Empathic and cognitive processing in people with schizophrenia: a study on an Italian sample

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Summary

The aim of this study was to explore the relationships among empathy processes in terms of self-report empathy evaluation and recognition of emotional cues and Theory of Mind components. We used the Empathy Quotient – short form (EQ-s), the Pictures of Facial Affect (POFA) system, a (ToM) Irony appreciation task and the Wisconsin Card Sorting Test (WCST), respectively. The Positive and Negative Symptoms Scale (PANSS) and Global Assessment of Functioning (GAF) were also used to investigate the relationship with symptomatology and functioning. The sample consisted of 30 participants with diagnosis of schizophrenia. Our results found no significant correlations between EQ-s and other cognitive or clinical variables. PoFA total score and recognition of fear correlated with time spent to give a correct response to the ToM irony comprehension. Time spent to correctly respond to both ToM and physical vignettes correlated with negative symptoms. Positive, negative and cognitive clusters of the PANSS correlated with the GAF. The relationships we found among the considered constructs suggest that empathic processing acts on functionality improving the personal efficiency, in terms of readiness and rapidity, to cope with one's environment, in the multifaceted social setting. Given that emotion perception in particular has been connected to social competence, independent living and community functioning, it is conceivable that emotion processing may be a potential catalyst within the mindreading process, which can have an impact both on symptomatology and social functioning.

Key words

Theory of Mind • Irony • Pictures of Facial Affect • Social Functioning

Introduction

People interact in social settings ascribing mental states (such as beliefs, desires, intentions, emotions) to others, often with no significant mental effort, despite the complexity of the task. Nevertheless, a complex network of systems exists which allows humans to make inferences in social situations about the other mental states, i.e. have a Theory of Mind (ToM), as well as inferring emotions from nonverbal cues, such as prosody and facial expressions and eventually empathise with the person engaged in the interaction [1-3].

To explore this complex phenomenon in schizophrenia, the issues we considered are: i) the role played by ToM, Empathy and Emotion Recognition constructs in social understanding, reporting evidence and considerations on their interactions; ii) the role of these components in relation to the symptoms of schizophrenia and functioning.

Previous studies on the relationships among these constructs have yielded inconsistent results. On one hand, they seem to work independently; indeed as Baron-Cohen [4] hypothesised, both cognitive ToM and the ability to correctly grasp emotions from persons' facial expressions are independent contributors to empathy. In addition, Benedetti et al. [5], by using a task requiring individuals to empathise with the affective states of the characters of stories, reported empathy deficits in schizophrenia. On the other hand, it is possible to hypothesise a reciprocal influence between the constructs. As Derntl and colleagues [6] found, patients reported difficulties with empathy which correlated with poor emotion recognition and perspective-taking, as well as poor affective responsiveness. Of note, while some have presented data suggesting that cognitive and affective components of ToM are dissociable (e.g. Shamay-Tsoory et al. [7]), other studies show how ToM and affective components can be reduced to a single factor [8 9].

Following this path, we can argue that the mental state of *reasoning*, which taps the cognitive aspect of ToM, and the mental state of *'emotional' decoding*, or the ability to automatically infer what the other is feeling based on nonverbal cues [10 11], may represent different, but reciprocally interacting, aspects of the mindreading process [12].

Emotion recognition, contributing to the perception of a

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kind of 'first glance' empathy, is essential to infer with immediacy some mental states. Since this ability requires 'gut feelings' rather than effortful verbal processing, it may be more closely related to social perception and functioning [11 13]. Moreover, irony is an ability well considered to be related both to ToM and empathy, with *reasoning (i.e. cognitive)* and *decoding (i.e. emotional)* components [14-16]. From this perspective, the reasoning component fits well with the social cognitive aspect of ToM [17], while the *decoding* component fits well with the social perceptual aspect of ToM [7 18].

How do these variables interact? Specifically, it has been suggested that a poor understanding of others' minds can affect empathy. In fact, ToM appears to involve the capacity to reason about mental states and the ability in decoding mental states, that is, to form quick impression of what others think and feel. On the other hand, the opposite can be possible: to infer the others' states of mind, the person first needs to intuit what the others feel, think and wish, and then to put oneself in the others' shoes, seeing things from a different and decentred stance [19 20].

Finally, burgeoning evidence suggests that impaired the cognitive and emotional aspects of ToM bear effects on symptoms and functioning [3 8 21-24]. Intentions inferring deficits have been found to correlate with thought disorder and negative symptoms [25 26]. Deficits in understanding others' intentions through indirect hints [27] and irony understanding [28] seem to be related to negative and behavioural signs of schizophrenia [14 30]. Recent findings have also demonstrated relationships between ToM deficits and persecutory delusions [29].

