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Emotion identification and mentalization in non-psychotic first-degree relatives of young adult patients with schizophrenia disorder

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Abstract

Background: Social cognition is a multi-factorial construct defined as the ability to process social information for adaptive functioning. A large body of evidence acknowledges deficits in social cognition as important features in schizophrenia and that such impairment represent a trait deficit. The aim of this study is to assess two social cognitive functions (emotional identification and mentalization) in young non-psychotic first-degree relatives of patients with schizophrenia; and to compare their performance with that of young patients with schizophrenia as well as with young healthy controls. This a comparative, cross-sectional study including 30 young patients with age range 15–25 with schizophrenia disorder, Thirty young non-psychotic siblings of the patients and 30 young healthy subjects**.** The patients were subjected to PANNNS to assess severity of psychotic symptoms. Selected tests for assessment of basic cognitive abilities and social cognitive functions (using Reading Mind in the Eye Test, Emotion Identification Test and Emotional Intelligence scale) were used for the three groups.

Results: the relatives group show better performance than the patients groups and worse performance than the control group in subtests of basic cognition and social cognition functions using Reading Mind in the Eye Test and Ekman, in addition, there was negative correlation between severity of negative psychotic features and facial emotional identification as measured by Ekman.

Conclusion: Youth who are first-degree relatives of schizophrenia patients show social cognitive deficits, supporting the hypothesis of the role of social cognition impairment as endophenotypic trait in schizophrenia disorder.

Keywords: Social cognition, Schizophrenia, Youth, First-degree relatives

Introduction

Schizophrenia is related to markedly impoverished social adeptness and functioning. The capacity to explore social cues and behaviors is innately reliant on knowledge base and set of attitudes, normally known as "social cognition" [1]

Social cognitive deficits appear to be key determinants of daily functioning in schizophrenia, including instrumental actions, interpersonal functioning, and vocational achievement. It generally refers to the mental operations that underlie social interactions, including perceiving, interpreting, and generating responses to the intentions, dispositions, and behaviors of others [2]

Social cognition is a multifaceted concept, comprising several sub-domains Among which, two are more frequently studied: emotional processing (also referred to as Emotional Intelligence) which refers to the ability to understand emotions, discriminate between different emotions, and manage emotions and emotional reactions and mentalizing (also referred to as Theory of Mind [ToM]) which reflects the ability to interpret an individual's speech and actions in terms of his or her intentions, knowledge, and beliefs [1].

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There is growing evidence that emotion processing, mentalizing, and social perception impairments are core features of schizophrenia that are present at a comparable level in recent-onset patients, not secondary to positive symptoms or medication effects, relatively stable over the course of illness, and detectable at attenuated levels in unaffected biological relatives of patients and in prodromal or other high-risk samples [3]

The studies of subtle social cognitive impairment in unaffected relatives of patients with schizophrenia have aimed to test whether these deficits might be potential endophenotypes linking the clinical phenotype with the genetic predisposition for schizophrenia, which might help to identify rational targets for new treatments in the future [4]

Several psychosocial therapies have showed potential in helping people with schizophrenia to overcome and remediate social cognitive problems. Indeed, existing research suggests that the majority of focused social cognitive training programs established to date may result in improvements in the social cognition areas for which they are intended [5]

This study hypothesized that groups comprising schizophrenia patients, their first-degree relatives, and healthy controls would differ in terms of Theory of Mind (ToM) and emotion recognition performances and that performances would be the poorest in schizophrenia patients, better in first-degree relatives, and the best in healthy controls.

Hence, the aim of this study is to assess two social cognitive functions (emotional identification and mentalization) performance in young non-psychotic first-degree relatives of patients with schizophrenia disorder; and to compare their performance with that of young patients with schizophrenia spectrum disorders and with young healthy controls.

