Title: Visuospatial Skills in Adults after Perinatal Stroke

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Introduction: A number of studies suggest that unilateral brain injury in adults leads to deficits in spatial processing that differ depending on the laterality of the lesion: adults with left hemisphere (LH) injury have difficulty representing the details of a spatial pattern, while adults with right hemisphere (RH) injury have difficulty integrating the constituent parts into a coherent whole. Research with individuals with brain injury in early childhood indicates that the young brain is better able to compensate for these hemispheric differences. However, subtle deficits in spatial processing may persist (Akshoomoff et al., 2002). These deficits may be more pronounced in individuals with early RH injury, as some studies suggest a right-lateralized dominance of function for visuospatial processing (e.g., Hugdahl, 2011). The current work explores these questions by testing adults who have had a perinatal stroke on a complex task: the Rey-Osterrieth Complex Figure (ROCF) (Osterrieth, 1944; Rey, 1941).

Method: Participants were 8 individuals who had suffered a brain injury at the time of birth; specifically, a unilateral lesion resulting from a stroke to the middle cerebral artery (Mean age at test = 20.55 yrs, SD = 3.78 yrs, Range = 16.33–26.75 yrs). Five individuals had lesions to the left hemisphere (LH group) and three had lesions to the right hemisphere (RH group). Participants were instructed to copy the ROCF exactly (Copy condition), and then draw it from memory (Immediate Recall condition).

Results: Copy Condition. Categories defined by Akshoomoff and Stiles (1995) were used to characterize how participants started their drawings: Perimeter (draws the outer contour first), Partial Perimeter (draws a portion of the outer contour), and Nonperimeter (internal elements first). Of the LH group, 1 participant was classified as Perimeter, 3 as Partial perimeter, and 1 as Nonperimeter. All 3 RH participants demonstrated a Partial Perimeter strategy. No participants demonstrated the “ideal” method (i.e., first completing the salient base rectangle), which is the common approach of typically developing (TD) adults (Akshoomoff & Stiles, 1995). These data indicate similar degrees of impairment across the groups, who both employed immature starting strategies that did not make use of the organizational structure of the figure. Immediate Recall Condition: The Boston Qualitative Coding System (Stern et al., 1994) was used to score the drawings. A score was given for each of three types of feature elements: Configural, Clusters, and Details. Overall, performance of participants was less accurate than those reported for TD adults (Akshoomoff & Stiles, 1995). In comparison to the LH group, the RH group showed higher Cluster scores, which are features within the figure that do not contribute to its overall structure. This indicates that these individuals may favor a piecemeal strategy of analysis, focusing more on the sub-structural elements rather than overall global form.

Discussion: To our knowledge, this work is the first to analyze the ROCF process and product in adults who had suffered a perinatal stroke many years earlier. We find that these individuals demonstrate immature starting strategies and also produce less accurate reproductions when recalling the figure from memory. While there are some differences between RH and LH injured participants, both groups show impairments. These data highlight a continued visuospatial impairment in this population. This demonstrates that in the face of an early dramatic injury, the plasticity of the young developing brain is not able to fully compensate for the maturation of spatial function to the level of typical development.
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