

Shyness and sociability in a sample of Egyptian patients with schizophrenia and its relation to resting frontal EEG

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Introduction

One of the most disabling features and consequences of schizophrenia is the marked impairment of social skills.

Aim of the study

The aim of this study is to determine the relationship between premorbid shyness and negative symptoms and resting frontal quantitative EEG alpha activity in patients with schizophrenia.

Methodology

Forty patients with schizophrenia were selected successively in a cross-sectional study. The patients were assessed using The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disease Axis of Disorders, Positive and Negative Syndrome Scale, The Revised Cheek and Buss Shyness, and Sociability Scale. Quantitative EEG was carried out and assessed for frontal alpha asymmetry.

Results

Ninety-seven percent of the patients showed asymmetrical frontal alpha EEG activity and 85% showed right resting frontal alpha EEG asymmetry. Patients with right frontal asymmetry showed higher PANSS-negative and shyness scores than those with left asymmetry.

Conclusion

The negative symptoms of schizophrenia and premorbid shyness could be related to right frontal resting alpha EEG asymmetry.

Keywords:

negative symptoms, QEEG alpha asymmetry, schizophrenia, shyness

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Introduction

One of the most disabling features and consequences of schizophrenia is the marked impairment of social skills [1]. Negative symptoms of schizophrenia such as decreased spontaneous movements, poor eye contact, and social withdrawal are especially detrimental to normal social interactions and are inversely correlated with social skills' performance [2]. These behavioral deficits are also associated with a poor prognosis, cognitive impairments, and reduced functioning [3].

Behavioral deficits in social functioning such as poor eye contact and social withdrawal are also characteristics of temperamental shyness [4], although there is research suggesting that stable individual differences in personality do exist among individuals with schizophrenia [5] and can possibly influence the severity and symptoms of the pathology [6].

It has been reported that hospitalized patients with schizophrenia experience greater shyness than controls [7]. More recently, another study found a higher degree of early shyness and sociability troubles in patients than controls [8] and greater relative right resting frontal

EEG activity (a trait marker of stress) in patients with schizophrenia who were shy [9]. These findings have important implications in light of research suggesting that early biological and behavioral antecedents of shyness and social withdrawal are identifiable in infants and young children, are linked to sensitivity of forebrain limbic and frontal cortical areas, and produce dysfunction in one's ability to regulate social stress [4].

Healthy adults and children who exhibit right frontal EEG asymmetry at rest are easily distressed, fearful, and shy, whereas those who exhibit left frontal EEG asymmetry at rest are socially outgoing and extroverted [10,11]. Because the pattern of frontal EEG asymmetry at rest is stable across time and its appearance early in life is predictive of later personality, some have argued that this metric may be 'trait-like' [11,12].

Some studies found that adults with schizophrenia scored significantly higher on measures of premorbid behavioral inhibition and trait measures of shyness compared with healthy adults [8], and that measures of trait shyness were immutable to change following weekly social skills' training over a 7-month period [13]. Another study revealed that high trait shyness was related to greater

relative resting right frontal EEG activity, whereas high trait sociability was related to greater relative resting left frontal EEG activity [13].

Aim of the study

To study the relationship between premorbid shyness, negative symptoms, and resting frontal alpha EEG activity in patients with schizophrenia.

Patients and methods

After receiving approval from Research Ethical Committee Review in Kasr El Aini hospital, 40 patients with schizophrenia diagnosed by Lecturer of Psychiatry according to Diagnostic and Statistical Manual of Mental Disease, 4th edition [14] criteria were recruited from the psychiatric outpatient clinic of Kasr El Aini hospital. This is a cross-sectional study. All patients gave consent to participate in the study after a full explanation of procedures was provided. Both sexes were included and the age range was 20–50 years. We excluded patients with other psychiatric disorders, mental retardation, organic brain disorders, especially epilepsy, and substance-induced psychiatric disorders. Forty control cases (healthy volunteers among the medical and paramedical personnel staff of Kasr El Aini university hospital) were chosen from an alphabetical computer list of employees of the hospital. All the scales showed absence of psychopathology in the control group. They were matched in terms of age and sex.

Psychometric tools

Semistructural interview

A specially designed semistructural interview derived from the Kasr El Aini psychiatric sheet was used to collect demographic data, personal data, past history, and family history.

The structured clinical interview for the Diagnostic and Statistical Manual of Mental Disease Axis of Disorders (severe combined immunodeficiency-I) [15]

The structured clinical interview for Diagnostic and Statistical Manual of Mental Disease, 4th edition axis I disorders, severe combined immunodeficiency-I, provides a broad coverage of axis I psychiatric diagnosis according to Diagnostic and Statistical Manual of Mental Disease, 4th edition.

Positive and Negative Syndrome Scale [16]

Each scale comprises seven symptoms that are rated on a 1 (absent) to 7 (extreme) metric.

