



*Faculty of Medicine - Ain Shams University*

**Event-Related Potential ( P<sub>300</sub> )  
In Normal Children  
( 4 - 6 Years )**

*Thesis*

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For The Master Degree In Audiology**

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# **Introduction and Rationale**



## Introduction and Rationale

P<sub>300</sub> is a late positive endogenous component of event related potentials . It is characterized by a single, large, positive peak which occurs at latency of approximately 300 m.sec. post-stimulus onset after the N<sub>1</sub> - P<sub>2</sub> complex ( *Ferraro and Durrant, 1994* ) .

P<sub>300</sub> occurs when rare stimuli are presented in experimental paradigm involving the auditory, visual or somatosensory systems . P<sub>300</sub> is generated when subjects attend and discriminate stimulus events that differ from one another on some dimensions by noting the occurrence of every target stimulus ( *Polich, 1986* ) . It is relatively unaffected by changes in stimulus parameters but it is sensitive to information-processing demands of the task ( *Rogers et al., 1991* ) . If P<sub>300</sub> appears, it is an indication that the subject recognizes the difference between the target and non target stimuli .

Intracranial recordings of P<sub>300</sub> have suggested that its generation involves multiple subcortical sites ( *Wood et al., 1980* ) . Regions of limbic system particularly the hippocampus and amygdala have been postulated as generators, both on bases of surface electromagnetic recordings ( *Okada et al., 1983* ) and intracranial recordings ( *Squires et al., 1983* ) . Thalamus ( *Wood et al., 1980* ) , frontal cortex ( *Wood and McCarthy , 1985* ) and auditory cortex ( *Richer et al., 1983* ) also contribute to P<sub>300</sub> generation.

P<sub>300</sub> seems to be neural correlate of cognitive functions such as decision making, information processing, and short term memory ( *Donchin , 1981* ) . So, it could be used as a clinical tool for assessment of cognitive functions, and its latency is considered to be a measure of speed of cognition ( *Donchin et al., 1986* ) .

$P_{300}$  is studied in normal adults as well as in patients with dementia ( *Goodin , 1990* ), Schizophrenia ( *Baribeau-Braun et al., 1983* ), Alzheimer's disease ( *Chayasirisobhon et al., 1984* ), head trauma and brain tumors ( *Ebner et al., 1986* ).

In children, changes in age and memory span both predicted significant changes in  $P_{300}$  latency and amplitude . In general, as children grow older,  $P_{300}$  latency decreases and its amplitude increases ( *Said et al., 1996* ) . This decrease in latency could be related to the maturation of cognitive process ( *Martin et al., 1993* ).

$P_{300}$  abnormalities have linked to auditory processing disorders ( *Jirsa and Clontz, 1990* ), Down's syndrome ( *Lincoln et al., 1985* ) and psychiatric disorders ( *Diner et al., 1985* ). Low amplitude  $P_{300}$  in children is due to hyperactivity, schizophrenia, and reading disabilities ( *Ciesielki et al., 1990* ).

$P_{300}$  in normal children ( 6 - 12 years old ) was studied by *Said et al. ( 1996 )* . They reported that larger amplitude and shorter latency were encountered in older age group ( 10 - 12 years ) than younger age group ( 6 - 8 years ) .

However, none of the available literature discussed auditory  $P_{300}$  in children below 6 years .

Studying auditory processing using  $P_{300}$  in such children may help in early detection of cognitive disorders and learning disability and consequently helps in their early management . The central test battery, as a tool to diagnose learning disability, could be too lengthy and definitely difficult in such age group .

Accordingly, this study is undertaken to address the variables of  $P_{300}$  in normal young children ( 4 - 6 years ) as an attempt in the diagnosis of cognitive disorders early in life .