets in two different situations: the red line plots show incongruency with a cue, and the blue line plots show congruency with a cue.
- **Figure B** suggests that there were potential improvements in reaction time on the Posner fMRI task, although they were not statistically significant. Error bars indicate standard error.

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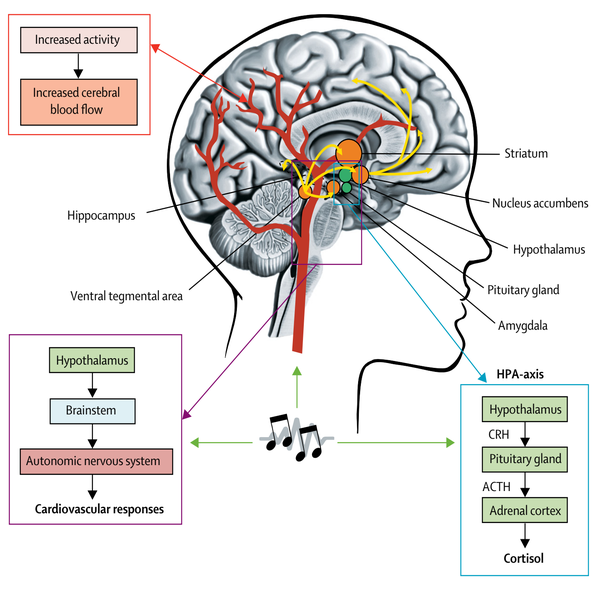
Findings from functional brain imaging research conducted on individuals have demonstrated that music triggers extensive activation of different brain networks.

- This activation also leads to an increase in blood flow in the middle cerebral artery due to autoregulation. **This enhanced blood flow could create beneficial conditions for overall recovery.**
- The orange circles and yellow arrows represent the mesolimbic system, a brain network involved in emotions, reward, and motivation.
- The green circles represent the hypothalamic-pituitary-adrenal axis (HPA axis). This is a complex system involving the brain and hormonal interactions that play a role in stress response and regulation.
- ACTH = adrenocorticotropic hormone; CRH = corticotropin-releasing hormone. These hormones are part of the body's stress response system.

Sihvonen, A. J., Särkämö, T., Leo, V., Tervaniemi, M., Altenmüller, E., Soinila, S. (2017). Music-based interventions in neurological rehabilitation. *The Lancet Neurology*, *16*(8), 648-660.

How music could affect the brain's emotional and reward centres (mesolimbic system) and hormonal systems related to stress and regulation (HPA axis) to contribute to the effectiveness of rehabilitation.



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