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Fine Analysis of Abnormal Facial Expressions in Chronic Schizophrenic Patients - A Pilot Study

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Abstract

Objective: Facial expressions seem to be closely related to limbic processes. Abnormal facial expressions were described often in schizophrenic patients, but the specific nature of this disturbance is still unclear. Since facial activity in total seems to be not specifically disturbed in schizophrenics, analysis of movement details during facial expressions could be a more promising tool. Methods: Seven chronic schizophrenic patients (DSM III-R: 295.6, all males and medicated, 32.3±7.3 years) were investigated while watching a humorous movie. Movements of the corner of the mouth were assessed during laughing by a light-signal device with high spatial and temporal resolution. Results: Starting to laugh at an emotional stimulus, schizophrenic patients exhibited a faster speed of left and right corner of the mouth than matched healthy controls (2.02±0.42 cm/s versus 0.82±0.41 cm/s, t-test: p=0.0002). There was no overlap between the two groups. Conclusions: This faster beginning of the facial movement "laughing" could be an objective and specific measure of abnormal facial expression in schizophrenic patients which is correlated to the clinical picture of manneristic and parathymic behaviour. Possibly, the changed movement of starting a facial expression reflects a disturbed transformation of emotions into facial movements in the so-called limbic-motor interface -the nucleus accumbens- in schizophrenic patients (German J Psychiatry 1998; 1: 6-9).

Key words: facial activity, facial expressions, schizophrenia

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Introduction

Disturbances in emotional and mood state are central characteristics in schizophrenic patients. Emotional states are expressed by motor activity in man like locomotor, gestic or facial activity. Facial expressions are the result of movements of the facial muscles which are innervated by the facial nucleus. This nucleus is highly connected to limbic structures (Rinn, 1984). Therefore, facial expressions could reflect dysfunctions in limbic structures in schizophrenics. Facial expressions in schizophrenic patients are often described as bizarre and manneristic movements and were already observed long before the introduction of neuroleptics (Rogers, 1992). With objective methods, facial expressions in psychiatric patients were investigated more or less unsystematically. Using, for example, video analysis, the Facial Action Coding System (Ekman and Friesen, 1978), EMG or computer-based approaches (Schneider et al., 1990), the result of such studies was in general that the facial activity is nonspecifically reduced in schizophrenic and depressed patients with or without medication. Neuroleptics especially induce a decrease in facial activity during treatment (Schneider et al., 1992). It can be therefore assumed that possibly only movement details of facial expressions, but not facial activity in total, are specifically changed in schizophrenic patients. Since it has been suggested that schizophrenic patients are in general

characterised by a dysfunction of the integration of the limbic and the motor system, which is especially visible in the initation and co-ordination of motor programs (Cassaday et al., 1991), analysis of starting a facial movement (so-called "on-set" phase) could be a promising tool to investigate such a specific dysfunction in schizophrenia. Using a new sensitive method for the assessment of facial activity, we measured the initial speed of oro-facial movements induced by emotional stimuli in chronic schizophrenic patients under neuroleptics. Due to the known slowness of reactivity, the negative symptoms and the neuroleptic treatment, slower speed in these patients than in healthy subjects at starting a facial movement was expected.

Material and Methods

Facial activity was measured in 7 chronic schizophrenic inpatients (diagnosed by DSM IIIR (295.6); all males; mean age: 32.3±7.3 years; all treated with different neuroleptics) after stabilisation. All patients showed pronounced residual negative symptoms. Seven matched healthy subjects (males; mean age: 30.4±6.8 years) were used as controls.

The volunteers sat in a comfortable chair and watched a short humorous movie (Loriot: "The oblique picture") presented on a television screen. A special camera recorded high frequency flash signals emitted by light diodes placed at well-defined points of the face (right and left corner of the mouth). Movements of the whole head were extracted by the data of two reference light diodes. Spatial resolution was below 1 mm, temporal resolution was up to 300 Hz. Therefore, it was possible to record very small and brief facial movements exactly. The digitalized signals of the light diodes corresponding to their movements while "laughing" were represented graphically as a function of space and time (Figure 1). A regression line through the points of this curve between the beginning and the maximum of the movement indicates the speed of the corners of the mouth at the begin of "laughing" [cm/s].