Methods

This study was a comparative, cross-sectional study. The Scientific and Ethical committees of the Department of Psychiatry, Faculty of medicine, Cairo University, has approved the study. A written informed consent was taken from patients after discussing with them the aim of the study. Patients under 18 years, informed consent was taken from their parents and ascent was taken from the patients. Thirty young patients with age range 15–25 years recruited consecutively from the in-patient ward and the outpatient clinic of Kasr Al Ainy Psychiatry and Addiction Hospital diagnosed to have schizophrenia disorder according to the diagnostic criteria of the fourth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM IV-TR), 30 young non-psychotic siblings of the patients and 30 young healthy subjects with no history of psychiatric disorders recruited from the workers in Kasr Al Ainy Psychiatry and Addiction hospital matched with schizophrenia patients in terms of age were included in the study. Subjects with significant head injury, organic brain disease, chronic medical/neurological disease or sensory disability history and/or co-morbid substance use disorder were excluded from the study. Patients who received electro-convulsive therapy (ECT) during the last 6 months were also excluded. Any axis I psychiatric disorder was exclusion criteria for the siblings group and any axis I psychiatric disorder and any positive family history of psychiatric disorder were exclusion criteria for the healthy control group.

Patients were subjected to Kasr AL Ainy semi-structured interview by experienced psychiatrists. Relevant data include (socio-demographic data, onset of the illness, family history of psychiatric illness and compliance to treatment) and the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID) [6] to establish the diagnosis of schizophrenia disorder, SCID is a diagnostic interview designed for use by mental-health professionals. It assesses 33 of the more commonly occurring psychiatric disorders (including Schizophrenia) described in the fourth edition of the DSM-IV of the APA. The SCID is a structured interview that allows the experienced clinician to tailor questions to fit the patient's understanding; to ask additional questions that clarify ambiguities; to challenge inconsistencies; and to make clinical judgments about the seriousness of symptoms. The main uses of the SCID are for diagnostic evaluation, research, and the training of mental-health professionals.

They were also assessed using Structured Positive and Negative Syndrome Scale for Schizophrenia (PANSS) [7] to estimate the severity of psychotic symptoms in patients with schizophrenia. It is a clinician-rated scale that is used to estimate the severity of psychotic symptoms in patients with schizophrenia.

The scale has three parts including:

Positive symptoms scale (P 1–7) which assess delusions, conceptual disorganization, hallucinations, hyperactivity, grandiosity, suspiciousness/persecution and hostility.

Negative symptoms scale (N 1–7) which assess blunted affect, emotional withdrawal, poor rapport, passive/apathetic social withdrawal, difficulty in abstract thinking, lack of spontaneity and flow of conversation and stereotyped thinking.

General psychopathology scale (G 1–16) which assesses somatic concern, anxiety, guilt feelings, tension, mannerisms and posturing, depression, motor retardation, uncooperativeness, unusual thought content, disorientation, poor attention, lack of judgment and insight,

disturbance of volition, poor impulse control, preoccupation and active social avoidance.

Each item is rated from 1 to 7 (absent = 1, minimal = 2, mild = 3, moderate = 4, moderately severe = 5, severe = 6, extreme = 7).

All subjects were examined for basic cognitive abilities (using Trail Making Test Part A [8] used to assess speed of processing. The test consists of 25 circles distributed over a sheet of paper. The circles are numbered 1–25, and the patient should draw lines to connect the numbers in ascending order and the patient is instructed to connect the circles as quickly as possible, without lifting the pen or pencil from the paper. The dependent measure is the total time in seconds. Digit symbol substitution of Wechsler Adult Intelligence Scale (Arabic version) [9]. This subset is used to assess speed of processing. It consists of nine digit-symbol pairs (for example:. 1/-, 2/⊥ … 7/Λ, 8/X, 9/=) followed by a list of digits. Under each digit the subject should write down the corresponding symbol as fast as possible. Dependent measure is the number of correct symbols within the allowed time (90 s). Digit span, this subtest is used to assess working memory and composed of two parts Digit Forward and Digit Backward. Each of them is administered separately. On Digits Forward, the subject is read number sequences of increasing length and after each sequence is asked to repeat it from the memory. On Digits Backward, the subject is read similar numbers sequences and after each sequence is asked to repeat it backward. Dependent measure is total correct forward and backward and maximum score achieved is 24. Pair-associate of Wechsler Memory Scale [10]. This subtest is used also to assess episodic memory. The subject memorizes eight word pairs, four of which reflect easy associations (for example: table/chair) and four of which are more difficult (for example: horse/car). Subjects are given three presentations and three recall trials in which the first word pair is presented and the subject is asked to recall the associated word from the memory within a certain time limit. Dependent measure is the total correct items and maximum score achieved is 24.

