

New directions in aphasia rehabilitation

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This abstract briefly outlines the contents of the lecture on the “New directions in aphasia rehabilitation” at the Asia Oceanian Congress on Neuro Rehabilitation 2021. Aphasia is an acquired language disorder that may occur in people suffering from stroke (Basso et al., 2013; Rhode et al., 2013), Traumatic Brain Injury (TBI; e.g., Heilman et al., 1971) or other disorders (e.g., neurodegenerative processes such as in Primary Progressive Aphasia; Marshall et al., 2018). Its characteristics vary depending on a range of factors. Overall, in persons with aphasia (PWA) microlinguistic (i.e., phonological, lexical and grammatical) skills are usually affected with heterogeneous symptoms depending on illness severity (mild, moderate, severe) and affected linguistic modalities (i.e., production, comprehension and/or repetition). Importantly, microlinguistic difficulties may have also effects on macrolinguistic (i.e., pragmatic and discourse level) processing (e.g., Andreetta et al., 2012; Andreetta and Marini, 2015).

In the acute phase within the first three months post onset an initial spontaneous recovery can be observed (Picano et al., 2021). Interestingly, there is also evidence suggesting that therapies that focus on syntactic skills and on the ability to produce informative messages may enhance such recovery already in the early post onset period in non-fluent PWA (e.g., Marini et al., 2007). Further linguistic improvements can occur after behavioral training also in the chronic phase (Fama et al., 2014).

A crucial predictor for positive language outcomes is the intensity of the linguistic training (5 to 10 hours per week; e.g., Bhogal et al., 2003). For example, Marini et al. (2016) observed in a bilingual patient with extensive loss of the left hemisphere due to severe traumatic brain injury a remarkable language recovery (in both languages) after an intensive training (focused only on one of these languages, i.e., Italian) twice a week for 5 years with a reorganization of his linguistic network in the right hemisphere. Unfortunately, a number of reasons (e.g., the limited economic resources of the

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national health systems, the high costs of private health care services) do not allow PWA to have access to the recommended amount of training. For these reasons, to enhance the efficacy of the rehabilitation process over the past 20 years innovative rehabilitation methods have been developed. These may act either as a substitute or an adjunct to traditional approaches. Two examples of such innovations include the Virtual Reality (VR) and the Transcranial Direct Current Stimulation (tDCS) approach (Picano et al., 2021).

VR applications are computer-generated simulations of 3D environments that allow to perform therapies aimed at enhancing functional communication in ecological contexts (Brady et al., 2016). The development of VR applications for linguistic and communicative rehabilitation in PWA is still at an early stage (Grechuta et al., 2019; Marshall et al., 2016). Nonetheless, growing evidence supports its efficacy for the rehabilitation of language in PWA (e.g., Giachero et al., 2020). The use of virtual everyday contexts enhances the ecological validity of treatment protocols as the semi-immersive interaction encourages language practice in realistic communication contexts. Furthermore, it should also be noted that the inclusion of a virtual therapist does not require the presence of a clinician. Therefore, the PWA may practice it every time (s)he wants to (even several hours a day, implementing an intensive training) reducing his/her feeling of loneliness and social isolation (Thompson et al., 2010; Cherney and van Vuuren, 2012).

Recent advancements in neurorehabilitation take into account the mechanisms underlying cerebral reorganization (Picano et al., 2021; Taub et al., 2002). Transcranial Direct Current Stimulation (tDCS) is a non-invasive adjunctive therapy for neurological disorders (Fregni et al., 2020; Lefaucheur et al., 2017) that modulates cortical excitability by inducing a slight electrical current (1-2 mA) through surface electrodes applied over the scalp (Monte-Silva et al., 2013; Nitsche and Paulus, 2011). Also in this case, increasing evidence suggests its utility as an effective supplementary treatment in persons with chronic aphasia (Marangolo, 2020). For example, in Marangolo et al. (2013) a conversational therapy paired with anodic transcranial Direct Current Stimulation of the left Inferior Frontal Gyrus

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significantly increased the linguistic production skills of a cohort of 12 persons with chronic non-fluent aphasia who had not benefited from a traditional therapy.

In conclusion, language rehabilitation in PWA is the target of growing interest among aphasiologists. This renewed interest has been prompted, among other things, by the development of relatively new neuromodulation techniques that are promising in enhancing the efficacy of the rehabilitation process (i.e., tDCS) and new technologies that allow PWA to be immersed in virtual communicative scenarios that can be used not only in the clinical setting but even at home. This is a critical step to provide such patients with the possibility to be engaged in intensive programs.

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