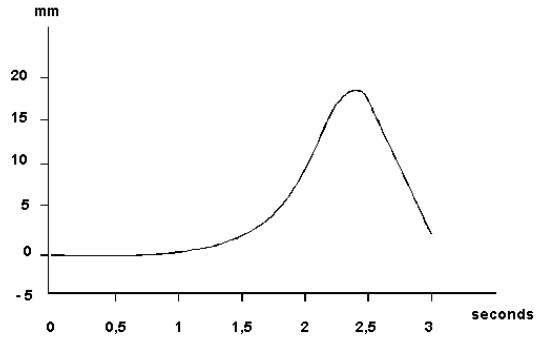

Figure 1. "Laughing" at a humorous movie represented as a line from the signals of a light diode placed at the left corner of the mouth. The speed in starting a laughter was calculated by a regression line through the values between the beginning and the maximum of the movement.

Table 1. Speed of the left and right corner of the mouth (cm/s) in laughing at emotional stimuli (humorous movie) in schizophrenic patients and healthy controls.

Speed	Schizophrenics	Healthy Controls	T-Test
left corner	2.02 ± 0.42	0.82 ± 0.41	0.0002
right corner	1.90 ± 0.61	0.86 ± 0.43	0.003

Results

Schizophrenic patients exhibited a significantly faster speed of movement of the left and right corner of the mouth after emotional stimuli inducing laughter than the healthy controls (Table 1). There was no difference between the left and right corner of the mouth concerning speed in the two groups.

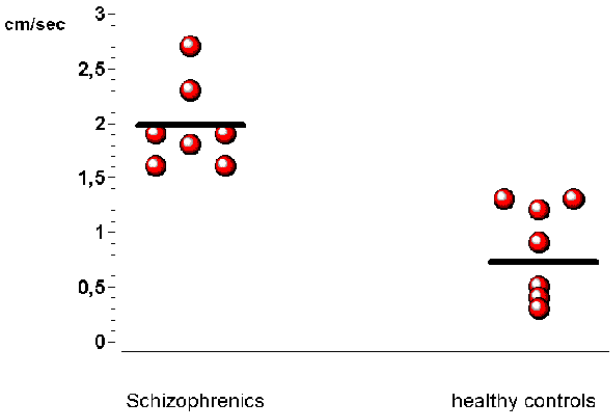

Figure 2. Single values of speed of starting "laughing" in schizophrenic patients and healthy controls

Discussion

In contrast to the expectation mentioned above and the literature showing reduced total facial activity in schizophrenic patients, fine analysis of facial expressions in schizophrenics revealed they exhibit a faster initial speed of facial movements than the healthy controls during the start of laughing. This result seems to be remarkable because there is a clear separation between schizophrenic and healthy subjects by this variable. Possibly, this faster speed of starting laughter is correlated to the fast, downward shooting movements in the otherwise very calm face of schizophrenics which are clinically designated as maniristic and parathymic and which was called "mimic disintegration" (Heimann and Spoerri, 1957).

Due to the small sample size, interpretation of the finding is limited. Since there was no difference between the two groups concerning the intensity of emotional experience of the movie, it could be assumed that the transformation of the emotional experience of humour into the facial movement "laughing" is disturbed in schizophrenics. The morphological substrate of this transformation seems to be the so-called limbic-motor interface, i.e. the nucleus accumbens (Mogenson et al., 1980). It is well known that this nucleus plays an important role in starting motor programs induced by emotional processes in limbic structures (Heimer et al., 1982). The volume of the nucleus accumbens and the neurone number are reduced in schizophrenic patients (Bogerts et al., 1990; Pakkenberg, 1990). Since the dopaminergic and serotonergic system are involved in modulating neuronal excitability of the nucleus accumbens as well as in the pathophysiology of schizophrenia, it can be speculated whether or not disordered motor activity in schizophrenic patients may be caused by dysfunctional dopaminergic and serotonergic neurotransmission in the nucleus accumbens. This will be investigated by different pharmacological interventions in a current study.

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