All subjects were examined for social cognitive abilities too using Reading Mind in the Eye Test [11]. This test is used to assess empathy as a part of mentalizing process based on the Theory of Mind (ToM). The test measures the ability to accurately perceive how someone is feeling based solely on looking at their eyes. It consisted of 36 photos that include only the eyes of individual faces and the person is asked to choose an answer from four choices. Dependent measure is total correct answers and maximum score is 36. Ekman Emotion Identification Test, this test is used to assess facial emotion identification and formed of photographs from the software developed by Ekman [12]. The test included eight digitized photos of facial expressions for each of 6 different emotions (happy, sad, angry, afraid, surprised and disgusted) plus neutral expressions (total 56 images). Subjects viewed each face and then selected the label they thought was correct from a list of emotions and the dependent measure is total correct of 56 images. Emotional Intelligence Scale (Arabic version) [13, 14]: This test is a 33-item that measures emotional intelligence. The Arabic version is originally developed from the Assessing Emotional Scale by Schutte, which is considered a unidimensional instrument. The scale assesses how effectively respondents typically identify, understand, regulate, and harness emotions in self and others.

Statistical analysis

Data were coded and entered using the statistical package SPSS (Statistical Package for the Social Sciences) Version 24.0, released 2016, created by IBM, Armonk, New York, United States of America. Data were summarized using mean, standard deviation, median, minimum and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data. Comparisons between quantitative variables were done using the non-parametric Kruskal–Wallis and Mann–Whitney tests. For comparing categorical data, Chi-square (χ^2) test was performed. Exact test was used instead when the expected frequency is less than 5. Correlations between quantitative variables were done using Spearman correlation coefficient. p-values less than 0.05 were considered as statistically significant.

Results

The three groups included in the study were matched regarding age and education. The demographic characteristics of the study participants are illustrated in Table 1.

On comparing the three groups with regard to basic social cognition, it was found that the performance of the schizophrenia group was the worst regarding basic cognition (Trail Making Test Part A (TMT_A), Digit symbol, Digit span and Pair associate) and social cognition (using Reading Mind in the Eye Test and Ekman). Moreover, the relatives group show better performance in basic cognitive and social cognition domains than the patients groups; however, this reaches statistical significance only for TMT_A ($p = 0.014$), Digit symbol ($p = 0.010$), Pair associate ($p = 0.007$) and Reading Mind in the Eye Test ($p = 0.001$). On the other hand, the group of relatives had worse performance than the control group in all basic cognitive and social cognition, with statistical significant difference only attained for TMT_A ($p = 0.002$), Digit symbol ($p < 0.001$), Digit span: digit forwards (DF)

Table 1 Demographic characteristics of the participants of the three groups (patients with schizophrenia, first-degree relatives and healthy controls)

