LinguiSystems Article

Applying Neuroplasticity Principles to Aphasia Treatment

Advancements in neuroimaging techniques have given researchers new insights into the recovery of language impairment after acquired brain injury (aphasia). Knowledge of neuroscience principles and how they apply to aphasia research can help guide clinical decision making.

In a review of studies that demonstrate neural changes associated with aphasia recovery, Raymer et al. (2008) make these points:

- Recovery from brain injury is aided by several neural mechanisms, depending on the stage of aphasia recovery.
- Spontaneous recovery of the affected regions occurs in the subacute phase of recovery.
- Later in recovery, language function is reorganized as regions of the brain adjacent to the injury assume new language functions and some language functions shift to the right hemisphere.

Here are some general principles of neuroplasticity pertaining to successful recovery from neural lesions.

1. **Use it or lose it:** Taub and colleagues (cited in Raymer et al., 2008) demonstrated improved movement of the affected limb in hemiparetic stroke patients when they were forced to use the limb and overcome "learned nonuse." This method, constraint-induced movement therapy (CIMT), is centered on massed practice, constraint of the unaffected limb with forced use of the affected limb, and therapeutic shaping of the response. These principles have been applied to aphasia treatment in constraint-induced language therapy (CILT) with encouraging results. Interestingly, the use of chemical restraints (i.e., the use of some medications in the acute and subacute stages of recovery) and social restraints (i.e., the absence of social interaction) have been found to have negative effects on behavioral and neurological recovery.
2. **You're never too old:** The injured brain, regardless of age, is flexible and capable of change throughout the lifespan. Several studies have reported significant functional gains in language abilities many years following aphasia onset.
3. **Repetition matters:** Repetition is important in maintaining changes in the brain and their corresponding functional benefits (Pascula-Leone, Wassermann, Sadato, and Hallett, 1995 as cited in Raymer et al., 2008). This supports the need for long-term, consistent use of a skill to produce lasting changes.
4. **Intensity matters:** The more intense the treatment, the greater the skill acquisition and change. Therapy provided at a higher frequency for a shorter period of time resulted in better outcomes than therapy provided at a lower frequency over a longer period of time (Bhogal, Teasell, and Speechley, 2003 as cited in Raymer et al., 2008).
5. **Timing matters:** Treatment early in the recovery process may be maximally beneficial, but later treatment is also effective for improving function. The timing of aggressive therapy (such as CILT) appears to influence recovery. It remains to be determined what period in the recovery is most effective for aggressive treatments.
6. **Treatment variables matter:** Stimulus characteristics such as salience, concreteness, and frequency influence access to the lexicon. Careful selection of stimulus material can maximize generalization. Studies suggest that training complex material (as opposed to training simpler material) may improve generalization to less complex, untrained material when the tasks are linguistically-related.
7. **Specific treatments matter:** There is promising evidence that specific speech-language interventions promote functional brain reorganization and underlying language improvement. Systematic investigation is needed to delineate specific factors that promote as well as interfere with successful language recovery.

The future of aphasia treatment is bright! Practicing SLPs can use evidence-based practice in their daily work to help advance aphasia treatment. Integration of knowledge from aphasia research, neuroscience, and your own experience in speech and language therapy will result in better outcomes for persons with aphasia.

Raymer, A.M., Beeson, P., Holland, A., Kendall, D., Maher, L.M., Martin, N., Murray, L., Rose, M., Thompson, C.K., Turkstra, L., Altmann, L., Boyle, M., Conway, T., Hula, W., Kearns, K., Rapp, B., Simmons-Mackie, N., & Gonzalez Rothi, L.J. (2008). Translational research in aphasia: From neuroscience to neurorehabilitation. *Journal of Speech, Language, and Hearing Research, 51*, S259-S275.