Aim of the study

Supported by these observations and hypotheses derived from the literature, we speculated that multiple interacting abilities intervene to cope with one's environment. ToM, emotional inference from non verbal hints and empathy allow one to grasp cues that lead the person to be efficient i.e. efficacious and ready in social context.

We aimed to explore the relationships among these processes as well as their associations with symptomatology and functional outcomes.

We hypothesised that empathy and emotional processing can be related to cognitive processing speed and the readiness that environmental functioning requires.

Methods

Subjects

A total of 30 consecutive outpatients diagnosed with DSM-IV for schizophrenia participated in this study. All were in a stable phase of the disorder and able to live in the community with antipsychotic therapy provided by the outpatient facilities of the Villa Serena Medical Centre.

The sample consisted of 21 males and 9 female participants. Ages ranged from 21-66 years, with a mean of 37.8 (SD 10.7). Mean education level was 9.9 years (SD 2.8). All were in a post-acute phase of illness defined by no changes in medication with no changes for at least six months. None of the patients had ever been hospitalised for more than six consecutive months. The average participant had had 10.03 (SD 7.15) lifetime psychiatric hospitalisations, with a length of illness of 13.87 years (SD 6.20).

Exclusion criteria were major physical illness requiring constant medical care, neurological disease, alcohol or substance abuse, and mental retardation (IQ < 75). All participants provided written informed consent after a complete description of the study, in accordance with the local ethics committee which approved the study.

Procedures

Testing was conducted in two sessions, by a resident clinical psychologist (MDA), in which tasks were presented in a random order.

Empathy Quotient – short form (EQ-s) – Italian version. The EQ-s is a self-report questionnaire developed by Baron-Cohen to measure empathising capacity [30]. The original form contained 60 items, which Wakabayashi et al. [31] shortened to a more efficient 22-item scale. The EQ empathy questions target both the emotional and cognitive components of empathy. The EQ has a forced choice format; the participant must choose one of four responses. The item is scored two points if the respondent records the behaviour strongly or one point if the respondent records the behaviour mildly.

Pictures of Facial Affect (POFA) system [32]. Thirty-six slides of human faces portraying surprise, happiness, fear, disgust, sadness and anger were presented in a random order that was the same from participant to participant. Each participant was first shown six cards on which each of the emotions was written down. After insuring that the participant knew what the words meant, he was told that he would see a face for a few seconds and then asked to answer what kind of emotion was displayed. Stimulus exposure was set at 10 seconds.

Irony appreciation task. We used a version of 30 visual jokes from the Marjoram et al. [33] paradigm. Two sets of jokes were shown: a 'Physical set' of slapstick humour that did not require ToM capabilities to understand the joke contained within the picture and a 'ToM set' in which an appreciation of the mental states of the characters (i.e. false belief and deception) were required; the 'Physical set' is used as a control condition of the ToM

irony task. Fifteen single-image cartoon jokes were presented one at a time for each condition (an example of the two conditions is reported in Figure 1). The participant was instructed to indicate when he understood the jokes' meaning: the interval from vignette administration and appreciation constitutes the 'Time for correct response'. The participant was then required to report his interpretation. For the interpretation response to be considered correct, the participant had to appropriately interpret the characters' mental state for ToM jokes, or describe the scenario for Physical joke. The examiner scored one for a correct answer and zero for an incorrect one. The sum of the reported scores and time spent to give the correct response for each condition (i.e., ToM and Physical) constituted the scores.

Wisconsin Card Sorting Test (WCST), for the executive functions evaluation. This is a neuropsychological test of strategic planning, organised searching, utilising environmental feedback to shift cognitive sets, directing behaviour toward achieving a goal, and modulating impulsive responding. A number of stimulus cards are presented to the participant telling him/her to match the cards, but not how to match; however, the subject is told whether the match is right or wrong. It was administered with the standard instructions described by Heaton [34] using a computerised version. Performances were automatically scored by the computer and were based on number of stages achieved, number of total and perseverative errors.

Clinical evaluation

A senior psychiatrist (A.R.) and a clinical psychologist (I.R.) blind to performances on the tasks clinically evaluated participants for symptomatology and global functioning. The current symptoms of the patients with schizophrenia were assessed using the PANSS [35], a 30-item, 7-point rating instrument, in Italian version. Each item on the PANSS is accompanied by a complete definition as well as detailed anchoring criteria for all seven rating points, which represent increasing levels of psychopathology. Of the 30 psychiatric parameters assessed on the PANSS, seven constitute a Positive Scale, seven a Negative Scale and the remaining 16 a General Psychopathology Scale. The PANSS cognitive component was calculated by summing the 7 items according to Bell et al. (1994) and Daneluzzo et al. [36].

