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Schizophrenia Research 32 (1998) 59–62

SCHIZOPHRENIA RESEARCH

Short Communication

Increased repetition blindness in schizophrenia patients and first-degree relatives of schizophrenia patients

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Received 20 December 1997; accepted 12 March 1998

Abstract

This study investigated the phenomenon of repetition blindness in schizophrenia patients and first-degree relatives of schizophrenia patients. Twelve schizophrenia patients, 13 siblings of schizophrenia patients and 26 normal controls were tested on their ability to detect the repetitions within rapidly presentated visual word lists. Schizophrenics and their relatives showed increased repetition blindness compared with normal controls. This suggests a deficit in rapid information processing in schizophrenia. © 1998 Elsevier Science B.V. All rights reserved.

Keywords: Early information processing; Relatives of schizophrenics; Repetition blindness; Schizophrenia

1. Introduction

How do we separate events in time? When events happen in a rapid sequence, we sometimes perceive two events as one. Repetition blindness refers to a failure to detect the repetition of a target within a rapid, serial presentation of visual stimuli (Kanwisher, 1987; Kanwisher and Potter, 1989). This phenomenon is very robust for presentation rates of six stimuli per second or faster. Repetition blindness is not a simple sensory phenomenon. It has been demonstrated with words, objects, colors, letters, homophones and combinations of objects and words that have the same semantic meaning (Kanwisher, 1991; Bavelier and Potter, 1992; Bavelier, 1994; MacKay and Miller, 1994). Even when the stimuli words are written in different cases or spatially distinguished, repetition blindness still occurs. Hence, semantic features of the stimuli seem important. Kanwisher (1987) suggests that repetition blindness arises from recognizing 'types' (e.g. the word 'canary') without individuating 'tokens' (e.g. second instance of the word 'canary') of the same 'type'.

Schizophrenia patients show abnormalities in a variety of attentional functions (Nuechterlein and Dawson, 1984; Cornblatt and Erlenmeyer-Kimling, 1985; Posner et al., 1988; Beech et al., 1989; Granholm et al., 1996; Park et al., 1996). They also show deficits in temporal prcocessing of visual and auditory stimuli at rapid presentation rates (Schwartz et al., 1988; Weiss et al., 1992; Green et al., 1994; Green and Nuechterlein, 1994).

However, many of the deficits shown in schizophrenia are often confounded by medication effects or a general cognitive deficit related to the illness. For these reasons, it is particularly interesting if corresponding cognitive abnormalities are also

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PII: S0920-9964(98)00035-8

found in clinically unaffected, medication-free, first-degree relatives of schizophrenia patients. We examined the repetition blindness effect in schizophrenia patients and first-degree relatives of schizophrenia patients, with a rapid serial visual presentation (RSVP) of word lists.

2. Methods

2.1. Subjects

Twelve chronic schizophrenia outpatients were recruited from a private psychiatric hospital. Thirteen healthy, unmedicated first-degree relatives of schizophrenia patients were recruited by using a family database from the same hospital. The relatives were siblings of the schizophrenia patients who participated in this study. Twenty-six age-matched normal control subjects were recruited from the same urban area. Schizophrenia patients met the criteria for DSM diagnosis using the SCID. All patients were receiving antipsychotic medication. Subjects were excluded if they had any history of brain injury or substance abuse. Relatives did not have any DSM Axis1 diagnoses. All the relatives and normal controls were medication-free. All subjects had normal vision or corrected to normal vision, and all subjects could read the stimuli words (about 4 cm × 1 cm) at a distance of 60 cm from the computer screen.

There was no significant difference in age of the three subject groups [$F(2,48)=1.4$, $p>0.24$]. The mean ages of schizophrenics, relatives and controls were 35.8 (s.e.=2.9), 34.2 (s.e.=1.9) and 30.8 (s.e=1.9), respectively. There was a significant difference in the number of years of education. The relatives (mean=15.8 years, s.e.=0.6) were better educated than the other groups [$F(2,48)=4.3$, $p<0.02$]. However, there was no significant difference between the schizophrenia patients (mean=14.5 years, s.e.=1.5) and the controls (mean=14.3 years, s.e.=1.8) in education.

