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SHORT COMMUNICATION

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Right hemispatial inattention and magical ideation

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Abstract In visual and tactile bisection tasks, healthy subjects have been reported to place the subjective midline towards the left of the objective midline. This phenomenon, known as "pseudoneglect", has been interpreted as a right hemispatial inattention due to hypodopaminergic activity of the left hemisphere mesocortical dopamine system. In schizophrenic patients pseudoneglect was previously found to be correlated with severity of psychotic symptoms. We administered a tactile bisection task (rod centering) to 40 healthy students (20 women and 20 men). All participants also filled in the "Magical Ideation" scale which asks for hallucination-like experiences and delusion-like beliefs. There was no significant pseudoneglect for the group as a whole. However, Magical Ideation scores were significantly correlated to the size of relative right-sided inattention for the 20 men only. On the background of the findings in patients with schizophrenia we conclude that, at least in healthy *men*, susceptibility to schizophrenia-like experiences and thoughts is likewise accompanied by an attentional shift towards the left hemispace.

Key words Pseudoneglect · Tactile bisection task · Cognitive neuropsychiatry · Delusional beliefs · Dopaminergic asymmetry

Introduction

When normal right-handed subjects are required to bisect lines or rods at their midline, they tend to place the subjective midpoint to the left of the actual midpoint, i.e., they show a "pseudoneglect" of the right hemispace [1, 5, 22; 18 for review]. Rather than being due to a greater perceptual saliency of left-sided stimuli, pseudoneglect is thought to "stem from an inherently greater natural tendency to deploy attention to the left" [5; pp. 737–738]. This imbalance in the lateral direction of spatial attention is considered a consequence of an asymmetry in (mesocortical) dopamine turnover between the left and right hemispheres [2, 3, 11, 12].

Of special interest to the topic of the present report is the observation that, in patients with schizophrenia, right hemispatial inattention was found to be correlated with the severity of psychotic symptoms [2, 16]. Assuming that healthy persons' proneness to hallucinate and their susceptibility to misattributions of causality have the same neurocognitive origin as psychotic patients' perceptual aberrations and "false" beliefs [7, 9, 13], we set out to investigate whether or not an analogous correlation could be observed in normal subjects. Specifically, we predicted that the size of right hemispatial inattention in a rod-centering task would be correlated to individual scores on the "Magical Ideation" scale [13]. This 30-item true/false inventory asks for hallucination-like experiences ("I have noticed sounds on my records that are not there at other times") and beliefs in conventionally invalid forms of causation ("Some people can make me aware of them just by thinking about me"). In clinical psychology this scale is of common use for the quantitative assessment of a person's proneness to schizophrenia-like experiences and thoughts ("schizotypy").

Subjects and methods

A total of 40 university students volunteered in the experiment. There were 20 women and 20 men between the ages of 17 and 29 years, right-handed according to a 13-item questionnaire [10], and without prior history of neurological or psychiatric disease, nor any history of learning disabilities or substance abuse. All subjects gave written informed consent to participate in the study approved by the University of Victoria ethics committee.

All subjects were tested individually with a rod-centering task introduced by Harvey et al. [16]. In brief, the blindfolded subjects had to center a rod (20 mm diameter) protruding from a small cen-

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tral tube after repeated tactile exploration of one side at a time with the ipsilateral hand. Pseudo-randomly alternating across trials, initial placement of the rod was either far to the left or right. By stroking down the rod from its right end to the right edge of the tube with the right hand and by analogous left-sided exploration with the left hand subjects had to decide which side was longer and to adjust the rod accordingly. Either side of the rod could be inspected first, and there was no constraint as to inspection time or the number of adjustments with either hand. After a subject had indicated the completion of a trial, magnitude and direction of the lateral displacement was established to the nearest millimeter. In 6 trials a short rod (650 mm), and in the other 6 a long rod (880 mm), was used. After the experiment, subjects filled in the Magical Ideation scale.

Results

Magical Ideation

Mean Magical Ideation score was 9.3 (SD = 5.5), women and men not scoring differently from one another ($t(38) = 1.40$, $P > 0.5$).

