EEG Delta-Beta Coupling in 2-year-old Offspring of Pregnant Persons Receiving a Diet-and-Exercise Intervention: A Randomized Controlled Trial Follow-up

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Abstract

Background: Delta-beta coupling (DBC) is a neural marker of emotion regulation (ER), with elevated DBC linked to cortical over-processing of emotional stimuli. This study investigates the effects of the Be Healthy in Pregnancy (BHIP) intervention, combining a high-protein, energy-controlled diet, nutrition counseling, and physical activity, on offspring DBC. Methods: Pregnant individuals received either the BHIP intervention or usual care. Twenty-four offspring at follow-up completed resting-state EEG at age two using a 128-channel system. DBC was quantified as the correlation coefficient between delta (2–4Hz) and beta (13–30Hz) power across epochs. Group differences were analyzed using Fisher's Z-tests. Results: BHIP offspring exhibited significantly lower DBC in frontal (p=.017), central (p=.014), and parietal (p=.009) regions compared to controls. Conclusion: Reduced DBC reflects a neural profile linked to efficient ER, enabling context-appropriate cognitive resource allocation. These findings suggest prenatal diet and exercise potentially modulate neurodevelopment, warranting validation in larger, more diverse cohorts.

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