Relationships Between Fluid and Crystallized Intelligence and Hippocampus Subareas' Volumes: An MRI Study with Standardized Testing

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Over the last century, intelligence has been extensively studied, but theories at the brain level are now emerging, and they are in constant evolution. Previous research has identified relationships between cognitive abilities such as learning and memory and hippocampus volumes. Specifically, associations with episodic memory have been long established. The present study aims to seek possible significant correlations between hippocampus subareas' volumes relative to ICV (Total Intracranial Volume) and crystallized (Gc) and fluid (Gf) intelligence, expressed through Verbal and Performative IQ (VIQ & PIQ). A positive correlation "CA1"-Gc and a negative correlation "CA4-DG"-Gf was hypothesized. Anonymized brain MRI (Magnetic Resonance Imaging) from 67 healthy subjects, aged 17 to 24 (mean=20; SD=1.52) with Full IQ values ranging from 91 to 140 (mean=125; SD=8.49), were analyzed. The original data were collected by the Beijing Normal University and released in a public repository. None of the output results were considered statistically significant. Therefore, both hypotheses have been proven wrong. Nevertheless, this lack of significance doesn't mean a veritable absence of a relationship. The low-variability sample in terms of IQ might be the reason why correlations have been this way. Further analysis may focus on the asymmetry of the structure and the study of the left-right hippocampus separately. The importance of this study lies in the processes the hippocampus is involved: learning and memory. These functions are related to education, and by understanding human cognitive processes, we can create more significant, active, and efficient learning.

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