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Age of Acquisition and Lexical Retrieval in Bilinguals: A Neurolinguistic Synthesis with Implications for L2 Vocabulary Instruction

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Abstract

In bilinguals, Age of Acquisition (AoA) predicts second language (L2) lexical processing; yet integrated models fail to fully address the neural mechanisms involved. In retrieval tasks, early bilinguals excel better than late learners; brain dynamics differ according to proficiency, modality, and orthographic transparency. Early AoA increases left-lateralized activation in the inferior frontal gyrus (IFG) and middle temporal gyrus (MTG), while late AoA activates domain-general areas such as the dorsolateral prefrontal cortex (DLPFC) and anterior cingulate cortex (ACC). This review examines the relationships among AoA, executive control, and semantic integration by synthesizing 20 studies (2011–2024) that integrate models such as BIA-d and BiLex using fMRI, ERP, and behavioral data. We browsed for AoA-bilingual lexical access studies (2011–2024) using PRISMA-ScR and searched PubMed, Scopus, Web of Science, PsycINFO, and Google Scholar. Adult bilinguals centered around early/late AoA and empirical, peer-reviewed fMRI/ERP designs are covered. Non-English, reviews, and non-AoA comparisons are excluded. The reliability achieved by double-screening was $\kappa=0.88$. Thematic analysis was made attainable by NVivo 14, and the modified Newcastle–Ottawa Scale was used to evaluate rigor. This study examined connectivity between modalities, activation, and N400/P600 components. Early AoA indicates robust N400 for semantic access and automated left-lateralized IFG/MTG activation. Bilateral ACC/DLPFC compensation, delayed/diffuse N400/P600, and perpetual post-proficiency adjustment are all part of late AoA. Immersion reduces late-AoA expressive task deficits, while complicated syntax (like English) strengthens differences. Early learners exhibit cohesive networks, contrasted with late learners' executive-language links, according to BIA-d/BiLex models, emphasizing AoA in lexical competition and representations. AoA-tailored L2 instruction and rehabilitation are influenced by the regulation of lexical efficiency across language-selective or control channels. Neural economy benefits from early engagement; scaffolding is necessary for late learners. Connectivity should be included in models to provide comprehensive views.

Keywords: Age of acquisition, Bilingualism, Lexical access, Neural plasticity, Executive control

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