	Patients n = 30	**First degree relatives n = 30**	**Controls n = 3**	***p* value**
Age: (mean ± SD)	22.67 ± 1.88	22.07 ± 3.03	23.27 ± 2.90	0.094
Gender:	n (%)	n (%)	n (%)	
Male	*24 (80.0)*	18 (60)	13 (43.3)	0.014
Female	*6 (20)*	12 (40)	17 (56.7)	
Education	n (%)	n (%)	n (%)	0.057
Primary	*4* (13.3)	0 (0)	0 (0)	
Preparatory	10 (33.3)	12 (40)	7 (23.3)	
Secondary	0 (0)	0 (0)	3 (10)	
Diploma	10 (33)	8 (26.7)	8 (26.7)	
Higher education	6 (20)	10 (33.3)	12 (40)	
Occupation	n (%)	n (%)	n (%)	< 0.001
Unskilled	4 (13)	6 (20)	6 (20)	
Skilled	4 (13)	8 (26.7)	7 (23.3)	
Unemployed	*18 (60)*	3 (10)	0 (0)	
Professional	0 (0)	4 (13.3)	6 (20)	
Student	4 (13.3)	9 (30)	11 (36.7)	
Marital status	n (%)	n (%)	n (%)	0.007
Single	30 (100)	22 (73.3)	28 (93.3)	
Married	0 (0)	6 (20)	2 (6.7)	
Engaged	0 0	2 6.7	0 0	

Chi-square test

Table 2 Comparison between the three groups as regards basic and social cognition

	Patients	**Relatives**	**Control**	***p* value**
TMT_A[a] (seconds)	84.13 ± 46.39	46.20 ± 23.80	29.37 ± 8.92	< 0.001
Digit symbol	19.20 ± 9.50	30.33 ± 12.06	44.80 ± 12.16	< 0.001
Pair associate	5.80 ± 1.30	6.80 ± 1.19	7.37 ± 0.72	< 0.001
DF[b]	1.73 ± 5.81	4.60 ± 4.17	7.13 ± 0.90	< 0.001
DB[c]	0.73 ± 3.27	2.53 ± 1.66	5.50 ± 1.25	< 0.001
Ekman	34.60 ± 7.81	39.53 ± 5.84	47.97 ± 5.34	< 0.001
Mind in the eye	17.73 ± 4.42	22.67 ± 3.59	25.47 ± 3.00	< 0.001
EI scale[d]	86.53 ± 12.06	87.20 ± 8.28	88.26 ± 8.52	0.788

Kruskal–Wallis test

[a] TMT_A: Trail Making Test Part A

[b] DF: digits forwards

[c] DB: digits backwards

[d] EI scale: Emotional Intelligence scale

($p \leq 0.05$ is significant)

Table 3 Comparison between the three groups as regards facial specific emotion recognition deficits

	Patients	**Relatives**	**Controls**	***p* value**
ER happy	0.07 ± 0.25	0.13 ± 0.51	0.27 ± 0.78	0.560
ER sad	3.80 ± 2.91	3.20 ± 2.14	1.07 ± 1.36	< 0.001
ER afraid	6.40 ± 1.57	5.47 ± 1.78	3.40 ± 2.46	< 0.001
ER surprised	1.20 ± 1.58	0.33 ± 0.61	0.43 ± 0.63	0.018
ER angry	4.40 ± 2.22	3.07 ± 2.30	1.33 ± 1.37	< 0.001
ER disgusted	2.53 ± 2.26	3.00 ± 2.44	0.47 ± 0.73	< 0.001
ER neutral	2.60 ± 2.13	1.27 ± 1.55	1.13 ± 1.89	< 0.001

Kruskal–Wallis test

ER emotion recognition

($p \leq 0.05$ is significant)

($p = 0.002$) and digit backwards (DB) ($p < 0.001$) as well as Ekman ($p < 0.001$) and Reading Mind in the Eye Test ($p = 0.045$) (Table 2).

Regarding specific emotions recognition in the face by Ekman Facial Identification Test, the comparison between the schizophrenia, relatives and control groups revealed that patients with schizophrenia show more deficits than the other two groups and this was statistically significant for the negative emotions: ER_sad ($p < 0.001$), ER_afraid ($p < 0.001$), ER_angry ($p < 0.001$) and ER_disgusted ($p < 0.001$). It was also statistically significant for ER_surprised ($p = 0.018$) and for ER_neutral ($p < 0.001$) (Table 3).

