

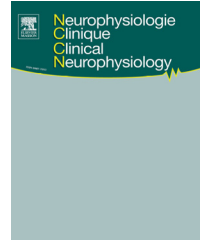


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ORIGINAL ARTICLE/ARTICLE ORIGINAL

# Early perceptual anomaly of negative facial expression in depression: An event-related potential study



*Mise en évidence, au moyen des potentiels liés à l'événement, d'anomalies du traitement perceptif précoce des expressions faciales négatives dans la dépression*

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Received 21 April 2015; accepted 28 September 2015  
Available online 18 November 2015

## KEYWORDS

Depression;  
Negative cognitive  
bias;  
ERP;  
P1;  
N170

**Summary** Depressed patients have a demonstrated cognitive bias in emotional information processing. However, it is unknown how early perceptual processing is modulated by emotional stimuli in depression. To examine this question, we studied 22 depressed patients and 22 healthy controls performing a cued target-response task with emotional facial expression as the cue. The early perceptual processes were examined using event-related potential (ERP) components, i.e., P1 and N170. Results showed that depressed patients had larger P1 amplitudes than healthy controls, implying that early perceptual abnormality for face processing in depression may occur as early as the P1 stage. There was no significant interaction between emotion types and groups on P1 amplitudes, which suggested that cognitive biases in depression might not yet have arisen. Following the P1 stage, N170 amplitudes for sad faces were larger than for other emotion types in depressed patients, whereas N170 amplitudes for happy faces were larger than for other emotion types in healthy controls. These results implied that depressed patients might have a

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**MOTS CLÉS**

Dépression ;  
 Biais cognitif négatif ;  
 Potentiels liés à  
 l'événement ;  
 P1 ;  
 N170

perceptual bias associated with sad emotions, which may be detectable from the N170 time window. In summary, this study provides new insights for understanding the negative cognitive bias in depression using the electroneurophysiological biomarker N170.

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**Résumé**

*Introduction.* – Il a été démontré que les patients déprimés présentaient un biais cognitif dans le traitement des informations émotionnelles. On ne sait cependant pas comment s'exerce cette modulation à un stade perceptif précoce.

*Patients et méthodes.* – En vue d'étudier cette question, 22 patients déprimés et 22 sujets témoins ont été soumis à une tâche stimulus–réponse basée sur l'expression émotionnelle faciale. Les processus perceptifs précoces ont été examinés au moyen des composants P1 et N170 des potentiels liés à l'événement.

*Résultats et discussion.* – L'amplitude du P1 était plus importante chez les patients déprimés que chez les témoins, ce qui implique que les anomalies perceptives précoces dans la dépression peuvent survenir dès le stade du P1. Il n'y avait pas d'interaction significative entre les types d'émotions et les groupes sur l'amplitude du P1, ce qui suggère que les biais cognitifs ne se manifestent pas encore à ce stade. À un stade ultérieur, l'amplitude de la N170 était plus importante en réponse aux visages tristes par rapport à toutes les autres émotions chez les déprimés, alors qu'elle était plus importante en réponse aux visages heureux par rapport à toutes les autres émotions chez les témoins. Ceci implique que le biais perceptuel associé aux visages tristes chez les déprimés est détectable dans la fenêtre temporelle de la N170.

*Conclusion.* – L'utilisation du marqueur neurophysiologique N170 permet de mieux comprendre le biais cognitif négatif dans la dépression.

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**Introduction**

Depression is a mental disorder characterized by a pervasive low mood and anhedonia [12]. Cognitive theories of depression have suggested that depression is characterized by biased processing of emotional information, which may be related to its emotion dysregulation [17]. One theory postulated that existing memory representations lead individuals to selectively attend negative-information from the environment. Beck theorized that themes of loss, failure, worthlessness and other negative traits present in memory representations create a systematic bias in their processing of environmental information that is relevant to these themes [2]. Gotlib and Neubauer have found that these negative themes influence information processing in depression by promoting the salience of negative material and by reducing the salience of positive material [19].

Using emotional stimuli, numerous studies have demonstrated a cognitive bias in depressed patients, observed as enhanced responsiveness and memory specifically to negative materials [15,18,21,25,26]. In a facial recognition task, findings revealed that patients with depression displayed a significantly longer reaction time to sad facial expressions when compared with healthy individuals [15]. According to a meta-analysis of studies assessing recall performance, depressed people remembered 10% more negative words than they did positive words [26]. Cognitive models of depression have been proposed to interpret cognitive bias in depression, suggesting that depression is associated with biases across several stages of information processing, including perception and attention, interpretation and working memory [24]. The existence of

negative biases in perception and attention, interpretation, and memory in depression remains a point of controversy [4,6–8,17,22,34]. Many studies have focused on working memory and have observed a bias specific to sad faces in depression [6,32,34]. However, little is known about how early perceptual processing is modulated by emotional facial stimuli and whether this may lead to a negative bias in depression. Here, we used event-related potentials (ERPs), which provide high temporal resolution, to investigate the time course of early perceptual processes of emotional facial expression in depression.

In healthy people, two early ERP components, P1 and N170, have been widely investigated during early perception of emotional faces [6,23,29,34]. The P1 is a positive-direction component, which appears at parieto-occipital sites around 70–130 ms and is thought to relate to processing of low-level features of stimuli [27]. The N170 is a well-known ERP component that has been specifically related to face processing [3]. For facial stimuli, the N170 has a maximal negative peak around 170 ms at occipito-temporal sites after stimulus onset [3]. Deldin et al. reported that individuals with major depressive disorder (MDD) demonstrated a reduction in the N200 component (i.e., the face-specific N170) to faces [9]. Righart et al. suggested that P1 might reflect an early stage of face detection preceding face configural processing represented by N170 [29]. However, few studies have examined both P1 and N170 to study early perception bias in depression. Additionally, several studies have found inconsistent results on P1 component behavior in depression [7,8]. Dai and Feng found larger overall P1 amplitudes for patients with MDD compared to control participants in a negative affective priming task [8]. However,

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