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Event-related potentials and thought disorder in schizophrenia

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Abstract

We examined the relationship between event-related potentials and thought disorder in schizophrenia. The subjects were 29 chronic schizophrenic patients. Thought disorder was assessed using the Comprehensive Index of Positive Thought Disorder developed by Harrow and colleagues (Harrow, M., Quinlan, D., 1985. Disordered Thinking and Schizophrenic Psychopathology. Gardner Press, New York; Marengo, J.T., Harrow, M., Latin Kettering, L., Wilson, A., 1986. Evaluating bizarre–idiosyncratic thinking: a comprehensive index of positive thought disorder. Schzophr. Bull. 12, 497–511). Auditory event-related potentials were recorded during a standard oddball task. The P300 amplitude correlated negatively with the severity of the thought disorder. The P300 amplitude in the patients with thought disorder was significantly smaller than in the patients without thought disorder. These results suggest that a reduction in P300 amplitude *is associated with* a fundamental impairment of information processing in schizophrenic patients.

Keywords: Event-related potential; P300; Rating scale; Schizophrenia; Thought disorder

1. Introduction

Since the description of Bleuler (1911/1956), thought disorder (TD) has been recognized as a fundamental and primary dysfunction of schizophrenia. Although it is not easy to clinically evaluate the nature and the severity of TD, a number of rating scales that assess the severity of this disorder have recently been developed (Andreasen, 1986; Solovay et al., 1986; Harrow and Quinlan, 1985). The Comprehensive Index of Positive Thought Disorder (CIPTD) (Marengo et al., 1986) is one such scale that has proved useful in quantitatively assessing the positive TD in schizophrenic patients. The CITPD is relatively short and easy to administer, and was found to be a satisfactory tool for evoking idiosyncratic and bizarre responses in those with a potential for disordered thought (Harrow and Quinlan, 1985).

A reduced P300 amplitude of event-related potentials (ERPs), particularly in the auditory task, is one of the most consistently replicated biological observations in schizophrenia, and has been assumed to be a vulnerability marker for this disease (Pritchard, 1986; Ford et al., 1992). This finding has also been regarded as an electrophysio-

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logical trait marker of schizophrenia, since it is observed in patients' siblings (Saitoh et al., 1984) and in high-risk children (Friedman et al., 1982). Although several studies have reported a relationship between P300 and TD in schizophrenia, there have only been a few studies that used a comprehensive rating scale for TD. In the present study, we examined the relationship between ERP measures and TD assessed using the CIPTD in chronic schizophrenic patients.

2. Methods

2.1. Subjects

Twenty-nine right-handed chronic schizophrenic patients (15 males and 14 females) in remission, who provided written informed consent, were included in this study (mean age, 34.7 years; SD 11.6). They had a mean age at onset of 23.7 years (SD, 7.4), and a mean duration of illness of 11.1 years (SD, 10.1). All of them met the DSM-IV criteria for schizophrenia (American Psychiatric Association, 1994). The subjects were receiving antipsychotic medication, and the mean daily dosage in chlorpromazine equivalents (Davis, 1976) was 1244 mg (SD, 1515). Symptoms present on the day of testing were rated with the Positive and Negative Syndrome Scale for Schizophrenia (PANSS) (Kay et al., 1987). The mean score was 16.0 (SD 5.7) for the positive subscale, 19.9 (6.3) for the negative subscale, and 35.7 (8.4) for the general psychopathology subscale. These values indicated that the symptoms of these patients were mild.

2.2. ERP recording

The subjects performed a two-tone auditory discrimination task (oddball task) in a sound-proof room. They were presented with a series of 270 auditory stimuli with a fixed interstimulus interval of 1500 ms. Eighty-five percent of the stimuli were tones of 1000 Hz, and the other 15% were tones of 2000 Hz. Stimuli were presented in a Bernoulli sequence. The subjects were instructed to press a button as quickly as possible upon hearing the infrequent high-pitch tones. The stimulus intensity was 75 dBSPL, and the tone duration was 50 ms, with a rise/fall time of 10 ms.

The scalp electroencephalogram (EEG) was recorded with Ag/Ag−Cl disc electrodes at Fz, Cz, and Pz monopolarly according to the international 10–20 electrode system, referred to linked earlobes. The bandpass was set at 0.15–120 Hz. Vertical and horizontal electro-oculograms (EOG) were recorded from electrodes placed below and at the outer canthus of the right eye.

EEG samples were acquired every 2.5 ms, beginning 40 ms before and ending 600 ms after the stimulus onset. Trials contaminated by peak to peak potentials of over 100 μV or accompanied by an EOG of over 75 V were eliminated from the averaging. The responses to frequent and rare tones with correct reactions were averaged separately. N100 was defined as the most negative peak between 50 and 150 ms poststimulus at Fz. P300 was defined as the most positive peak between 250 and 500 ms poststimulus at Pz. Amplitudes were measured with respect to an average voltage during the 40 ms prestimulus.

2.3. Assessment of TD

The CIPTD evaluates positive disordered thoughts expressed through verbal and behavioral responses on Gorham's Proverbs test (Gorham, 1956) and the comprehension subtest of the Wechsler Adult Intelligent Scale (WAIS) (Wechsler, 1955). This rating scale includes five categories for disordered thoughts. Categories I–IV are assessments of verbal responses (category I, Linguistic form or structure; category II, Content of the statement, ideas expressed; category III, Intermixing; category IV, Relationship between response and question), and category V is an assessment of the behavior of the subjects during the test. Table 1 shows the categories and subcategories of the CIPTD.

The Proverbs test and the WAIS comprehension subtest were administered to the patients. The subjects' responses and the testers' questions were tape-recorded so that they could be transcribed verbatim. As enough information was not available