

Variability in P3a Index Automatic Orienting Response Dysfunction in Schizophrenic Patients Without Auditory Hallucinations

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PURPOSE

Schizophrenia is characterized by marked disturbances of attention and information processing. **Patients experience difficulty focusing on relevant cues and avoiding distraction by irrelevant stimuli.** However, contradictory results have been reported in studies of event-related brain potential (ERP) responses to stimuli in attentional tasks.

Using the auditory oddball paradigm, the centro-parietal P3b component of the ERP which appears after task-relevant stimuli detection has been consistently reported to be reduced in schizophrenics [1]. However, mixed results have been observed for the novelty P3a, a fronto-central component elicited by task-irrelevant stimuli. Some studies have found novelty P3a amplitude reductions [1] suggesting a disturbed involuntary orienting response in schizophrenia. However, others have observed higher amplitudes than in healthy subjects [2] suggesting increased salience of irrelevant stimuli in certain patients.

Given the clinical heterogeneity of the schizophrenia spectrum disorders, we wished to explore if the **presence/absence of persistent auditory hallucinations, an important phenotype associated with abnormal emotional processing,** could account for the contradictory results reported in the literature.

METHOD

SAMPLE

We studied the **P3b** and **P3a** components of the auditory ERP in three groups of individuals:

11 schizophrenic patients presenting chronic auditory hallucinations (**AH+**);

7 schizophrenic patients free of auditory hallucinations (**AH-**);

10 healthy controls (**HC**).

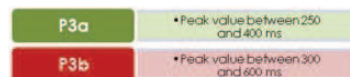
TASK

An **auditory oddball paradigm** containing frequent, infrequent (target) and novel task-irrelevant stimuli was administered. Participants were instructed to ignore the frequent and novel stimuli and to respond as quickly and accurately as possible to the target stimuli. Responses were given by button press.

EEG

The **electroencephalogram (EEG)** was recorded from 19 standard scalp sites (Fp1/2, F3/4, C3/4, T3/4, T5/6, P3/4, O1/2, F7/8, Fz, Cz, Pz) referenced to the two mastoid leads.

Fig. 1: Peak values corresponding at P3a and P3b waves:



ANALYSIS

The statistical analysis was performed using a one-way ANOVA with participant group (AH+, AH-, HC) as factor. Pairwise comparisons were conducted using independent-samples t-tests.

RESULTS

Fig. 2: P3a (green) and P3b (red) means of AH+ patients, AH- patients, and healthy controls.

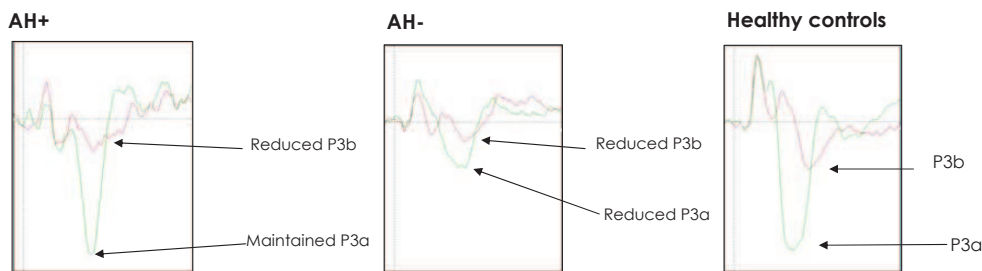


Table 1: Mean±SD: schizophrenic patients with auditory hallucinations (AH+); schizophrenic patients without auditory hallucinations (AH-); Healthy controls (HC).

	AH+	AH-	HC
P3a peak value at Cz as mean±SD	14.4±4.9	6.7±5.5	15.2±7.2
P3b peak value at Pz as mean±SD	5.4±4.5	3.9±4.1	9.3±4.9

✓Results showed that compared to controls, both **AH-** and **AH+** schizophrenic patients showed reduced amplitudes of the **P3b**.

✓No differences were found between the patient groups for this component.

✓Regarding the **P3a**, **AH-** patients showed reduced amplitudes of this component when compared to controls.

✓On other hand, **AH+** had P3a amplitudes that did not differ from those of controls and that were significantly larger than those of the **AH-** patients.

Thus, whereas the **P3b** was similarly reduced in the two patient groups, the amplitude of the **P3a** was not homogeneous in the schizophrenic population and depended on the presence or absence of auditory hallucinations.

CONCLUSIONS

Whereas cognitive processes indexed by the **P3b** such as **updating of working memory and stimulus categorization** appear to be impaired in most schizophrenic patients...

... the automatic orienting response to novel stimuli is preserved in patients experiencing auditory hallucinations

... These findings suggest that: different neurocognitive deficits may be responsible for the variability in perceptual symptoms within the schizophrenia-spectrum disorders.

Additionally, they support the notion that 'aberrant salience' may be involved in the genesis of certain psychotic symptoms such as **persistent auditory hallucinations**.

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Reference(s): [1] Cortiñas, M., Corral, M. J., Garrido, G., Garolera, M., Pajares, M., & Escera, C. (2008). Reduced novelty-P3 associated with increased behavioral distractibility in schizophrenia. *Biological psychology*, 78(3), 253-260. [2] Schall, U., Catts, S. V., Karayanidis, F., & Ward, P. B. (1999). Auditory event-related potential indices of fronto-temporal information processing in schizophrenia syndromes: valid outcome prediction of clozapine therapy in a three-year follow-up. *The International Journal of Neuropsychopharmacology*, 2(02), 83-93.