As regards the correlation between basic cognition (using TMT_A, digit symbol, digit span and pair associate) and symptoms severity using the PANSS in patients with Schizophrenia, our findings show statistical significant correlation between TMT_A score and all PANSS subscales ($p \leq 0.05$), as well as between digit symbol, PANSS negative subscale ($p < 0.001$) and PANSS total ($p = 0.004$), also between Pair associate and the PANSS total ($p = 0.026$).

Moreover, social cognition as assessed by Ekman test is negatively correlated to severity of negative psychotic symptoms as assessed by PANSS Negative subscale ($p = 0.008$) (Table 4).

Descriptive data regarding age of onset, duration of illness, number of hospitalization and family history of patients with schizophrenia are illustrated in Table 5.

Correlation results of PANSS scores and social cognition scores are illustrated in Table 6.

Correlation results of PANNS scores and basic cognitive measures are shown in Table 7.

Discussion

This study findings support the hypothesis that patients with schizophrenia had the worst performance in comparison to first-degree relatives and healthy controls as regards social cognition (using Reading Mind in the Eye Test and Ekman).

Table 4 Correlation between social cognition (using RMET, Ekman and EI scale) and symptoms severity using the PANSS in patients with schizophrenia

			PANSS[b] total	PANSS *p*	PANSS N	PANSS G
Ekman	n = 30	Correlation coefficient	− 0.356	0.181	− 0.478	− 0.330
		p value	0.053	0.340	0.008	0.075
Mind in the eye	n = 30	Correlation coefficient	− 0.042	0.007	− 0.008	− 0.038
		p value	0.825	0.970	0.966	0.842
EI scale[a]	n = 30	Correlation coefficient	− 0.178	0.330	− 0.271	− 0.279
		p value	0.345	0.075	0.147	0.136

Spearman test

[a] EI scale: Emotional Intelligence scale

[b] PANSS: Positive and Negative Syndrome Scale for Schizophrenia

($p \leq 0.05$ is significant)

Table 5 Descriptive data regarding age of onset, duration of illness, number of hospitalization and family history

		Patients				
		Mean	Standard deviation	Median	Minimum	Maximum
Age of onset (years)		20.14	1.69	20.25	17.00	22.00
Duration of illness (years)		2.57	1.22	2.25	0.00	5.00
					Patients	
					Count	%
Number of hospitalizations		None			12	40.0
		Once			14	46.7
		Twice			4	13.3
		Patients		Relatives		Control	
		Count	%	Count	%	Count	%
Family history	Psychotic	16	53.3	16	53.3	0	0
	Bipolar	2	6.7	2	6.7	0	0
	Substance use disorder (tramadol)	2	6.7	2	6.7	0	0
	Intellectual disability	2	6.7	2	6.7	0	0
	Negative	8	26.7	8	26.7	30	100.0

Table 6 Correlation results of PANSS scores and social cognition scores

		PANSS[b] total	PANSS *p*	PANSS N	PANSS G
Ekman	Correlation coefficient	− 0.356	0.181	− 0.478	− 0.330
	p value	0.053	0.340	0.008	0.075
	n	30	30	30	30
Mind in the eye	Correlation coefficient	− 0.042	0.007	− 0.008	− 0.038
	p value	0.825	0.970	0.966	0.842
	n	30	30	30	30
EI scale	Correlation coefficient	− 0.178	0.330	− 0.271	− 0.279
	p value	0.345	0.075	0.147	0.136
	n	30	30	30	30

[a] EI scale: Emotional Intelligence scale.

[b] PANSS: Positive and Negative Syndrome Scale for Schizophrenia

Table 7 Correlation results of PANNS scores and basic cognitive measures

		PANSS total[d]	PANSS *p*	PANSS N	PANSS G
TMT_A (s)[a]	Correlation coefficient	0.561	− 0.416	0.686	0.449
	p value	0.001	0.022	< 0.001	0.013
	n	30	30	30	30
Digit symbol	Correlation coefficient	– 0.515	0.316	– 0.758	– 0.248
	p value	0.004	0.089	< 0.001	0.186
	n	30	30	30	30
DF[b]	Correlation coefficient	0.043	– 0.002	0.102	0.012
	p value	0.823	0.992	0.591	0.949
	n	30	30	30	30
DB[c]	Correlation coefficient	– 0.045	0.230	– 0.030	– 0.062
	p value	0.811	0.221	0.876	0.746
	n	30	30	30	30
Pair associate	Correlation coefficient	− 0.407	− 0.151	− 0.305	− 0.211
	p value	0.026	0.426	0.101	0.262
	n	30	30	30	30

[a] TMT_A: Trail Making Test Part A

[b] DF: Digits forwards

[c] DB: digits backwards.