Patient's functioning was rated using Italian version of The Global Assessment of Functioning (GAF) Scale [37] as the Axis V of DSM-IV reflects global functioning. The GAF is the standard method for representing a clinician's judgment of a patient's overall level psychological, social, and occupational functioning. In *DSM-IV,* the rating is made on a scale from 1 to 100, from severe impairment to superior functioning.

Statistical analysis

Because some continuous measures were not normally distributed (Kolmogorov-Smirnov test: $p < .01$), Spearman's correlation was used. The level of significance was set at $p = .05$.

Results

The data (means and standard deviations) of the sample are reported in Table I. No significant correlations were found between EQ-s and any other cognitive or clinical variable.

PoFA total score correlated with time spent to give a correct response to the ToM irony comprehension and with

TABLE I.
Cognitive and clinical characteristics of the sample.

	Mean	SD	Range
EQ-s	22.10	6.6	0-44
PoFA (correct answers)			
Total	65.9	16.2	0-100
Happiness	93.9	13.5	0-100
Sadness	45.5	28.7	0-100
Fear	51.6	25.2	0-100
Anger	61.6	26.7	0-100
Surprise	75	25	0-100
Disgust	70.5	29.6	0-100
Irony comprehension			
ToM (correct answers)	5	2	0-15
ToM time	52.3	34.2	-
Phy (correct answers)	7.23	3.3	0-15
Phy time	45.5	35.4	-
WCST			
Correct stages	3.3	2.2	0-6
Tot Errors	17.9	12.4	0-63
Perseverative Errors	30.4	13.8	0-63
PANSS			
Total score	95.1	19.4	30-210
Positive cluster	19.9	4.6	7-49
Negative cluster	21.5	6	7-49
Cognitive cluster	20	6.1	7-49
GAF	55.6	9.1	0-100

EQ-s: Empathy Quotient short; PoFA: Pictures of Facial Affect; Irony comprehension: ToM, theory of mind condition; Phy: physical condition; WCST: Wisconsin Card Sorting Test; PANSS: Positive and Negative Syndromes Scale; GAF: Global Assessment of Functioning.

appreciation of humour in the physical vignettes (Table II). Observing the coefficients for single emotions, recognition of fear correlated with time spent (ToM irony comprehension), while anger correlated with appreciation of physical irony (irony not requiring ToM ability). No other significant correlations were seen for the remaining emotions.

ToM irony comprehension score correlated with WCST index. This correlation reached statistical significance even partialling out for education level (vs. WCST number of stages rho = 0.41 $p < 0.05$).

With regard to symptoms and functioning, time spent to correctly respond to both ToM and physical vignettes correlated with negative symptoms (rho = 0.46 and rho = 0.40, $p < 0.05$). Positive, negative and cognitive clusters of the PANSS correlated with the GAF (rho = -0.39, rho = -.41 and -0.46, $p < 0.05$ respectively).

Discussion

In this study, we sought to explore if some relations between different abilities, i.e. empathy, ToM and emotion recognition, exist, and if these abilities are correlated to symptomatology and global functioning.

The hypothesis we made of a relationship between empathy, emotional processing and cognitive processing speed and the readiness required by the environment

TABLE II.
Correlations between participants demographics. Clinical/functional characteristics and tasks measures.

