



MiRAR- Mixed Reality in Aphasia Rehabilitation: Concept and Development

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MiRAR- Mixed reality in aphasia rehabilitation: Concept and development

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Background:

Aphasia, an impaired ability to use language for communication after a head injury, is a major impediment to the quality of life (QOL) of the affected individuals. Speech-language therapy (SLT), the primary means of intervention for aphasia, usually involves didactic interaction between the speech-language therapist and the client, often without regard to the real-life environments in which the communication occurs (Boles et al., 2004). Provision of SLT in natural environments, however, is beyond the scope of conventional, clinic-based intervention setups. In light of the technological advances [previous examples in virtual reality (e.g., EVA-Park) Marshall et al., 2020] the proposed approach is expected to make the PWA use their language in an ecologically valid and meaningful manner in the natural communication contexts.

Aims:

With the aid of mixed reality (MR: augmented + virtual realities (i.e., AR + VR)), we present the concept, development, and deployment of a social communicative approach to aphasia rehabilitation in a controlled manner, to facilitate communicative participation of PWA.

Methods and Material:

Team building: We constituted an interdisciplinary team with hired technical professionals from software development, 3D application development, immersive technology, and graphic designing.

The implementation of functional approach into the MR application was planned in different phases. In the first phase, the SLPs critically appraised and planned the requirements for the functional therapy approaches for PWA. This included preparation and identification of relevant communication scenarios in the culturally-relevant context. This was carried out with a qualitative study design (e-Delphi

method). The participants were 10 experienced SLPs with a minimum of 3 years of experience in aphasia rehabilitation in India. They were recruited from the directory of Indian Speech and Hearing Association [(ISHA)- <https://www.ishaindia.org.in/>].

Concept of MR application: The proposed plan was to use Microsoft HoloLens device for delivery of conventional script training with the MR experience for PWA. This was supported with device specification (portability, comfort and minimal risk of fatigue due to immersion), and literature evidence in stroke patients (nausea, fatigue). The MR application (immersive technology) would have a VR, AR, and a script component. The VR mode would provide social scenes and the AR mode would facilitate the SLP's live interaction with the client. The script would be provided alongside with the VR and AR modes. An example and schematic diagram is provided in Figure 1.

Results:

In this report, we demonstrate our concept, work-flow, and development of communication therapy for PWA using immersive technology (Mixed reality).

The application consists of a monitoring admin panel (SLP admin panel as a Web-Page application) and Mixed reality application (for the clients with aphasia). The SLP will be able to guide the PWA who is undergoing the therapy with MR Glass. Further, the SLP can control the scenario scripts (editor), sound, text, and display of written instructions for individual PWA [Script complexity based on Kaye et al., 2016]. Twenty communicative scenarios are considered based on social, cultural, and dialectic (standard) variations of Indian languages (Indian English, Kannada, Hindi, & Malayalam).

Conclusion:

Currently, the MR application has been successfully developed. In the next stage of this ongoing work, this application would be used for the training of PWA so that meaningful, ecologically valid, and socially useful rehabilitation could be provided in controlled environments.

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Figure 1: Diagrammatic representation of the mixed reality application. Participant interaction on 3D immersive technology (example: restaurant) with SLP support.



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