[d] PANSS: Positive and Negative Syndrome Scale for Schizophrenia

The first-degree relatives group performed better than the patients group (reaching statistical significance for Reading Mind in the Eye Test). In addition, deficits in social cognitive abilities (assessed by Reading Mind in the Eye Test and Ekman) were more pronounced in the first-degree relatives group in comparison with the control group.

The deficit in face emotion perception in patients with schizophrenia was demonstrated in previous studies [15, 16]. In our study, it was found that the mean score of the Ekman facial identification test in patients with schizophrenia was 34.60. Similar mean has been reported in the study conducted in Egypt by Gohar et al. [17], in which the mean for Ekman test was 35.45. In addition, there was a statistically significant difference on comparing the three groups as regards the mean scores of Ekman Facial Identification test. On the other hand, the mean score for Emotional intelligence scale for schizophrenia patients in this study was 86.53 which was not statistically significant from the mean scores of the relatives group (87.2) as well as that of the controls group (88.26). This discrepancy may be attributed to the Emotional Intelligence scale being a self-report questionnaire, which renders it a subjective test.

As regards Theory of Mind, the mean in this study for Reading Mind in the Eyes Test (RMET) for schizophrenia

patients was 17.73 which is consistent with the study conducted by Bora and colleagues [18], in which the mean was 16.2. This is also consistent with several behavioral and neuro-imaging studies that reported ToM deficits in schizophrenia [19–26].

Moreover, our study findings are is in line with a meta-analysis conducted by Lavoie and colleagues [27] who assessed social cognitive functioning in first-degree relatives of patients with schizophrenia. It included 29 studies which evaluated mentalizing, emotional processing, and social perception domains of social cognition. The results from this meta-analysis highlight that social cognition is globally affected in first-degree relatives of people with schizophrenia, suggesting that social cognition deficits in schizophrenia may be related to a genetic vulnerability for the disorder. Likewise, another meta-analysis comparing schizophrenia patients in remission, first-episode patients, persons at high risk for psychosis, and relatives, concluded that the literature provides support for ToM deficits also being a trait characteristic of schizophrenia rather than just a state characteristic [28].

When comparing first-degree relatives to patients with schizophrenia, our study results showed that the patients with schizophrenia showed poorer performance than their first-degree relatives in the cognitive tests applied to assess processing and psychomotor speed (TMT part A and Digit Symbol coding), working memory (digit span) and episodic memory (pair associate). This is in line with the recent and comprehensive meta-analytic review of 20 studies comparing cognitive functioning in 1341 first-degree relatives of patients with schizophrenia, 939 first-degree relatives of patients with bipolar and 1427 healthy controls, matched for age, sex, education, and estimated intelligence quotient (IQ), where significant impairments were found in all domains of cognitive functioning in first-degree relatives of patients with schizophrenia [29].

In this study, we also collected data about face ER for multiple specific emotions (including neutral) using Ekman Facial Identification Test. In this regard, our study showed that first-degree relatives and schizophrenia patients showed worse performance than healthy controls in their recognition of sadness, anger, fear, disgust as well as neutral emotions. Our finding of a robust deficit in facial fear recognition in first-degree relatives, specifically siblings, is consistent with Bediou et al. [30] who also found that siblings of people with first-episode schizophrenia were impaired in recognizing fear, as well as disgust in faces, however, they were not impaired in recognizing happiness or anger. Leppanen et al. [31] found that siblings of people with schizophrenia had a significant deficit in recognizing facial anger, but not happiness or neutral emotion.

