Highly schizotypal students have a weaker sense of self-agency

Tomohisa Asai, MA and Yoshihiko Tanno, PhD
Department of Cognitive and Behavioral Science, Graduate School of Arts and Sciences, University of Tokyo, Tokyo, Japan

Schizotypy can be seen as an indicator of a predisposition to schizophrenia. It is possible that schizotypal people have an abnormal self-consciousness, especially with regard to the sense of self-agency. Students were rated using the Schizotypy Traits Questionnaire (STA). They were asked to press a button, which generated a tone after some delay. They were then required to judge whether they felt they or someone else had generated the tone. The results showed that the high schizotypy group had a weaker sense of self-agency than the low schizotypy group. The present study used an experimental method to show that schizotypal traits are correlated with an abnormal sense of self-agency.

Key words: schizophrenia, schizotypy, sense of self-agency.

Schizophrenia patients are impaired in perceptual as well as cognitive functions. In the past dozen years, several theoretical models of schizophrenia symptoms have been proposed, often inspired by advances in cognitive neuroscience. It was recently suggested that these models of schizophrenia may also apply to schizotypal traits. Schizotypal people may be seen as indicating a predisposition to schizophrenia. Schizophrenia traits probably exist on a continuum. Relatives of schizophrenia patients score significantly higher on measures of schizotypal personality, which suggests that within the spectrum of schizophrenia disorders there is a range in which schizotypal traits may be expressed and that this range is at least partly genetic.

It has been suggested that people with schizophrenia have an abnormal self-consciousness or self-awareness; people with schizotypal traits might also have an abnormal self-consciousness. One study showed that schizophrenia spectrum disorder in a non-clinical population might involve self-face recognition. Another examined the relationship between schizotypal personality traits and deception, which are correlated with a theory of mind and self-awareness.

Although these studies suggested that schizotypal traits are correlated with an abnormal self-consciousness, they did not focus on self-consciousness directly.

It has been proposed that self-consciousness can be divided into two important aspects: the minimal self, a self devoid of temporal extension, and the narrative self, which involves personal identity and continuity across time. The minimal self includes the sense of self-agency, that is, that ‘I am the one who is causing my own action’ and the sense of self-ownership, that is, that ‘I am the one who is undergoing an experience’. In the normal experience of voluntary or willed action, the senses of self-agency and self-ownership coincide and are indistinguishable. In the case of involuntary action, however, it is possible to distinguish between the senses of agency and ownership.

The abnormal self-consciousness that is correlated with schizophrenia and schizotypal personality traits appears to involve problems with the sense of self-agency.
self-agency. Phenomena such as delusions of control, auditory hallucinations, and thought insertion experienced by patients with schizophrenia may be caused by an abnormal sense of self-agency. Two studies reported that when required to make judgments about the origin of an action while being presented biased feedback, patients with schizophrenia tended to feel that they had reached the origin more than did normal controls.

The relationship between schizotypal personality traits and the sense of self-agency has not been examined previously, although highly schizotypal people are likely to have an abnormal sense of self-agency. The present study examined the relationship between schizotypal personality traits and the sense of self-agency, using the paradigm of a previous study.

**METHODS**

Two hundred and twenty-four students (ages 18–27 years; mean, 19.8 years) consisting of 128 men and 96 women were rated using the Schizotypal Traits Questionnaire (STA) and the Fear of Negative Evaluation Scale–Brief version (FNEB), the latter serving as a negative control. The STA is a 37-item, true–false, self-report questionnaire based on the DSM-III diagnostic criteria for schizotypal personality disorder. It measures schizotypal traits, especially perceptual aberration, which are analogous to positive symptoms including auditory hallucinations, thought insertion, and delusions of control. FNE is a widely used measure that assesses various dimensions of social–evaluative anxiety and its validity is well established. An FNEB is available that contains 12 items from the original 30-item scale, with responses based on a 5-point Likert metric rather than the original true–false format.

Ten students from the top 25% (the high schizotypy group) and eight students from the bottom 25% (the low schizotypy group) participated in the experiment. We sent an email that explained the experimental procedures; subjects applied of their own will. All were right-handed. None had a history of mental disease or hearing difficulties, nor did they report any hearing problems at the time of the experiments. We obtained informed, written consent from all of the participants before the experiments were undertaken. The experiments were conducted in a silent and dark room. The auditory stimuli were created and the experiments conducted using MATLAB (Mathworks, Natick, MA, USA) and Psychophysics Toolbox.

The participants made self-paced key presses with their right index finger and a 1000-Hz tone was generated on a personal computer and presented through headphones for 200 ms after a temporal delay of 0, 15, 30, 45, 60, 75, 90, 105, 120, or 135 ms.

In the sense of self-agency block, the subjects were required to judge whether they felt that they had originated the tone. In the perception of temporal delay block, they were asked to judge whether there was a temporal delay. Instructions were given as follows.

'There are two cases. In one case you might hear the tone as a result of your key pressing, but in another case the experimenter (PC) might have made the tone. All you have to do is to judge whether the tone you heard on the headphone exactly corresponded to that which you have made with your finger without regard for its causative agent (perception of the bias task), or whether you were the one who made the tone you heard on the headphone without regard for its corresponding with what you did (the sense of self-agency task).'

The participants completed 60 trials per block. Both blocks were counterbalanced and the 10 temporal delay stimuli were presented in random order. None of the subjects became ill during the experiments.

The design had two within-participants factors: type of judgmental block (the sense of self-agency and the perception of delay blocks), and temporal delay (0-, 15-, 30-, 45-, 60-, 75-, 90-, 105-, 120-, or 135-ms delays from the timing predicted) in each high- and low-schizotypy group.