The Revised Cheek and Buss Shyness and Sociability Scale [17]

The scale was translated and back translated to the Arabic language. These two scales comprised a 20-item self-report questionnaire. Sample items from the shyness scale include 'I don't find it hard to talk to strangers'

(scored in reverse direction). Sample items from the sociability scale include 'I like to be with people', and are scored on a 0–4 metric, with high scores showing shyness and sociability for the two scales.

EEG mapping was carried out as an outpatient procedure during the daytime with a recording time of 30 min: 15 min with the eyes open and 15 min with the eyes closed. We used a 14-channel digitalized Schwarzer BrainLab 4 GmbH (Germany), medical diagnostic equipment. The EEG surface electrodes were positioned according to the 10/20 system of the International Federation, with an electrode impedance below 10 Kohm, and ear lobe electrodes served as a reference [18]. The EEG was recorded from the left and right anterior and posterior regions of the scalp (i.e. mid-frontal, F3 and F4, and parietal, P3 and P4).

The EEG activity was collected in the parietal region in order to examine whether asymmetry differences were specific to the frontal region.

EEG data reduction and quantification

The EEG data were visually scanned for artifacts because of movement (e.g. eye blinks and body movements). If an artifact was present in one channel, then data in all channels were excluded. All artifact-free EEG data were analyzed using a discrete Fourier transform. Regional EEG power was derived in the alpha (8–13 Hz) frequency band separately for the EO and EC conditions. Because the EEG power in the EO and EC conditions was highly related for each of the sites, a composite measure of resting EEG alpha power was computed separately for each EEG site by averaging power in the EO and EC conditions. This aggregate measure is known to produce a more reliable estimate of EEG power and asymmetry than separate EO and EC conditions [12]. A separate EEG asymmetry measure was then computed for the frontal (i.e. F4 alpha power minus F3 alpha power) and parietal (i.e. P4 alpha power minus P3 alpha power) regions. Because EEG power is inversely related to activation, negative values on the frontal asymmetry metric reflect greater relative right EEG activation [19].

After calculating the difference between F3, F4 and P3, P4 for each participant, whether case or control, we calculated the average difference for the control cases. Then we took this average as the cut-off limit of asymmetry among the cases. So any patient above average of control was considered as asymmetry.

The statistical methods

Data were statistically described in terms of range, mean $\pm$ standard deviation, and median when appropriate. Comparison between right-side and left-side asymmetry results was carried out using the Mann–Whitney *U*-test for independent samples. The correlation between various variables was assessed using the Spearman rank correlation equation for a nonnormal relation. A probability value (*P*-value) less than 0.05 was considered statistically significant. All statistical calculations were carried out using computer programs Microsoft Excel

2007 (Microsoft Corporation, New York, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, Illinois, USA) version 15 for Microsoft Windows.

Results

Sociodemographic data

There were no statistically significant differences regarding age, sex, marital status, education, and occupation between the patients and the control (Tables 1–4).

Table 1 Comparison between frontal and parietal asymmetry (above average control)

	Frontal		Parietal	
	Frequency	%	Frequency	%
No asymmetry	1	2.5	18	45
Asymmetry	39	97.5	22	55

Table 2 Right and left asymmetry in frontal and parietal (above average control)

	Frontal asymmetry		Parietal asymmetry	
	Frequency	%	Frequency	%
Right	34	85	15	37.5
Left	5	12.5	7	17.5

Table 3 Comparison between clinical variables in right and left frontal asymmetry

	Mean $\pm$ SD		<i>P</i>
	Right frontal asymmetry	Left frontal asymmetry	
PANSS positive	22.7 $\pm$ 8.9	20.4 $\pm$ 9.5	0.6
PANSS negative	28.2 $\pm$ 9.6	18.6 $\pm$ 5.5	0.02
Sociability	22.3 $\pm$ 6.4	30 $\pm$ 4.3	0.01
Shyness	35.7 $\pm$ 7.3	27 $\pm$ 8.4	0.03

PANSS, Positive and Negative Syndrome Scale; SD, standard deviation.

Table 4 Comparison between clinical variables in right and left parietal asymmetry

	Mean $\pm$ SD		<i>P</i>
	Right parietal asymmetry	Left parietal asymmetry	
PANSS positive	23.3 $\pm$ 9.2	21.7 $\pm$ 5.5	0.6
PANSS Negative	27.7 $\pm$ 10.5	26.5 $\pm$ 9.5	1
Sociability	22.9 $\pm$ 6.3	22 $\pm$ 6.4	0.7
Shyness	35.2 $\pm$ 7.9	34.7 $\pm$ 8.4	0.8

PANSS, Positive and Negative Syndrome Scale; SD, standard deviation.

