Evaluating the Effectiveness and Usability of the TCI Mobile App as an Adjunct to Constraint-Induced Movement Therapy: A Randomized Controlled Trial in Stroke

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Objective

To evaluate the effectiveness and usability of the TCI Mobile app as an adjunct to Constraint-Induced Movement Therapy (CIMT) for people with chronic stroke.

Participants

Twenty stroke survivors with chronic hemiparesis (>6 months post-stroke).

Inclusion criteria:

- Ability to walk at least 8 meters (with or without assistive device)
- Minimum score on the Mini-Mental State Examination (adjusted by education level)

Desing & Setting

Single-blind, randomized controlled trial with two parallel groups:

- CIMT + TCI Mobile App (intervention)
- CIMT only (control)

Conducted at the Federal University of São Carlos (UFSCar), Brazil.

Outcomes measured:

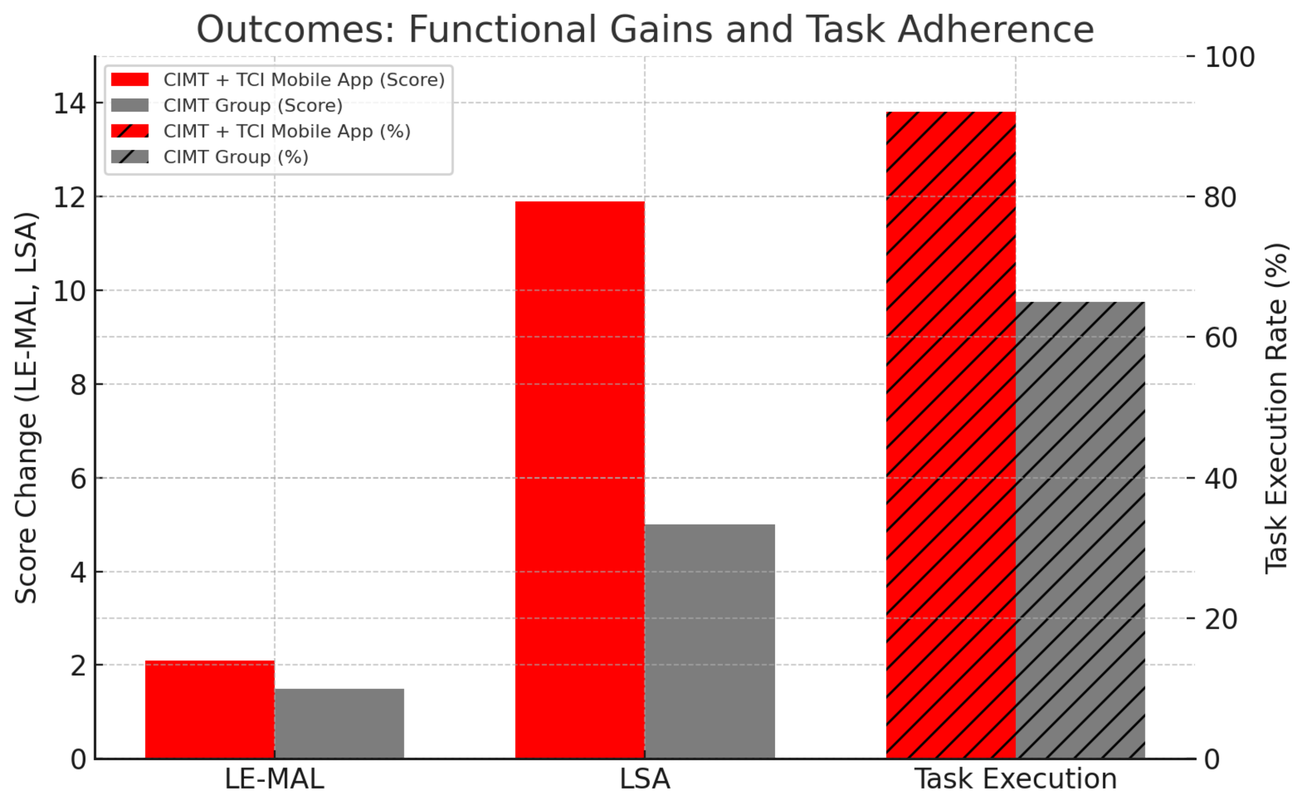
- Lower limb use (Lower Extremity Motor Activity Log – LE-MAL)
- Spatial mobility (Life Space Assessment – LSA)
- Usability (uMARS, intervention group only)
- Task execution rate (%), comparing adherence to daily home-based tasks between groups

Interventions

- Both groups received CIMT: 3-hour daily sessions for 10 consecutive weekdays.
- The TCI Mobile group also received 10 personalized home-based tasks per day via the app, collaboratively selected with the therapist from a structured list that included activities across home and community settings (e.g., climbing stairs, gardening, walking to the market).
- The app featured real-time step monitoring, allowing therapists to schedule 3–4 tailored push notifications per day to reinforce task execution, promote daily movement, and encourage use of the paretic lower limb in real-life environments. The push content was customized based on the participant's activity levels and routine.
- The control group received the same number and type of tasks, but only in printed format, without access to remote monitoring or digital prompts.

Results

Participants in the CIMT + TCI Mobile App group showed significantly greater improvements in lower limb use and spatial mobility compared to the CIMT-only group. LE-MAL scores increased by 2.1 points (vs. 1.5 in control; $p < 0.05$), and LSA scores improved by 11.9 points (vs. 5.0 in control; $p < 0.05$). The intervention group also demonstrated a higher adherence to home-based tasks, with an execution rate above 90% (vs. ~65% in control; $p < 0.01$). Usability of the app, assessed via uMARS, was rated highly, especially in the engagement and functionality domains.



Conclusion

Adding the TCI Mobile App to lower extremity CIMT significantly enhanced functional outcomes and task adherence in chronic stroke survivors. The app proved to be a usable and engaging tool, supporting real-world practice and expanding access to evidence-based neurorehabilitation.

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References

Gomes, L., de Oliveira, N., dos Anjos, S., dos Santos, T., Filippo, T., & Pereira, N. (2022). Usability of the TCI Mobile app as a complement to the Constraint-Induced Therapy protocol. Archives of Physical Medicine and Rehabilitation, 103(12), e134.