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Neuro Cognitive Improvement During Pregnancy: An Auditory Event Related Potential (ERP) and Neuropsychological Study

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Abstract

Background: Although there is increasing research interest in auditory cognitive function among pregnant women, little is known about auditory cognitive function during the second (mid) and third trimesters of pregnancy. Therefore, we investigated auditory cognitive and behavioral functions during the mid- and third trimesters of pregnancy using event related potentials (ERPs) and neuropsychological tests, respectively.

Methods: ERPs were examined using a 128-sensor net, and the PAS, WCST, ZCT, RAVLTIM, RAVLTD, RAVLTT were administered as neuropsychological assessment tools. Thirty-nine participants were recruited as a control group (G1, n=15, non-pregnant), mid trimester (G2, n=12, 13-26 weeks), and third trimester (G3, n=12, 26-40 weeks). The auditory oddball paradigm was used during the ERP examination. Subjects silently counted the number of occurrences of a target tone while ignoring the standard tone.

Results: The value of mean differences of two stimuli were measured in case of amplitudes of P50, N100 and P300 ERP components. The highest (significantly) amplitudes were found in three, three and two sites in P50, N100 and P300 ERP components, respectively. Pregnant group (G2 and G3 both) evoked the highest (significantly) amplitudes in three, one and two sites in P50, N100 and P300 components, respectively, comparing with the control group (G1). Within pregnant group, G3 possesses the highest (significantly) amplitudes at 2 sites (out of 3) in P50, 1 site (out of 3) in N100 and 1 site (out of 2) in P300 components. The highest amplitude of P300 was observed in G2 comparing with the G3. G2 subjects achieved the highest (significantly/nearly significantly) scores on the WCST, RAVLTIM; where G1 subjects had the highest score in ZCT among groups.

Conclusion: These findings indicate that pregnant women exhibit good auditory attention, memory and executive function. Pregnant women exhibited better auditory cognitive function in the second trimester compared with those in the third trimester of pregnancy.

Keywords: Pregnancy; Auditory cognition; WCST; PAS; ZCT; RAVLTs; P300; P50; N100

Introduction

Cognitive functioning is essential for the maintenance of social responsibilities, family, and work. Any deficit in cognitive function can have a negative impact on functioning in daily life. Several studies have investigated the cognitive function of pregnant women, often reporting a tendency for pregnant women to be forgetful, with impaired focus [1] and poor memory [2]. Cognitive changes during pregnancy are thought to be related to hormonal fluctuations [3,4] and depression [5]. However, previous studies of cognitive abilities among pregnant women have often involved subjective measures, and cognitive findings may be affected by factors related to depression. Therefore, the current study integrated both objective and subjective tests using event related potentials (ERPs) and neuropsychological tests, respectively. In humans, pregnancy involves three trimesters. Each trimester is associated with fluctuations of sex hormones to support and maintain fetal development. The current study was performed to compare the auditory cognitive function of pregnant women using auditory oddball stimuli in the mid and third trimesters of pregnancy.

The recruitment of neural resources is important for assessing attention deficits among pregnant women. ERPs are an electrophysiological tool that can be used to investigate brain activity during cognitive processing and can play a valuable role in assessing attention by measuring the amplitudes and latencies of various ERP components. ERP measurement enables evaluation of electrophysiological signals from the brain that occur directly after the