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Saccadic eye movements, schizotypy, and the role of neuroticism

Ulrich Ettinger [a,b,*], Veena Kumari [c], Trevor J. Crawford [d], Vanja Flak [b], Tonmoy Sharma [e], Robert E. Davis [b], Philip J. Corr [b,f]

[a] *Department of Psychology, McGill University, Stewart Biological Sciences Building, 1205 Dr Penfield Ave, Montreal, Que., Canada H3A 1B1*
[b] *Department of Psychology, Goldsmiths College, University of London, London, UK*
[c] *Department of Psychology, Institute of Psychiatry, University of London, London, UK*
[d] *Mental Health and Neural Systems Research Unit, Department of Psychology, Lancaster University, Lancaster, UK*
[e] *Clinical Neuroscience Research Centre, Dartford, UK*
[f] *Department of Psychology, University of Wales, Swansea, UK*

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Abstract

We investigated the relationships of anti- and prosaccades with psychometric schizotypy. One aim was to estimate the role of negative emotionality and general psychopathology (i.e. neuroticism) in this relationship. 115 non-clinical volunteers underwent infrared oculographic assessment of antisaccades and prosaccades. Schizotypy was assessed with the Personality Syndrome Questionnaire (PSQ-80), the Rust Inventory of Schizotypal Cognitions (RISC), and Eysenck Personality Questionnaire-Revised (EPQ-R) Psychoticism. Higher positive schizotypy scores predicted increased antisaccade errors (RISC) and greater prosaccade spatial error (PSQ-80 Unreality). Greater thought disorder (PSQ-80 Activity) predicted shorter prosaccade latencies. EPQ-R Neuroticism was substantially correlated with schizotypy but was not related to saccadic measures and did not account for their relationship with schizotypy. We conclude that saccadic performance patterns in schizotypy are not due to negative emotionality or general psychopathology, but specific to schizophrenia spectrum signs and symptoms.

Keywords: Antisaccade; Prosaccade (reflexive saccade, visually-guided saccade); Oculomotor control; Schizotypal personality traits; Neuroticism; Negative emotionality; Endophenotype; Schizophrenia

* Corresponding author. Tel.: +1-514-398-4220; fax: +1-514-398-4896.
E-mail address: ulrich@ego.psych.mcgill.ca (U. Ettinger).

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1. Introduction

The antisaccade task requires the initiation of a saccade in the opposite direction to a peripheral target, thereby involving the suppression of a prepotent, or reflexive, response to the target. Performance is primarily measured as the rate of reflexive errors, i.e. glances towards the target, and has been linked to frontal lobe function, in particular the frontal eye fields (FEF), dorsolateral prefrontal cortex (DLPFC), and anterior cingulate, as well as the striatum (Gaymard et al., 1998b; Müri et al., 1998; O'Driscoll et al., 1995; Sweeney et al., 1996). People with schizophrenia consistently display increased error rates (Crawford et al., 1995a,b; Curtis et al., 2001; Fukushima et al., 1988).

In contrast to the antisaccade deficit, performance on the prosaccade (or reflexive saccade) task has been argued to be relatively normal in schizophrenia (McDowell and Clementz, 2001). The prosaccade task requires the initiation of a saccade to an abruptly appearing target. Prosaccades share some of the basic saccadic neural circuitry with the antisaccade but do not critically rely on FEF, anterior cingulate, or DLPFC (Gaymard et al., 1998a).

The increased antisaccade error rate has been proposed as a schizophrenia endophenotype (Clementz, 1998; Ettinger and Kumari, 2003). An endophenotype, or intermediate phenotype, is a behavioural or biological marker thought to be a more direct expression of a disease gene than the disease phenotype (Leboyer et al., 1998; Ott, 1991). A useful endophenotype must meet a number of criteria. In addition to its observation in the patient group under study, the marker should also be found in related, or spectrum, populations. In the field of schizophrenia research, the most important spectrum populations are: (1) clinically unaffected first-degree relatives of schizophrenia patients and (2) schizotypal individuals. These groups have been identified on the basis of an increased frequency of schizophrenia-related genotypes (i.e. first-degree relatives) or phenotypes (i.e. schizotypal individuals).

An important methodological advantage of studying these spectrum populations is the relative absence of secondary factors confounding psychological or biological measurement in the patient group, such as antipsychotic treatment, hospitalisation, and variable motivation.

Schizotypy refers to temporally stable signs and symptoms (i.e. traits) that are phenomenologically similar to, but of lesser severity than, the full-blown symptoms of schizophrenia. Although the nature of schizotypy has yet to be fully characterised, it is not thought to be a unitary construct; instead, it is believed to consist of a number of dimensions. The most consistent dimensions that have emerged from factor analytic studies of psychometric schizotypy questionnaires are those of *positive* and *negative* schizotypal features as well as *anxiety-related traits* and *psychoticism* (or nonconformity) (Vollema and van den Bosch, 1995). Positive features include signs and symptoms resembling, albeit in less severe form, the clinical schizophrenic symptoms of delusions and hallucinations (or reality distortion) on the one hand and thought disorder (or disorganisation) on the other hand. Negative features involve a reduced interest in interpersonal interaction, loss of volition, and anhedonia. Psychoticism, or nonconformity (also termed tough-mindedness by Eysenck, 1992) was initially hypothesised to be a predictor of psychotic illness; however, it is now thought to be more indicative of subclinical psychopathy-related traits (Corr, 2000).

There is thought to be a link between schizotypy and schizophrenia not only at a clinical (or phenomenological) level, but also at genetic and neurocognitive levels.