



REVIEW ARTICLE

Behavioral and neural correlates of emotional development: typically developing infants and infants of depressed and/or anxious mothers[☆]



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KEYWORDS

Infant;
Depressed mothers;
Anxiety;
Face;
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Abstract

Objectives: To describe the main findings of studies of behavioral and neural correlates regarding the development of facial emotion processing during the first year of life in typically developing infants and infants of depressed and/or anxious mothers.

Sources: Comprehensive, non-systematic review of the literature on studies about individual differences in facial emotion processing by newborns and infants over the first year of life.

Summary of the findings: Maternal stress related to depression and anxiety has been associated to atypical emotional processing and attentional behaviors in the offspring. Recent neurophysiological studies using electroencephalogram and event-related potentials have begun to shed light on the possible mechanisms underlying such behaviors.

Conclusions: Infants of depressed and/or anxious mothers have increased risk for several adverse outcomes across the lifespan. Further neurobehavioral investigations and the promotion of clinical and developmental research integration might eventually contribute to refining screening tools, improving treatment, and enabling primary prevention interventions for children at risk.

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PALAVRAS-CHAVE

Lactente;
Mães Deprimidas;
Ansiedade;
Face;
Emoção;
Comportamento

Bases neurais e comportamentais do desenvolvimento emocional: lactentes com desenvolvimento típico e lactentes filhos de mães deprimidas e/ou ansiosas

Resumo

Objetivos: Descrever os principais achados de estudos de correlação entre o comportamento e as bases neurais em relação ao processamento de emoções faciais durante o primeiro ano de vida de lactentes com desenvolvimento típico e lactentes de mães deprimidas e/ou ansiosas.

Fontes: Análise abrangente e não sistemática da literatura de estudos sobre diferenças individuais no processamento de emoções faciais de neonatos e lactentes ao longo do primeiro ano de vida.

Resumo dos achados: O estresse materno relacionado à depressão e ansiedade tem sido associado a alterações no processamento emocional e na alocação da atenção da prole. Estudos neurofisiológicos recentes utilizando electroencefalograma e potenciais relacionados a eventos começam a esclarecer os possíveis mecanismos inerentes a esses comportamentos.

Conclusões: Lactentes filhos de mães deprimidas e/ou ansiosas têm maior risco de problemas de saúde física e mental durante toda vida. O avanço de estudos neurocomportamentais e a promoção de integração entre a pesquisa clínica e de desenvolvimento poderão contribuir para refinar as ferramentas de triagem, melhorar o tratamento e permitir intervenções de prevenção primária para crianças em risco.

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Introduction

The ability to recognize and understand facial expressions of emotion is a fundamental skill in daily interactions with others, and plays a particularly important role early in life, before the onset of language.¹ Face recognition is one of the most salient cues for social interaction and affective communication. Facial expression recognition develops gradually during infancy and childhood, and appears to continue to develop until early adulthood.² During the first year of life, however, the development of visual orientation and the discrimination of different emotions progresses rapidly.³ Over the past several decades, behavioral studies⁴⁻⁶ have used different measures of visual preference to infer aspects of recognition of emotional faces. More recently, new methods to elucidate distinct correlates of brain activation have provided significant contribution to the field. Two of the most used methods, known as electroencephalogram (EEG) and event-related potentials (ERP), are reviewed here.

Evidence has become available that stress exposure during pregnancy and the postnatal period leads to several long lasting detrimental outcomes in the offspring, including behavior and cognitive problems and neurodevelopmental delay.⁷ Studies on maternal negative affective states, including both depression and anxiety, indicate a detrimental effect on the child's health and development, increasing the risk for a wide range of disorders such as low birth weight and preterm birth, cognitive and motor developmental delay, achievement deficits, and psychiatric disorders.⁸ Infants of depressed and anxious mothers have increased vulnerability to cognitive and emotional problems throughout their lifespan.^{7,8}

Psychological stress, depression, and anxiety are closely linked and often coexist.⁷ Approximately 10–20% of women will exhibit symptoms of depression during pregnancy

and/or the postpartum period.⁷ Anxiety disorders in the perinatal period have received more scientific attention only recently and their prevalence is still unclear, yet estimates range as high as 30%.⁹ The outcomes of anxiety and depression are often studied together, as the symptoms frequently overlap, and their coexistence is a marker of severity.^{9,10}

The mechanisms between maternal negative affective states and the infant outcomes are studied both in animal and human clinical research. During pregnancy, maternal stress induces the dysregulation of the hypothalamic-pituitary-adrenocortical (HPA) system, elevating the cortisol levels and inducing sympathetic activation with release of catecholamines.^{7,9} The latter is associated to increased uterine artery resistance, reducing the blood flow to the fetus, with restricted inflow of oxygen and nutrients.^{10,11}

The higher levels of maternal cortisol adversely affect fetal brain development, possibly due to epigenetic dysregulation through alterations in synaptogenesis and neurotransmitter functions.^{11,12} There is evidence of disruption of the fetal HPA system, with adverse physiological and biochemical effects on the fetus and newborn¹⁰ that can persist throughout infancy, resulting in altered infant perception and behavior.

In the postnatal period, maternal anxiety and depression are related to less sensitive and inconsistent care when interacting with infants, providing suboptimal levels of general stimulation, and disrupting the mother-child relationship and the formation of attachments.^{8,13} Accumulating evidence indicates that the emotional environment of the infants' daily experiences influences their developmental trajectory of facial recognition.¹⁴ Typically, the mother is the most present person in an infant's life, and the mother's facial expressions are the most prevalent in their experience.¹⁴ Mothers with depression and anxiety smile less, display more flat affect and negative

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