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Abstract

Do Adolescents Have a "Brain Without Brakes"? Prefrontal Maturation, an Overactive Amygdala, and Social Responsibility

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Introduction: Human development is a continuous process in which the brain, emotions, and social context interact. One of the central structures is the prefrontal cortex (PFC), which is responsible for planning, decision-making, empathy, and impulse control. The amygdala, a component of the limbic system, is associated with rapid emotional responses, such as fear, anger, alertness, and impulsivity. The amygdala matures before the PFC, which reaches full maturity at approximately 24 to 26 years of age. Thus, particularly during adolescence, intense emotions coexist with mechanisms of self-control and reflection that are still developing, contributing to greater vulnerability to impulsive behavior. **Objective:** To analyze how PFC maturation, amygdala regulation, and neuroplasticity, influenced by biopsychosocial factors, contribute to healthy human development and the development of social responsibility. **Methods:** A narrative literature review of articles published between 2015 and 2025 in the PubMed and SciELO databases. Portuguese and English descriptors were used according to DeCS and MeSH, including "prefrontal cortex," "amygdala," "neuroplasticity," "emotional regulation," "human development," and "social responsibility." Functional neuroimaging studies, systematic reviews, and studies linking brain development to environmental, emotional, and social factors were included. Studies that did not address the interaction between prefrontal–amygdala circuits and the biopsychosocial context or that fell outside the specified period were excluded. **Results and Discussion:** The studies indicate that experiences during childhood and adolescence directly affect the organization of circuits connecting the PFC and amygdala. In contexts of toxic stress, such as domestic violence, abandonment, and the absence of stable caregivers, the amygdala tends to become overactive, interpreting the environment as threatening. This condition is associated with greater impulsivity, difficulty trusting others, aggressive or flight responses, and a higher risk of anxiety and depressive disorders. At the same time, the strengthening of prefrontal regions involved in inhibitory control, decision-making, planning, and empathy may be impaired, limiting the ability to assess consequences and act responsibly toward others and the community. Conversely, enriched environments promote positive neuroplasticity. Children and adolescents exposed to secure emotional bonds, supportive adults, educational opportunities, and psychosocial support show better prefrontal development, greater connectivity with limbic structures, and more balanced emotional responses, with improved self-regulation and reflection and reduced risk-taking behavior.

Conclusion: PFC maturation and its ability to regulate amygdala activity constitute neurobiological foundations for healthy development and socially responsible behavior. Violence, neglect, and inequality may impair this maturation, promoting impulsivity and weakening commitment to the collective good. Conversely, protective environments, inclusive public policies, strong emotional bonds, and educational and psychosocial interventions promote positive neuroplasticity and enhance emotional regulation, empathy, and social responsibility.

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