2.2. Design

All procedures, designs and stimuli were constructed to approximate Kanwisher's original repetition blindness experiment (Kanwisher, 1987) as closely as possible. Stimuli were lists of words presented in a very rapid sequence. Each list contained eight concrete nouns (seven nouns plus one repetition). All nouns were five or six letters long and were matched for frequency (Kucera and Francis, 1967). The words were either presented in capital letters or in lower case. Within each list, one target word was chosen to occur in two different serial positions (i.e. repeated). Subjects were asked to identify which one was repeated. The case of the first word always differed from its repeat. Therefore, the repeated words were semantically identical but physically distinct (e.g. LEMON vs. lemon). In half of the lists, the first target word was capitalized, and the repeat was in lower case. In the other half of the lists, the reverse was true. Half of the intervening words were capitalized, and the other half were in lower case. Words were unique to the trial. Two dimensions of the word lists were varied: the rate of word presentation and the number of intervening words between the two targets (lag). There were four different word presentation rates: 117 ms, 150 ms, 183 ms and 250 ms. The number of intervening words between the two repeated target words was varied systematically; one, two, three, four or six words were presented between the two repeated targets. There were 10 list conditions (see Table 1).

The different word presentation rates were blocked. The order of presentation of the 10 list conditions and four presentation rates was counterbalanced across the subjects.

2.3. Procedure

Subjects sat 60 cm from a Macintosh computer fitted with a polaroid filter. A head rest was used to support the head. The subjects were asked to fixate in the middle of the screen and instructed to press the spacebar to initiate a trial. Immediately afterwards, words were presented sequentially to the subjects in the center of the screen. After the eight words were presented, subjects reported the words and identified which one was repeated within that list. Four blocks of 40 lists (160 total) were presented, in addition to 40 practice trials.

Table 1
Design of the list presentation

	Sequential position of the words							
List	1	2	3	4	5	6	7	8
1		TARGET		target				
2		TARGET			target			
3		TARGET				target		
4		TARGET					target	
5					target		TARGET	
6				target			TARGET	
7			target				TARGET	
8		target					TARGET	
9	TARGET							target
10	target							TARGET

3. Results and discussion

The percentage detection of the repeated words was the dependent measure. A repeated measures multifactorial analysis of variance was conducted. There was a main effect of diagnosis on the detection of the repeated words [$F(2,47)=14.5$, $p<0.001$]. Both schizophrenia patients [$F(1,36)=9.6$, $p<0.004$] and the first-degree relatives [$F(1,37)=8.9$, $p<0.005$] were significantly worse at detecting the repeated word than the normal controls. However, schizophrenics and first-degree relatives did not differ in repetition detection [$F(1,23)=0.12$, $p>0.73$].

There was a main effect of the word presentation rate [$F(3,141)=37.1$, $p<0.001$] and a main effect of lag [$F(4,188)=30.9$, $p<0.001$]; for all subject groups, detection of repeated words was more difficult when the presentation rate was faster and when there were fewer intervening words. This result suggests that mnestic factors probably do not contribute to repetition blindness abnormalities since performance improves with longer delays (see Fig. 1).

There was a diagnostic groub-by-lag interaction [$F(8,188)=2.19$, $p<0.029$]. Normal controls performed better than schizophrenics [$F(1,35)=19.5$, $p<0.0001$] and the relatives [$F(1,36)=25.3$, $p<0.0001$] in all lag conditions. The interaction stems from the performances of the relatives and the patients. Relatives performed better than schizophrenics when the lag contained fewer words, but when there were more intervening words, the relatives performed worse than the patients [$F(4, 92)=4.48$, $p<0.01$]. It is interesting to note that under certain conditions, unmedicated relatives perform less accurately than the patients (see Fig. 2). There were no other significant interactions.

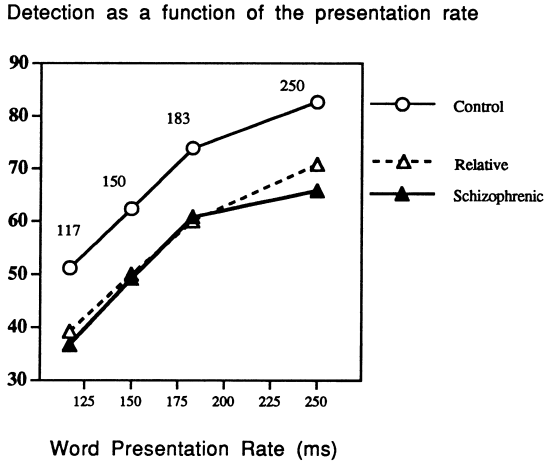

Fig. 1. Percentage detection as a function of presentation rate.

These results suggest that schizophrenia patients and the first-degree relatives of schizophrenia patients may experience increased 'blindness' for repeated words than do normal controls. Schizophrenia patients and their relatives appear to need more time and more intervening words between the repeated target in order to individuate the 'tokens' of a 'type'.