Our findings are also consistent with a more recent study by Allott et al. [32] which found that first-episode schizophrenia participants performed significantly more poorly in recognizing anger, disgust and fear and first-degree relatives were significantly poorer at recognizing fear than healthy controls. These findings bolster evidence for emotion recognition (particularly for fear) as a heritable characteristic of schizophrenia.

A review of literature of social cognitive domains in first-episode psychosis (FEP) revealed that social cognition deficits may be associated with negative symptoms which is in accord with our findings. This is can be explained by the fact that individuals with low social cognition abilities might be less likely to interact with others effectively, which may in turn increase negative symptoms (for example., encourage withdrawal and negative affect). Furthermore, this review revealed significant association between positive symptoms and social cognitive domains; on the other hand, the review did not find support for a relationship between disorganized symptoms and social cognition in FEP [33].

Our findings could be explained by the fact that patients recruited for the study did not have severe symptomatology; in addition, they were receiving antipsychotic medications and while positive and disorganized symptoms are ameliorated with antipsychotic treatment, negative symptoms tend to persist [34].

The study results has important clinical implications as they highlight the importance of assessment of social cognition in patients with schizophrenia as well as their first-degree relatives who would benefit from social cognitive interventions.

It is recommended that future research should investigate all four domains of social cognition and the degree to which they are affected in schizophrenia spectrum disorders patients and their first-degree relatives. Moreover, further research is required to investigate more clearly the precise biological correlates, mechanisms and pathways by which social cognitive impairments contribute to the onset and maintenance of psychotic symptoms. It is recommended as well that future research should also assess inter-relationships between symptoms, social cognition, and functional outcome of psychiatric patients. This is of particular interest as social functioning is a key goal of targeted social cognition treatment efforts.

This study has certain limitations. For instance, the difficulty in recruiting patients with schizophrenia disorder and their first-degree relatives fulfilling the tight inclusion and exclusion criteria limits the number of patients who participated in the study, so the results could not be generalized to all patients. Moreover, most

of the social cognitive assessments were translated and back translated by another researcher in a previous study [17]. The standardized scores for all social cognitive tests were based on North American normative samples. However, this study does not rely on standardized scores, and only compares the scores of the three groups of patients, relatives and healthy controls.

Conclusions

Social cognitive functions can be considered as endophenotype markers in schizophrenia. Social cognition is affected in patients with schizophrenia more than their first-degree relatives who in turn had worse performance on social cognitive domains than healthy controls. Regarding Facial Emotion Recognition for negative emotions, patients with schizophrenia had the worst performance followed by their first-degree relatives and the healthy control subjects. Social cognition as assessed by Ekman test is negatively correlated to severity of negative psychotic features.

Abbreviations

DB: Digit backwards; DF: Digit forwards; DSM IV-TR: Fourth edition of Diagnostic and Statistical Manual of Mental Disorders Text Revision; ECT: Electro-convulsive therapy; EI scale: Emotional Intelligence scale; ER: Emotion recognition; PANSS: Positive and Negative Syndrome Scale for Schizophrenia; SCID-I: Structured Clinical Interview for DSM-IV-TR Axis I Disorders; SPSS: Statistical Package for Social Sciences; ToM: Theory of Mind; TMT_A: Trail Making Test Part A.

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Author contributions

All authors had made a substantial contribution to the design of work, data collection and interpretation, writing the manuscript, revising it, and approving the final version. YM made the main effort in patient data collection and DBT made the major contribution in writing the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The data used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the ethical committee in Kasr Al-Ainy Psychiatry and Addiction Prevention Hospital before the beginning of the study on August 2016. A written informed consent was taken from patients after discussing with them the aim of the study. Patients under 18 years, informed consent was taken from their parents and ascent was taken from the patients. Reference number was not applicable as the ethical approval was only a necessity at the departmental level without any other prerequisites from the university.

Consent for publication

Not applicable.

Competing interests

The authors declare that they do not have any competing interest.

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