To control for the increase in Type I error in repeated measurements, the degrees of freedom were adjusted using the Greenhouse–Geisser coefficient when appropriate.

The protocol of the present study was approved by the local ethics committee.

**RESULTS**

The sta scores ranged from 0 to 31 with a mean of 13.2 ± 6.6, and FNEB scores ranged from 12 to 60 with a mean of 42.8 ± 9.8, across the entire sample. The two scores were significantly correlated (r = 0.35, P < 0.05). The high-schizotypy group (ages 18–22 years; mean, 19.8 years; five men and five women) had a mean STA score of 21.7 ± 3.3 (range,
18–28) and a mean FNEB score of 47.5 ± 6.8 (range, 34–57). The low-schizotypy group (ages 19–21 years; mean, 20.0 years; four men, four women) had a mean STA score of 5.9 ± 1.9 (range, 2–8) and a mean FNEB score of 40.4 ± 4.8 (range, 32–46). The two groups differed significantly in both scores (STA, \( P = 0.0000 \); FNEB, \( P < 0.05 \)).

We examined the difference between the sense of self-agency and perception of temporal delay within each group (Fig. 1). Repeated measures using analysis of variance (ANOVA) with temporal delay and the two judgmental blocks as the within-subject variables showed that only the main effect of temporal delay was statistically significant (\( F_{3.13,28.20} = 20.9, P < 0.001 \)) in the high-schizotypy group. By contrast, in the low-schizotypy group the main effects of temporal delay (\( F_{3.10,21.73} = 47.6, P < 0.001 \)) and of the difference between two judgmental blocks (\( F_{1.00,7.00} = 7.83, P < 0.05 \)) were significant. These results mean that while the high-schizotypy group judged the sense of self-agency closely according to their perception of the temporal delay, the low-schizotypy group sometimes felt a sense of self-agency despite a perceived temporal delay.

**DISCUSSION**

Although the present study produced some interesting results, the small number of participants means that the findings should be regarded as preliminary. We found that the more distinct the temporal bias became, the more accurately participants could perceive it. However, the more distinct the bias became, the less they felt a sense of self-agency. Although previous studies have suggested that the sense of self-agency becomes weaker as bias becomes more distinguishable,\(^6\) they did not distinguish between the sense of self-agency and the perception of the bias. We showed that there might be a difference between the sense of self-agency and the perception of the bias.

According to Sato and Yasuda this illusionary phenomenon, that the sense of self-agency becomes weaker as bias becomes more distinguishable, is caused by the existence of a discrepancy between the predicted and actual sensory consequences.\(^6\) We measured the perception of delay as the actual sensory consequence and showed that there may be a difference between the sense of self-agency and the actual sensory consequence. This suggests the importance of prediction of consequences in the sense of self-agency. A developmental study showed that 4-year-olds were successful at self-recognition tasks involving delayed video feedback.\(^15\) The results indicated that 4-year-olds, but not 3-year-olds, are able to identify themselves in delayed feedback when they are cognizant that the feedback is presented with short temporal delays. Four-year-olds may thus be able to predict the consequences of their own actions.

Furthermore, we showed that the high-schizotypy group tended to judge that they had not originated the tone, meaning that this group has a weaker sense of self-agency. The highly schizotypal people did not feel a sense of self-agency when they perceived the bias, while the low-schizotypal people did feel a sense of self-agency, even when they perceived the bias to some extent. This suggests that the highly schizotypal people were more realistic in judging the
origin of the action. An abnormal sense of self-agency, which characterizes people with schizophrenia, may be due to abnormal prediction of their own actions. The present results may also be caused by the subjects’ abnormal prediction of their own actions.

It has been shown that schizotypal people may have compromised self-face recognition, which could be correlated with a weaker sense of self-agency. People with schizotypal traits possibly have a lower degree of self-consciousness or self-awareness. The present study focused on the sense of self-agency, which is a component of self-consciousness.

Although the finding that high-schizotypal students have a weaker sense of self-agency is consistent with the idea that schizophrenic experiences, including auditory hallucinations, thought insertion, and delusions of control, could occur because of the feeling that one is not at the origin of one’s own acts, two previous studies have reported that patients with schizophrenia tended to feel that they were at the origin more than did normal controls. This may suggest that schizophrenia is correlated with a stronger sense of self-agency. If schizophrenia patients have a stronger sense of self-agency, why do schizotypal people have a weaker sense of self-agency?

There is the possibility that previous studies simply reflected the abnormal perception of people with schizophrenia; they might have perceived the bias less. In particular, in the Franck et al. study the instruction was ‘Did the movement you saw on the screen exactly correspond to that which you made with your hand?’ The present study focused on schizotypal people, who may be seen as having a predisposition to schizophrenia. It is highly likely, however, that they have normal perception, because schizotypal traits are part of their personality and they do not take medication that could disturb their perception. Focusing on schizotypal people can be an effective way of studying the process of schizophrenia while avoiding the problems that can arise when conducting experiments with schizophrenia patients. We found that highly schizotypal people have a weaker, not stronger, than normal sense of self-agency. Further research should examine this difference in the disorders of schizophrenia.

A recent study showed that the anxiety component of schizotypy accounted for intentional dysfunction in a latent inhibition task. The statistically significant correlation between the STA and the FNEB scores and the statistically significant difference in the mean FNEB scores between the high and the low schizotypy groups suggest that this result may to a degree be confounded by other psychological factors. Further research should examine which components in schizotypy account for the weaker sense of self-agency.

REFERENCES