Rod-Centering task

Because rod length did not affect results in any way, data were collapsed over both rods. There was no significant displacement of the subjective midline to either side for the group as a whole (mean = 0.21 cm to the left; $t(19) = 0.11$, $P > 0.5$); nor did the genders differ from one another ($t(38) = 1.41$, $P > 0.5$). Because a regression analysis revealed a significant Sex by Magical Ideation interaction ($r = 0.41$, $P = 0.01$), men and women were analyzed separately. For the 20 men raw scores on the Magical Ideation scale were significantly correlated with relative neglect of the right hemispace (Spearman rho = 0.52, 95% confidence interval +0.11 to +0.77; $P = 0.023$; Fig. 1), whereas the same correlation was in the opposite direction, but not significant for the 20 women (rho = –0.33, 95% confidence interval –0.64 to +0.13, $P = 0.15$).

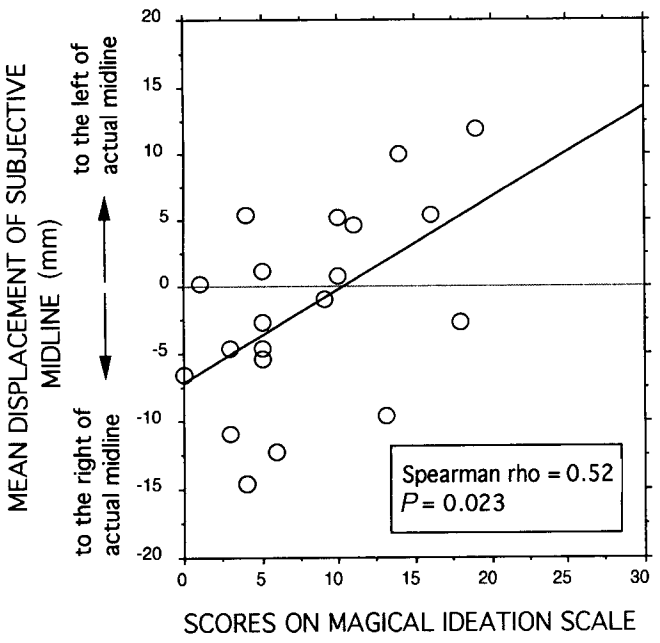

Fig. 1 Size of pseudoneglect (right hemispatial inattention: positive ordinate values) in tactile rod bisection as a function of scores on the Magical Ideation scale (possible range 0–30) for 20 healthy right-handed men

Conclusion

The rod-centering task used in the present study was originally administered to patients with schizophrenia [16]. While in that study there was no significant pseudoneglect for the sample as a whole, the authors reported a direct relationship between relative size of right-sided inattention and the severity of a patient's psychotic symptoms. Likewise, in our experiment, for all 40 healthy participants there was no indication of a pseudoneglect. The hypothesized relationship between size of right hemispatial inattention and degree of schizophrenia-like perceptual experiences and cognitive style was found for the 20 men only. As a cautionary note, we wish to stress that statistically this effect is small and certainly needs to be replicated before one can draw definite conclusions. Nevertheless, our result is consistent with Bracha's [2–4] views on hemispheric asymmetry in mesocortical dopaminergic asymmetry. In particular, a relative hypodopaminergia of the left hemisphere may lead (a) to an attentional bias towards the left hemispace [2–4, 11, 12] and independently, (b) to a disinhibition of the spreading activation within semantic networks and thus the emergence of delusion-like or "magical" thoughts [17, 23]. We note that such a dopaminergic asymmetry could also account for the absence of a regular right-ear advantage [14, 20] and right visual field superiority [6, 8 for reviews] for lateralized lexical decisions in both patients with acute schizophrenia and healthy dextrals high on magical ideation.

The nature of the difference between men and women is unclear. The results for women were not strong enough statistically to support a conclusion that women show a reversed relationship between unusual perceptual experiences and right hemispatial inattention, although this remains a possibility. A more conservative interpretation is that women may show either no relationship or a similar but less strong relationship than do men. In fact, generally less pronounced patterns of lateralization are the rule for healthy women [24]. Moreover, previous work on verbal dichotic listening performance as a function of schizotypy has described an absence of left hemisphere superiority for highly schizotypal men, but not for women [15, 21]. These gender differences led Rawlings and Borge [21; p. 485] to stress "the need for separate analyses for (highly schizotypal) males and females in future research". Our result also appears similar to one recently reported by Makarec and Persinger [19] who found men's, but not women's, latencies to specifically *right* visual field stimuli to be positively correlated to a measure of perceptual

aberrations and "paranormal" thought. These authors' as well as our own experiment suggest that, unlike in patients with schizophrenia [16], in normal subjects gender may be a relevant variable in studies exploring the relationship between schizotypal personality patterns and lateral biases in attention.

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