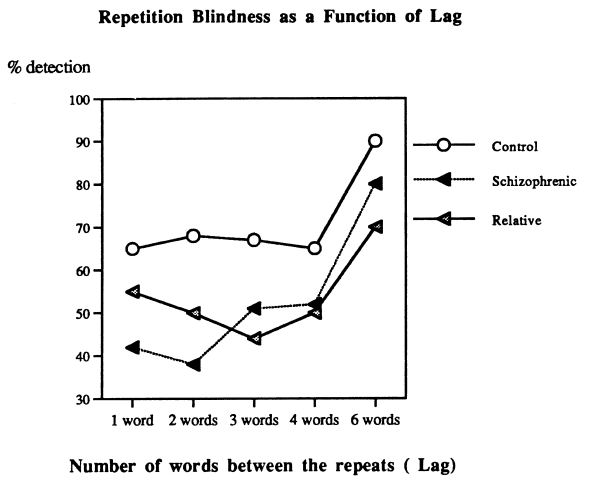

Fig. 2. Repetition blindness as a function of lag.

Patients and the relatives performed almost identically. The performances of schizophrenic patients and relatives were indistinguishable at all presentation rates; both groups were worse than normals. For the lag conditions, although there was no overall group difference between the relatives and the patients [$F(1,23)=0.06$, $p>0.80$], there was an interaction such that patients performed better than the relatives when there were more intervening words.

Although the relatives were free of DSM Axis 1 conditions, we did not screen them for Axis II. Therefore, we do not know whether they were free of schizophrenia spectrum conditions. Nevertheless, it is important to note that they were medication-free. Our finding that unmedicated relatives of schizophrenia patients show abnormal Repetition Blindness may be indicative of informational processing deficits, independent of psychosis or medications.

Acknowledgment

This work was supported by the NARSAD and the Scottish Rite Schizophrenia Program. We are grateful to Satoru Suzuki for helpful comments.

References

Bavelier, D., Potter, M.C., 1992. Visual and phonological codes in repetition blindness. J. Exp. Psychol. Hum. Percept. Perf. 18, 134–147.

Bavelier, D., 1994. Repetition blindness between visually different items: The case of pictures and words. Cognition 51 (3), 199–236.

Beech, A.R., Powell, T., McWilliam, J., Claridge, G.S., 1989. Evidence of reduced 'cognitive inhibition' in schizophrenia. Br. J. Clin. Psychol. 28, 109–116.

Cornblatt, B.A., Erlenmeyer-Kimling, L., 1985. Global attentional deviance as a marker for schizophrenia. J. Abnorm. Psychol. 94, 470–486.

Granholm, E., Asarnow, R.F., Marder, S.R., 1996. Dual task performance operating characteristics, resource limitations, and automatic processing in schizophrenia. Neuropsychology 10, 11–21.

Green, M.F., Nuechterlein, K., 1994. Backward masking in schizophrenia and mania I: Specifying a mechanism. Arch. Gen. Psychiatry 51 (12), 939–944.

Green, M.F. et al., 1994. Backward masking in unaffected siblings of schizophrenic patients: Evidence for a vulnerablility indicator. Arch. Gen. Psychiatry 51 (12), 945–951.

Kanwisher, N., 1987. Repetition Blindness: Type recognition without token individuation. Cognition 27, 117–143.

Kanwisher, N., Potter, M.C., 1989. Repetition Blindness: The effects of stimulus modality and spatial displacement. Memory Cognit. 17 (2), 117–124.

Kanwisher, N., 1991. Repetition blindness and illusory conjunctions: Error in binding visual types with visual tokens. J. Exp. Psychol. Hum. Percept. Perf. 17, 404–421.

Kucera, H., Francis, W.N., 1967. Computational Analysis of Present Day American English. R.I. Brown University Press, Providence, RI.

MacKay, D., Miller, M., 1994. Semantic blindness: Repeated concepts are difficult to encode and recall under time pressure. Psychol. Sci. 5 (1), 52–55.

Nuechterlein, K.H.R., Dawson, M.E., 1984. Information processing and attentional functioning in the developmental course of schizophrenic disorders. Schizophr. Bull. 10, 160–203.

Park, S., Lenzenweger, M.F., Püschel, J., Holzman, P.S., 1996. Attentional inhibition in schizophrenia and schizotypy. Cognit. Neuropsychiatry 1 (2), 125–149.

Posner, M., Pardo, P., Early, T., Reiman, E. et al., 1988. Asymmetries in hemispheric control of attention in schizophrenia. Arch. Gen. Psychiatry 45 (9), 814–821.

Schwartz, B., Mallott, D., Winstead, D., 1988. Preattentive deficit in temporal processing by chronic schizophrenics. Biol. Psychiatry 23 (7), 664–669.

Weiss, K.M., Chapman, H.A., Strauss, M.E., Gilmore, G.C., 1992. Visual information decoding deficits in schizophrenia. Psychiatry Res. 44 (3), 203–216.