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# Habituation of the blink reflex in first-episode schizophrenia, psychotic depression and non-psychotic depression

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**Abstract**

*Objective*: Electrophysiological recording of the electrically elicited blink reflex is the most reliable method of investigating habituation of the startle reflex. The purpose of this study was to compare the habituation and the late R3-component of the blink reflex between control subjects ($N=19$) and first-episode patients with schizophrenia ($N=17$), psychotic depression ($N=23$), and severe non-psychotic depression ($N=25$). *Methods*: The blink reflex was evoked by electrical stimulation of the supraorbital nerve, and the deficient habituation of the R2i-component was measured with a computer-assisted integral area measurement. Prefrontal executive function of the patients was assessed with the Wisconsin Card Sorting Test. Current psychiatric symptoms were assessed with the Brief Psychiatric Rating Scale, the Hamilton Depression Scale, the Positive and Negative Syndrome Scale, and the Calgary Depression Scale. *Results*: Deficient habituation of the blink reflex and occurrence of the late R3 component were associated both with a previous diagnosis of psychotic disorder and with the presence of current psychosis. The sensitivity and specificity of the abnormal habituation of the blink reflex in detecting psychotic disorder were 0.50 and 0.80, respectively. The abnormalities of the blink reflex were not associated with psychotropic medication. In schizophrenic patients, defective habituation of the blink reflex was associated with negative and cognitive symptoms, and in depressive patients with the presence of delusions. *Conclusions*: The deficient habituation of the blink reflex and occurrence of the late R3 component seem to be both trait and state markers of a psychotic disorder. The results suggest that schizophrenia and psychotic depression share some common neurobiological mechanisms involved in the modulation of the startle reflex. 

*Keywords:* Blink reflex; Depression; Dopamine; Habituation; Psychosis; Schizophrenia

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## 1. Introduction

Deficits in sensorimotor gating have constantly been found in schizophrenic patients, and they may render these individuals vulnerable to cognitive fragmentation and thought disorder (Perry and Braff, 1994). Schizophrenic patients have dramatic deficits in the normal inhibition of the startle reflex that occur when the startling stimulus is preceded by a weak prestimulus (prepulse inhibition, PPI), or when the startling stimulus is constantly repeated (habituation). The measurements of the deficits in the PPI and the habituation of the startle reflex have become important tools in biological schizophrenia research and in the development of new antipsychotic drugs (Geyer et al., 1990; Swerdlow et al., 1993, 1994).

The blink reflex (BR) is considered the most persistent component of the generalized startle reflex and, evolutionally, the BR has developed to protect the eyes from potentially harmful stimuli in the face region (Rusworth, 1962; Chokroverty et al., 1992). With electrical stimulation, the reflex response is mediated via the trigeminal sensory afferent fibers and their central connections in the trigeminal and facial brainstem nuclei, while the facial nerve serves as the efferent arch on each side (Kimura, 1989). The BR can be elicited by auditory, visual, mechanical or electrical stimulation. The auditory responses are considered more inconsistent than the visually evoked BRs, and both show larger latency variation intra- and interindividually than the electrically elicited BR (Rusworth, 1962; Yates and Brown, 1981; Tackmann et al., 1982). With electrical stimulation of the supraorbital nerve, the reflex response consists of an ipsilateral early component (R1i), and ipsi- and contralateral late components (R2i and R2c). Ultralate R3i and R3c components of the BR occur when noxious stimulus intensities are used. The striatal dopaminergic inhibition of the brainstem motoneurons has been suggested to play an important role in the regulation of the BR on the basis of decreased or absent BR habituation in parkinsonian patients, and enhanced BR habituation associated with Huntington's chorea (Ferguson et al., 1978). However, it seems that both the dopaminergic and the serotonergic central systems modulate the late BR components and the BR habituation (Geyer et al., 1990; Basso et al., 1993; Geyer and Braff, 1987; Evinger et al., 1993). Other neurotransmitters may also be involved in the modulation of the BR. In the rat, deficits in PPI can be obtained through manipulations of glutaminergic, cholinergic and GABAergic systems (Geyer et al., 1990; Swerdlow et al., 1993).

Psychiatric studies on the BR abnormalities have been carried out almost entirely with schizophrenic or schizotypal individuals, using acoustic or tactile stimulation of the BR (e.g., Braff et al., 1992; Cadenhead et al., 1993). To our knowledge, there has been only one study using more reliable electrical stimulation to elicit the BR response in patients with schizophrenic psychoses (Bolino et al., 1992). As far as we know, the BR abnormalities in individuals with schizophrenia and psychotic depression have not previously been compared, and this is also the first study to analyze the occurrence of the late R3 component in psychiatric disorders. Because age, heavy smoking (often associated with chronic schizophrenia), and long-term antipsychotic medication all influence dopamine turnover (Pohjalainen et al., 1998; Shihabuddin et al., 1998; Geracioti et al., 1999), we studied only first-episode patients in an attempt to minimize these effects. The aims of this study were: (1) to compare the habituation of the BR in first-episode patients with schizophrenia, psychotic depression, severe non-psychotic depression, and healthy controls, and (2) to investigate whether the deficits in the habituation of the BR were associated with psychotropic medication, current psychiatric symptoms, or executive function of the prefrontal cortex.

## 2. Subjects and methods

### 2.1. Subjects

All patients admitted to the Turku University Central Hospital and to the Turku City Hospital in Finland over a 41 month period (1 November 1994 to 31 March 1998) were considered for participation in the study. Inclusion criteria were as follows: (1) diagnosis of schizophrenia or severe major depression with or without psychotic fea-