	Ys Ill[a] (1)	Age (2)	Edu[b] (3)	Gender (4)	PANSS[c] (5)	Pos[d] (6)	Neg[e] (7)	Cogn[f] (8)	GAF[g] (9)	ToM[h] (10)	ToMt[i] (11)
1	1										
2	.65**	1									
3	-.18	.52**	1								
4	.41*	-.26	.22	1							
5	-.03	-.08	.26	.27	1						
6	-.02	-.30	**.51****	.33	.58**	1					
7	.02	.17	.10	.19	.71**	.07	1				
8	.11	.20	.05	.24	.83**	.33	**.61****	1			
9	.10	.13	-.17	-.26	- .59**	-.39*	-.41*	- .46*	1		
10	-.36*	-.61**	.62**	.26	.08	.34	-.15	-.02	-.16	1	
11	-.15	.15	-.16	-.06	.38*	.03	.46*	.36	-.19	-.32	1
12	-.39*	-.54**	.64**	.25	.03	.20	-.06	-.09	-.08	**.89****	-.30
13	-.17	.00	-.20	.21	.36	.08	.40*	.26	-.23	-.27	.52**
14	.15	.04	.18	-.16	-.06	.11	-.19	-.15	.06	.01	-.11
15	-.15	-.47**	.37*	-.16	.13	.33	-.10	-.05	-.12	.46**	-.02
16	.08	.13	-.10	-.25	-.20	-.23	-.02	-.13	.35	.05	-.30
17	-.17	-.39*	.31	.02	-.14	-.05	-.16	-.28	.26	.01	-.42*
18	-.16	-.25	.31	-.14	.25	.20	.01	.10	-.07	.30	-.06
19	-.12	-.15	.06	.21	-.17	.08	-.17	-.15	-.10	.33	-.21
20	-.20	-.32	.22	.04	-.03	.02	-.09	-.13	.04	.23	-.12
21	-.18	-.33	.26	.06	-.23	-.00	-.22	-.28	.17	.36	-.46*
22	-.07	-.32	.22	.05	-.02	.08	-.17	-.20	-.16	.44*	-.27
23	.21	.24	-.41*	-.09	-.21	-.14	-.11	-.09	.34	-.45*	.02
24	.23	.13	-.40*	-.18	-.07	-.15	-.11	.01	.18	-.27	-.05

* $p < .05$; ** $p < .01$.
[a] Duration of the illness-years; [b] Years of education; [c] Positive and Negative Symptoms Scale- Total Score; [d] PANSS Positive Symptoms Cluster; [e] PANSS Negative Symptoms Cluster; [f] PANSS Cognitive Symptoms Cluster; [g] Global Assessment of Functioning; [h] ToM Comprehension – Total score (Irony ToM Task); [i] Total Time spent to give correct response to ToM Comprehension; [l] Physical Comprehension-Total score (Irony Physical Task);

to have a good functioning was partially confirmed. Although no correlations were found between self-reported empathy and other variables, emotion recognition and understanding of irony were indeed related, suggesting that affective and cognitive components of understanding the mental state of the others may interact with each other [30 38]. According to our results of a correlation between time spent to give a correct response to the ToM task and the recognition of emotions, specifically of fear, it seems that a poor 'first glance' intention grasping, i.e. poor emotional recognition, corresponds to a long latency before correctly understanding the mental processes underlying ironic vignettes. If so, the negative correlation between time spent in irony detection and recognition of emotion in general may tap a possible shared mechanism for fast attributions of intentions to others. It is conceivable that patients with schizophrenia are particularly compromised when they have to "mentalise on the spot" under time pressure, as hypothesised by Corcoran and Frith [27], to grasp both states of mind and some relevant emotional expressions of others. They need to employ ToM and facial emotion recognition to correctly perform 'on-line' social tasks [27] as they would in a real-life situation. This lack of steady attributions may contribute to generate the communicative failures these persons suffer from.
Of note, on one hand the absence of a significant correla-

	Phy[l] (12)	Phyt[m] (13)	EQs[n] (14)	Hap[o] (15)	Sad[p] (16)	Fear[q] (17)	Ang[r] (18)	Sur[s] (19)	Dis[t] (20)	PoFA[u] (21)	Stages[v] (22)	NTotErr[w] (23)	NErrPers[x] (24)
	1												
	-.23	1											
	.07	-.18	1										
	.36	-.09	.33	1									
	.20	.04	.15	.07	1								
	.24	-.28	.05	-.01	.32	1							
	.47**	-.12	.14	.32	.42*	.38*	1						
	.30	-.26	-.33	.32	-.05	-.13	.01	1					
	.31	-.17	-.08	.35	.12	.41*	.46*	.18	1				
	.47**	-.32	-.04	.42*	.51**	.58**	.59**	.43*	.65**	1			
	.42*	-.23	.24	.33	-.08	-.01	.10	.31	.13	.17	1		
	-.31	-.19	-.00	-.20	.23	.23	.15	.04	.21	.26	-.43*	1	
	-.17	-.28	.17	-.06	.23	.21	.30	-.01	.22	.22	-.11	**.85****	1

[m] Total Time spent to give correct response to Physical Comprehension; [n] Empathy Quotient short version; [o] Happiness (Pictures Of Facial Affects); [p] Sadness (Pictures Of Facial Affects); [q] Fear (Pictures Of Facial Affects); [r] Anger (Pictures Of Facial Affects); [s] Surprise (Pictures Of Facial Affects);[t] Disgust (Pictures Of Facial Affects); [u] Pictures Of Facial Affects – Total Score; [v] Number of Stages-Wisconsin Cards Sorting Task; [w] Number of Total Errors-Wisconsin Cards Sorting Task; [x] Number of Perseverative Errors-Wisconsin Cards Sorting Task.

tion between ToM comprehension and emotions recognition we found is in line with [39] and could be interpreted in a way as supporting Frith and Frith's [40 41] neurocognitive model of social interaction. On the other hand, the relation between time spent to give a correct ToM response and emotion recognition is in line with Besche-Richard et al. [42] who found that performances in the facial emotion recognition are the best predictor of performances in the attribution of beliefs. Regarding the correlation specifically with fear, data exists on an impairment of facial expression of fear, anger and disgust in people with schizophrenia [43 44], but to the best of our knowledge, there are no studies about the possible relation between impairments of specific emotions and ToM ability. Accordingly, this issue deserves further research.

