Brief Report

Normal P50 Gating in Unmedicated Schizophrenia Outpatients

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Objective: The hypothesis of a sensory gating defect in schizophrenia has been supported by studies demonstrating deficient auditory P50 gating in patients. P50 gating is the relative attenuation of P50 amplitude in the auditory evoked potential following the second auditory stimulus of a stimulus pair.

Method: Auditory evoked potentials of 12 unmedicated male patients with schizophrenia and 24 healthy men were recorded during three runs of 40 click pairs. Three alternative waveform-processing strategies were used to analyze the data.

Results: Regardless of strategy used, the differences between subject groups regarding P50 amplitude and gating were nonsignificant.

Conclusions: The P50 gating in the patient group was normal. The results do not support the concept of the P50 gating defect as a general trait marker of schizophrenia.

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Deficiency in auditory P50 gating has supported the theory of sensory gating defects in patients with schizophrenia. In the setting of a larger, cross-modal investigation of sensory gating in schizophrenia, we recorded auditory P50 gating in a group of unmedicated schizophrenia patients and healthy comparison subjects.

Method

Patients with schizophrenia (N=12) were included if they were not currently receiving medication and had no history of substance abuse with the exception of tobacco. DSM-IV diagnoses (preceding 4 weeks and lifetime) were confirmed with the Schedules for Clinical Assessment in Neuropsychiatry (1). Healthy comparison subjects (N=24) were also assessed with the Schedules for Clinical Assessment in Neuropsychiatry interview; no family history of psychiatric disease was allowed. The Scale for the Assessment of Positive Symptoms and Scale for the Assessment of Negative Symptoms were used to derive the scores within the three symptom dimensions of schizophrenia (2). All subjects gave informed written consent as approved by the Ethics Committee, and they were paid to participate in the experiment.

During recording, the subjects were seated comfortably upright with closed eyes in dim light and with background masking low level white noise. Subjects were allowed to smoke during predetermined study breaks. Among other tests, three runs of the auditory gating paradigm were recorded within 6 hours in a fixed order. The three recording runs of 40 paired stimuli, the paradigm, the equipment, set-up, and peak detection were similar to earlier recordings in our laboratory (3). Sweeps were rejected when the electro-oculogram recordings exceeded ±70 μV, baseline-corrected with the mean of samples –40 to 0, and filtered with a bandpass of 10–50 Hz (rolloff of 12 dB/octave) (4). Two alternative waveform-processing strategies were applied to the data, one that included a very elaborate range of artifact rejections (5, 6) and the other which used a wide baseline, causing detrending of the waveform (7). Mann-Whitney U tests were used to test for sig-

TABLE 1. P50 Amplitude Following First Auditory Stimulus (S1) and Second Auditory Stimulus (S2) and Auditory P50 Gating (S2/S1) in Healthy Subjects and Patients With Schizophrenia

Waveform-Processing Strategy[a] and Amplitude Measure	Comparison Subjects						Patients With Schizophrenia					
				Percentiles						Percentiles		
	N	Mean	SD	25%	50%	75%	N	Mean	SD	25%	50%	75%
Intermediate frequency bandpass (10–50 Hz)												
S1 (μV)	22	2.52	1.39	1.41	2.14	3.02	12	2.56	1.63	1.16	2.09	4.52
S2 (μV)	22	1.01	0.84	0.41	1.01	1.42	12	0.89	0.71	0.13	0.97	1.33
S2/S1	22	0.40	0.30	0.15	0.40	0.53	12	0.32	0.24	0.04	0.33	0.53
Elaborate artifact rejection												
S1 (μV)	23	3.78	2.13	1.96	3.58	5.07	11	4.76	2.87	2.01	4.81	7.81
S2 (μV)	23	1.78	1.62	0.87	1.36	2.32	11	2.12	1.17	1.73	1.94	3.36
S2/S1	23	0.47	0.39	0.24	0.39	0.63	11	0.49	0.27	0.26	0.47	0.71
Wide baseline												
S1 (μV)	24	2.91	2.15	1.43	2.25	3.40	10	3.12	1.98	1.11	3.18	4.31
S2 (μV)	24	0.87	1.58	0.01	0.19	1.24	10	0.88	0.93	0.01	0.56	1.65
S2/S1	24	0.26	0.36	0.01	0.07	0.56	10	0.46	0.57	0.02	0.11	0.91

[a] S1 and S2 denote peak-to-peak amplitudes except in the wide baseline processing strategy, where amplitudes are baseline-to-peak.

nificance of difference by group, and Spearman correlations (significance level $p<0.01$) were used to determine the relationship between gating and subject variables.

Results

Twelve male schizophrenia patients (catatonic type [295.20]: N=1; paranoid type [295.30]: N=3; residual type [295.60]: N=1; undifferentiated type [295.90]: N=5; schizophreniform disorder, provisional [295.40]: N=1; and schizoaffective disorder, bipolar type [295.70]: N=1) and 24 healthy men were included. The mean age of the entire sample was 30.7 years; there was no difference between groups. However, the groups differed regarding the number of cigarettes smoked on the day of recording (healthy subjects: mean=1.3 [SD=2.7]; schizophrenia patients: mean=4.5 [SD=3.8]; Mann-Whitney test for independent samples: $z=-2.74$, $p=0.01$) but not regarding habitual smoking. Two of the patients were drug naïve, and the others had been without medication between 1 and 210 months (mean=54, SD=72). Illness duration ranged from 0.5 to 23 years (mean=9.5, SD=8.7), and cumulated total duration of former antipsychotic treatment ranged from 0 to 28 months (mean=8.8, SD=9.7). Mean symptom scores were 4.3 (SD=2.3) for positive symptoms, 6.8 (SD=4.5) for negative symptoms, 2.9 (SD=2.6) for disorganized symptoms, and 14.0 (SD=4.0) for total sum of scores.

The healthy comparison subjects had a gating ratio of 0.40 (SD=0.30), and the patients with schizophrenia had a gating ratio of 0.32 (SD=0.24). When the two alternative processing strategies were followed, the lack of between-group differences was also evident (Table 1).

No significant correlations were found between gating and age or consumption of cigarettes. Likewise, in the patients with schizophrenia, no correlations with gating were seen for the aforementioned illness parameters.

Discussion

The expected deficiency in P50 gating in the patient group was not observed. Most published studies have reported significantly increased gating ratios between 0.75–0.90 in schizophrenic patients (5–9). A negative finding has only been published once (10), and it was criticized for the stimulus being 10 msec long.

Smoking affects gating differentially in comparison subjects and patients (11). This was a major concern in the planning of the experiment, but no correlation between smoking and gating was seen across or within groups.

The long hours of continuous experimental recording have not been encountered before in studies of P50 gating. Arousal increment due to a painful stimulus or an embarrassing task decreases gating (4, 12, 13), and while for a short time in a neurophysiological laboratory, the patients could be more aroused than the comparison subjects. This difference is more likely to be evened out across several hours of recording.

Only a few studies have included patients with a drug-free period slightly resembling the long time seen in the present patient group (6, 7). The patients were disabled by their illness, but they were not severely disorganized, aggressive, or paranoid patients. However, a difference in symptoms does not seem to explain the normal gating, since stable unmedicated patients (6) and schizotypical personality disorder patients (14) have shown a gating impairment. Further studies are necessary to investigate if the gating defect serves as marker of a specific subgroup within the schizophrenia spectrum or if the state sensitivity of the P50 gating measure should lead to the prescription of highly standardized experimental procedures to sustain the findings of deficits in schizophrenia.

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