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How Emotional States Modulate Cognitive Control Strategies across Language-Switching Contexts

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Abstract

Emotional states have been shown to influence language control, but their specific effects on domain-general cognitive control remain unclear. This study investigates how emotional states (positive, negative, neutral) and language switching contexts with different switching frequencies (low: 25%, medium: 50%, high: 75%) jointly modulate executive control among unbalanced Chinese-English bilinguals. By combining a language switching task with a Flanker task within response trials, we explored the dynamic interaction between emotion and cognitive control under varying language demands. Our findings revealed that in medium switching contexts, individuals in negative states allocated fewer cognitive resources to early conflict monitoring (reflected by smaller N2 effects), but recruited more resources during the later conflict resolution stage (reflected by larger P3 effects), resulting in more effective conflict resolution. In high switching contexts, positive states facilitated proactive control, with greater P3 effects in incongruent trials than in congruent trials, whereas negative emotions relied on reactive control as demonstrated by greater P3 effects in congruent trials than in incongruent trials. These findings suggest that emotional states influence cognitive control strategies differently depending on the frequency of language switching. We put forth the Emotion-Context Modulated Adaptive Cognitive Control Model to provide a more comprehensive perspective of bilingual cognitive adaptation under different emotional states.

Keywords: bilingual language control; cognitive control; emotional states; ERPs; language switching frequency