

Digital Augmentation of Anger Management Cognitive Behavioral Therapy in Acquired Brain Injury: Effects of a Therapeutic App and Metaverse-Based Psychoeducation

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1. Aim of Research: Anger dysregulation is a common and persistent complication following acquired brain injury (ABI), including traumatic brain injury and cerebrovascular disease. Approximately 30% of individuals with severe injury develop clinically significant anger, which often persists for years and interferes with recovery, interpersonal relationships, employment, and social reintegration. Despite its impact, anger in ABI is frequently regarded as primarily organic, and evidence-based psychological treatments remain insufficiently established. To address this gap, we developed a specialized cognitive behavioral therapy program for ABI-related anger dysregulation (CBT-ABI). Preliminary findings demonstrated significant improvement, and a randomized controlled trial (RCT) is ongoing. To enhance engagement and scalability, we introduced digital augmentation through a therapeutic app and metaverse-based psychoeducation. This exploratory study examined the preliminary effectiveness and feasibility of the digitally enhanced model.

2. Method of Research & Progression: Participants who completed the waitlist phase of the ongoing RCT received digitally augmented CBT-ABI. The primary outcome was the State-Trait Anger Expression Inventory-2 (STAXI-2), assessed at baseline, post-treatment (12 weeks), and 6-month follow-up. Mixed-effects models for repeated measures (MMRM) were used under the intention-to-treat principle. The face-to-face program emphasized visual materials and procedural learning to reduce cognitive load. Conceptually, the intervention focused on enhancing awareness of primary emotions to reduce exaggerated secondary anger responses. The therapeutic app supported homework with structured prompts and automated feedback, reducing working memory burden. Metaverse-based group psychoeducation enhanced motivation and social presence while preserving anonymity.

3. Results of Research: Nine participants were enrolled (mean age 46.6 years), and seven completed treatment. Significant time effects were observed for the Anger Expression Index ($p < .001$), with estimated means decreasing from 65.0 at baseline to 3.4 post-treatment (Cohen's $d = 4.2$) and maintained at 6-month follow-up (Figure). Trait Anger also showed significant and sustained improvement ($p < .001$), suggesting possible reduction in dispositional anger reactivity. Participants reported that the app facilitated emotional awareness and reduced cognitive burden, while metaverse sessions enhanced psychological safety and engagement.

4. Future Area to Take Note of, and Going Forward: Given the small sample and single-arm design, findings require cautious interpretation and verification through the ongoing RCT. Future research should evaluate long-term outcomes, functional impact, and the independent contribution of each digital component. Implementation challenges, including digital accessibility, also warrant further investigation.

5. Means of Official Announcement of Research Results: Interim findings, including the present exploratory results, are scheduled for presentation at the 2026 Annual Meeting of the International Neuropsychological Society (INS) in Dublin.

Figure. Changes in the Anger Expression Index Following CBT-ABI

