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Advancing PTSD Diagnosis, Treatment, and Dissemination of Trauma Care in Humanitarian Emergencies -

Findings from the eResilience App Clinical Trial

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This symposium presents the results of a rigorous seven-year clinical trial aimed at promoting technological solutions to advance the global response to traumatic stress in humanitarian emergencies. While there is a growing recognition of the importance of trauma-informed care in emergencies, there is a lack of evidence-based tools to rapidly and effectively diagnose and treat trauma cross-culturally at scale. Moreover, aid agencies and charities providing psychological support to survivors often possess limited mental health training and resources. This clinical trial addressed these challenges by (i) identifying diagnostic and prognostic biomarkers of trauma that have the potential for integration in portable technology to equip agencies in emergency zones; (ii) developing and examining the feasibility of the eResilience App - a seven-day, cross-cultural mHealth intervention for emergencies; and (iii) conducting a pilot implementation of the Minimum Viable Product (MVP) via a local charity in Africa to examine technology acceptance and scalability potential. Presenters will highlight the development of the eResilience App, including the clinical rationale, the two MVP designs for research and field implementation, and its potential for the integration of biometric measures, Neurofeedback (NFB), Artificial Intelligence (AI), Photoplethysmography (PPG), and machine learning. Moreover, presenters will discuss the cognitive and electrophysiological biomarkers identified at baseline and post intervention, and the clinical results observed over a 12-month period. Insights from the field implementation at a rural Ebola-impacted community in Liberia will feature selected clinical and scalability response in the village, alongside technological challenges, proficiency, and adaptations.

Keywords: PTSD, Trauma, Humanitarian, Emergencies, mHealth, Neuroscience, Cognition

The Design of the eResilience App

Janaina Videira Pinto (The University of Sydney, Sync Body-Brain Health).

The eResilience clinical protocol presents a flexible, cross-cultural, neurophysiological and transdiagnostic framework, comprising evidence-informed techniques to address the complexities of traumatic stress and co-occurring mental health outcomes of exposure to adversity. The standardized curriculum follows an iterative design approach, evolved with the feedback from *n* = 10,730 trauma survivors in seven countries across six continents. Tasks target the (i) creation of a safe and personal therapeutic space to hone skills of body stabilization and regulation of the Autonomic Nervous System (ANS); (ii) restoration of optimal cognitive function; and (iii), promotion of healthy relational systems. Task modalities intercalate throughout the curriculum to facilitate the integration of skills during the intervention period. We will present two technology designs for the humanitarian sector motivated by economic efficiency, fast data collection capability, scientific rigorousness, and global dissemination potential. The first MVP is built for aid agencies and community leaders based in emergency regions, offering a group intervention design for facilitators working with many groups over time, leveraging significant outreach to harness its impact. The second software provides

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advanced tools for researchers to conduct clinical trials and further improve the model. Features from the 2.0 prototype design will showcase how the clinical content can be integrated with advanced technologies, expanding its outreach potential beyond emergency response.

The eResilience App Trial and Clinical Outcomes

Elsa J. Goninon (Sync Body-Brain Health), and Janaina Videira Pinto (The University of Sydney, Sync Body-Brain Health).

A total of 70 African refugees in Australia from Liberia, Congo DRC, and Sudan who had fled a humanitarian emergency participated in the clinical trial. The sample consisted of 31 males and 39 females aged 18 – 54 years (M = 33.64, SD = 10.54). Subjects joined experimental (n = 35) and trauma-exposed control (n = 35) groups based on clinical and subclinical PTSD. Trial procedures included a home visit to complete clinical interviews, a baseline lab visit for Cantab cognitive tests, qEEG recordings, and a 30-minute tutorial to learn how to use the App and biofeedback equipment at home for seven days. During the App week, researchers remotely monitored participant engagement and wellbeing via the app software. Participants had access to complete up to two hours of tasks on the App per day. On the 8th day, all participants returned to the lab to repeat all baseline assessments, followed by 1-, 3-, 6-, and 12-month interviews post-intervention. Results show significant reduction in the CAPS-5 symptom severity scores across five timepoints below threshold levels $F(6,180) = 138.18$, $p < .001$, $\eta_p^2 = .822$, and in comorbidities including major depressive symptoms ($p < .001$) and episodes ($p = .002$), inattention ($p = .008$), anxiety ($p < .001$), and sleep problems ($p < .001$), among others. Analyses including personality, refugee experiences, somatization, mindfulness, resilience, and exposure to early life stress will also be presented. The sustained clinical results over 12 months demonstrate potential feasibility for integration of the proposed technology in humanitarian settings.

Cognitive and Electrophysiological Outcomes

Janaina Videira Pinto (The University of Sydney, Sync Body-Brain Health).

Neuropsychological tests and electroencephalogram (EEG) provide objective measures of brain health that can be integrated in portable technology to improve precision diagnosis and treatment methods, or inform the integration of other cost-effective biometrics tools. We conducted exploratory EEG and cognitive analyses to identify diagnostic and prognostic markers of traumatic stress. Previous studies in PTSD indicate impairment in overall cognitive function and postulate that impairment in the Prefrontal Cortex (PFC) reflects high cortical beta power during rest. We plotted all time-domain EEG recordings into a frequency power-spectrum using Fast-Fourier Transform (FFT), with a low-pass frequency of 2Hz and compared recordings pre- and post-intervention alongside cognitive data. During the eyes open paradigm, we detected symmetrical reductions in beta power in the frontal lobe after the intervention. Such changes indicate an improvement in executive functions when correlated with cognitive test results ($p < .001$), and a potential physiological manifestation of lower states of intrusive thoughts and over alertness in the PFC. In the alpha frequency, we documented a reduction in peak power across all brain regions. To our knowledge, this is the first study to document a global downregulation of alpha power among PTSD cohorts as a prognostic marker for treatment response. Vigilance regulation models are a possible explanation of the phenomena. The presenter will discuss the implications of the above findings for technology integration and its utilization in emergencies.

eResilience App Pilot Field Implementation

Isaac E. Sart (Sync Body-Brain Health), and Janaina Videira Pinto (The University of Sydney, Sync Body-Brain Health).

We designed an offline-ready MVP version of the eResilience App aimed at large-scale community outreach for a pilot implementation in the field. In Liberia, West Africa, a local grassroots charity deployed a cohort of local mental health facilitators equipped with the App in a rural village that was formally a war refugee camp and was sequentially heavily impacted by the Ebola outbreak. The village lacked basic amenities and services such as power, water supply, schools, and markets, making it the ideal challenging environment to test the new technology. One-hundred community members participated in eResilience groups for seven days during a six-month period. Facilitators led groups with the tablets provided with the installed App. They also conducted baseline and post-test interviews to assess trauma, depression, and disability for 12 months. Results indicated a significant reduction of clinical symptoms below diagnostic threshold levels across five timepoints (PTSD, $F(2.67,245.45) = 278.13$, $p < .001$, $\eta_p^2 = .75$; MDD, $F(4,332) = 293.81$, $p < .001$, $\eta_p^2 = .78$), and improvement in disability levels assessed by the WHODAS 2.0 questionnaire. Moreover, after completing the program, beneficiaries reported spontaneously teaching the intervention to n = 652 others, projecting a six-fold organic dissemination potential. Qualitative responses on life improvement post-intervention reflected the three core clinical foundations of the app rationale, which focuses on body regulation, cognitive enhancement, and social systems. The presenter will discuss the process, adaptations, community response and challenges of integrating technology to scale outreach in a challenging post-emergency environment.