NEURAL UNDERPINNINGS AND COGNITIVE CORRELATES OF HYPER-PRIMING EFFECTS IN OLDER ADULTS: ELECTROPHYSIOLOGICAL EVIDENCE FROM THE PRIMED LEXICAL DECISION TASK

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Hyper-priming refers to an increased semantic priming effect; it is typically seen in pathological groups (e.g., Alzheimer's disease), and it may be accounted for by the declining inhibition function that leads to difficulties in processing semantically unrelated information. On the contrary, it can also be attributed to improved semantic functions that may arise due to the accumulation of semantic knowledge. To clarify its neural underpinnings, a primed visual lexical decision task was conducted in younger and older adults. We hypothesize that older adults will exhibit hyper-priming in the N400 or late positive component (LPC) windows, and that a hyper-priming effect may not necessarily reflect poor cognitive performance.

30 Cantonese-speaking young adults (15F, age = 21.8, *SD* = 1.43) and 59 older adults (31F, age = 68.9, *SD* = 3.21) were recruited. All older adults were cognitively normal (HK-MoCA = 26.4, *SD* = 2.27). For the primed lexical decision task, a short SOA (150 ms) was used to promote automatic semantic processing. Also, a series of tests (e.g., Stroop, Raven, Synonym, verbal fluency) were adopted to measure various cognitive abilities (inhibition, fluid intelligence, vocabulary knowledge, controlled retrieval).

A repeated-measures ANOVA on RTs revealed significant semantic priming effects (SP) in both groups. Older adults (*M* = 28.7 ms, *SD* = 20.2) showed a significantly larger SP than young adults (*M* = 17.1 ms, *SD* = 23.5), $t(51.30) = 2.29$, $p = .026$. Analysis of cognitive correlates revealed that older adults with higher verbal fluency were more likely to show smaller SP, $r(57) = -.28$, $p = .030$, reminiscent of that found in younger adults.

For the ERP analyses, two components were analyzed—the N400 and the late positive component (LPC). For N400, both groups showed significant semantic priming effects, albeit with topographical differences between groups. In young adults, the effect, which peaked at centro-parietal sites, was positively correlated with Stroop, $r(26) = .51$, $p = .006$; this suggested that general executive functions, especially inhibition, were involved in the task. The SP effect was significantly smaller in older adults and more right-lateralized; it was positively correlated with verbal fluency, $r(57) = .25$, $p = .057$ (marginal), and negatively correlated with age, $r(57) = -.23$, $p = .079$ (marginal). In contrast, the LPC, as an index of post-control processing, only showed SP in older adults. In support of our hypothesis, the magnitude of LPC was positively correlated with Synonym, $r(57) = .34$, $p = .009$, and verbal fluency, $r(57) = .38$, $p = .004$.

To conclude, notable topographical differences in the ERP of each group suggest that potentially differing cognitive mechanisms are at play, whilst LPC effects in the older group imply more controlled processing. Also, hyper-priming is a complex phenomenon that cannot be simply understood as either semantic improvement or declining inhibition function. Instead, multiple cognitive processes are at play, with some of these processes (N400/LPC SP and amplitude) reflecting improved semantic knowledge and preserved semantic activation in older adults, even though the effect may be dominated by other processes (e.g., inhibition) in young adults.

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