Exploring the correlations between self-reported empathy and other variables, we found it was neither related to facial emotion recognition nor to comprehension of irony, supporting previous evidence of these elements being dissociable [7 19 45 46]. This may be due to empathy being a complex ability that includes more than recognition of mental states. One may fully understand what the other is feeling and thinking, but be cold, detached, or even hostile, preventing the individual from being able to fully assume the other's perspective.

Correlations between cognitive ToM performance and poor mental flexibility (i.e. WCST) is a result consistent with previous literature findings suggesting that intact neurocognition is needed for at least the more basic aspects of the mentalistic system to work appropriately [7 15 47-49]. Some studies did not find, however, such a link [50].

Considering correlations with symptoms and social functioning, we found a significant correlation between time spent in appreciating both ToM or physical irony and negative symptoms. This may suggests that even if these patients can understand irony and the character's mental states, their slowing down is associated with symptomatology, interfering with the fast and natural interactions that social functioning requires. These patients are likely to require an extra-reasoning effort that would make them feel constantly out of synchrony with the rapid shifts between serious statements and jokes that form everyday conversations with relatives and peers. This delay in understanding mental states hampers the ability to maintain and support social contact during the demanding challenges of real-life social situations [51]. Alternative or integrative hypothesis may be that avolition, anhedonia and passivity could be an indirect sign of depression that would reduce the sensitivity to funny stories, and a possible marker of less desire for social contact.

Self-reported empathy did not show any significant correlations with the symptom cluster and global functionality. This result is consistent with previous findings: Derntl and colleagues [6] found no significant correlations between empathy deficits and clinical symptoms, though a subgroup of patients with prominent negative symptoms had better empathic performance than other groups with predominant positive or mixed symptomatology. In any case, our results are in line with Brune and colleagues [23], who failed to find significant correlations of this type.

The relationships we found among the variables considered can suggest that empathic processing acts on functionality improving the mentalisation efficiency, in terms of readiness and rapidity. Given that emotion perception in particular has been connected to social competence, independent living and community functioning [52], it is conceivable that emotion processing within empathy may be a potential catalyst within the process of comprehension of the minds of others, which can have an impact both on symptomatology and functioning [53].

There are some limitations to our study. First, the sample size is relatively small, but could be sufficient for a preliminary test of heuristic value hypotheses. Second, there was no control group so the difference in the battery we adopted that would have emerged in comparison to a non-clinical population has not been assessed. Third, the correlations between empathy and ToM need to be further investigated possibly using information from relatives or specific tasks for empathy performance involving affective responsiveness simulating real-life situations.

A fourth limitation is the use of self-report instrument, instead of the rating of the clinician, in order to detect empathy abilities. It is possible that a measure of such a complex mentalistic ability, self-reported by people who often do not have good self-reflection [47 48] could generate a biased description of true empathic ability even if some self-report questionnaires to measure self reflection abilities are widely used (e.g. Toronto Alexithymia Scale [54]).

Further, we did not apply a correction for multiple correlations. Nevertheless, due to the exploratory intent of the study supported by hypotheses derived from the literature, in which data are collected with an objective although with the *a priori* key hypothesis we stated, multiple test adjustments may not be strictly required with a flexible approach for design and analysis. Moreover, each variable we considered was of interest in its own, so we chose to report all individual p-values and make separate considerations in relation to our hypotheses. When multiple test results have implications on specific responses, correction for multiple comparisons can be unnecessary, as it is more relevant to know the strength of evidence for testing individual hypotheses [55].

This was a correlational study, so that no causal links can be derived from this experimental design. These findings, however, can be of heuristic value for the hypothesis of a parallel intervention of different constructs in the social adaptation.

Further studies are needed, possibly with multi-modal assessment of empathy, to better understand the role of an empathy deficit in schizophrenia and its relation to aspects of the mental state understanding systems, as well as its possible role in explaining the social dysfunction from which these persons suffer.

Conflicts of interest
None.

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