Discussion

Schizophrenia is one of the most debilitating psychiatric disorders, affecting approximately 1% of the population [14]. The clinical manifestations of schizophrenia vary widely in

both symptomology and severity, and recent research suggests that individual differences in personality traits or coping styles may account for part of this variance [6,8]. Also, certain maladaptive personality traits may predate illness onset [20]. Individual differences in personality do exist among people with schizophrenia [5] and can possibly influence the severity and symptoms [6].

It was found that healthy adults and children who exhibit right frontal EEG asymmetry at rest are easily distressed, fearful, and shy, whereas those who exhibit left frontal EEG asymmetry at rest are socially outgoing and extroverted [10,11]. Because the pattern of frontal EEG asymmetry at rest is stable across time and context [21] and its appearance early in life is predictive of later personality [11], some have argued that this represents a 'trait-like' marker of dispositional affective style [22].

We conducted this study to examine the relationship between frontal EEG asymmetry at rest and trait measures of shyness and sociability in a sample of Egyptian patients with schizophrenia. It was found that positive and negative symptoms are related more to right frontal asymmetry, which was statistically significant only with negative symptoms; this is consistent with Gruzelier [23] and Sutton and Davidson [24], who observed right hemisphere asymmetries in patients experiencing negative symptoms but not consistent with their findings that left hemisphere asymmetries noted in patients experiencing positive symptoms. This could be because of patient selection or drug effects.

Our results agreed with those of Schmidt [10], who found left frontal asymmetry in shy individuals who nevertheless scored high on measures of sociability.

Our findings are also not consistent with those of Jetha *et al.* [13], who found a left hemispheric bias in patients experiencing positive symptoms.

We also found that patients with left frontal asymmetry show premorbid high sociability, whereas patients with right frontal asymmetry show premorbid high shyness, with a statistically significant difference. Our results are consistent with some studies showing that adults with schizophrenia scored significantly higher on measures of premorbid behavioral inhibition and trait measures of shyness compared with healthy adults [8,25] and that measures of trait shyness were immutable to change following weekly social skills' training over a 7-month period [13]. Jetha *et al.* [13] revealed that high trait shyness was related to greater relative resting right frontal EEG activity, whereas high trait sociability was related to greater relative resting left frontal EEG activity.

However, in this study, it was found that PANSS-positive and PANSS-negative schizophrenic patients have right parietal asymmetry more than left parietal asymmetry. Sociability and shyness associated with right parietal asymmetry showed no statistically significant differences. This is in concordance with the study carried out by Schmidt and Fox, who examined differences in brain electrical activity (EEG), heart rate (EKG), heart rate variability, and behavior among 40 young women who

were selected for high and low self-ratings of shyness and sociability. They found that LOSHY/HISOCIABLE participants displayed greater relative right parietal activation and LOSHY/LOSOCIABLE participants displayed greater relative left parietal activation [26]. Also, the results of Jetha *et al.* [13] disagree with our results; they did not find a relation between parietal asymmetry and the negative symptoms scale.

Limitations

- (1) The relatively small sample size limits generalizations to a broader population of individuals with schizophrenia. Future studies should attempt to replicate the present findings with a larger sample of adults with schizophrenia.
- (2) The second limitation concerns the reliance on self-report measures in general for patients with schizophrenia, which may have potential for distortion depending on the degree of psychotic symptoms. However, we confirmed this information from the participants.
- (3) In addition, Beaton *et al.* [27] highlight the importance of considering concurrent emotional states of participants when examining psychophysiological correlates of personality. But in this study we did not measure the emotional state of the participants.
- (4) Although The Revised Shyness and Sociability Scale was translated and back translated by two different blind researchers, the methodological standardization of the applied test is still ongoing.

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Conflicts of interest

There is no conflict of interest to declare.

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الملخص العربي

الخلل والأعراض السلبية في مرضى الفصام المصريين و علاقته بالنشاط الدماغي الجبهي

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المقدمة: من السمات الواضحة لمرضى الفصام ضعف المهارات الاجتماعية.

الهدف : دراسة العلاقة بين الخلل ما قبل المرض والأعراض السلبية و النشاط الدماغي الجبهي في مرضى الفصام . طريقته و أدوات البحث: طبقت الدراسة على أربعين من مرضى الفصام و مقارنتهم بعينه قياسييه و تم استخدام مقياس شيبك و بوس للخلل و مقياس الاعراض السلبية و الايجابيه لمرض الفصام وباستخدام رسم المخ الكمي الرقمي للجميع وذلك بالتحليل الطيفي لقوة نطاقات التردد ألفا .

النتائج: وجد أن 75% من هؤلاء المرضى غير متمثلين النشاط الدماغي الجبهي وانه توجد علاقة بين كلا من الخلل ما قبل المرض والأعراض السلبية و النشاط الدماغي الجبهي الايسر في مرضى الفصام.