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Exploration of irony appreciation in schizophrenia

A replication study on an Italian sample

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Abstract Irony is a form of speech used to convey feelings in an indirect way. Patients with schizophrenia demonstrated an impaired irony processing, associated with poor theory-of-mind. We investigated irony appreciation in a sample of 20 subjects with schizophrenic disorder by using cartoon images. The primary aim was to examine the association between Positive and Negative Symptoms Scale (PANSS) scores (i.e. positive, negative and cognitive) and irony visual joke appreciation. The group performed significantly worse in the Theory of Mind (ToM) condition than in the physical one. We report a significant relationship between ToM performances with PANSS positive and cognitive symptoms but not with negative symptom scores. Average humour score significantly correlated with positive symptoms, i.e. more severe symptoms, less funny the cartoon, while the difficulty in understanding the jokes was related to PANSS cognitive cluster score, i.e. more cognitive symptoms, less difficult the ToM jokes. Our results offer evidence for a compromised ToM capability in appreciating visual jokes linked to specific symptomatology.

Key words irony · schizophrenia · Theory of Mind (ToM) · positive symptoms · cognitive symptoms

Introduction

Irony is a form of speech used to convey feelings in an indirect way. Patients with schizophrenia demonstrated an insensitivity to irony, associated with poor theory-of-mind (ToM) [9]. Understanding irony requires first-order intentionality about the speaker's belief to avoid interpreting irony as a mistake, as well as second-order intentionality about the speaker's beliefs about the listener's beliefs, to avoid interpreting irony as a lie [11]. The processing of irony are supposed to be mediated by highly circumscribed brain systems in the medial prefrontal cortex [6].

We investigated irony appreciation in a sample of 20 subjects with schizophrenic disorder by using the Gallagher's et al. [6] cartoon images and the Marjoram et al. [11] paradigm. On the basis of the hypothesis that compromised ToM capability in appreciating visual jokes could be linked to specific symptomatology, the primary aim is to examine the association between irony visual joke appreciation and PANSS scores (i.e. positive, negative and cognitive) in this schizophrenic group.

Materials and methods

Twenty consecutive outpatients (3 women and 17 men) were assessed during a stable phase of the illness. The patients met the DSM-III-R criteria for schizophrenia. Diagnoses were made by a senior psychiatrist (P.S.) who personally interviewed the patients according to the Structured Clinical Interview for DSM-III-R [12]. Subjects were considered in a stable phase if acute symptoms were subsided, although functioning could be impaired [2]. All patients were treated with classical or atypical antipsychotics with a mean chlorpromazine equivalent dose of 536.18 (SD 415.12) [8, 13] at the time of the evaluation.

We used visual jokes along the Marjoram et al. [11] paradigm. Two sets of jokes were shown to the patients by a clinical psychologist (I.R.) who performed all the irony evaluations: 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

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Table 1 Sample characteristics, clinical and irony appreciation assessments (mean \pm SD) of the studied sample ($n = 20$)

Sex (F/M)	3/17
Age	38.5 \pm 10.9
Educational level	11.7 \pm 2.3
Age at onset	22.7 \pm 3.1
Length of illness	15.2 \pm 13.2
Estimated IQ	106.4 \pm 7.7
PANSS	
Total score	79.0 \pm 12.3
Positive score	17.1 \pm 5.6
Negative score	21.6 \pm 4.2
General score	39.8 \pm 6.9
Cognitive score	18.4 \pm 5.0
Irony appreciation assessment	
<i>Objective scores</i>	
Physical score	22.1 \pm 4.5
ToM score	17.0 \pm 4.9
<i>Subjective scores</i>	
Physical average humour score	2.1 \pm 0.8
Physical difficulty score	1.8 \pm 0.9
Physical time for correct response	488.6 \pm 157.3 s
ToM average humour score	1.7 \pm 0.7
ToM difficulty score	1.3 \pm 0.6
ToM time for correct response	462.6 \pm 165.2 s

which an appreciation of the mental states of the characters (i.e. false belief and deception) were required. 32 single-image cartoon jokes were presented one at a time for each condition (i.e. Physical and ToM jokes). The subjects were instructed to indicate when they understood the jokes' meaning: the interval from vignettes administration and their appreciation constitutes the 'Time for correct response'. They were then required to report their interpretation. The interpretation response to be considered correct, the subject had to appropriately interpret the characters' mental status for ToM jokes, or describe the scenario for Physical jokes, along the cases examples reported by Marjoram et al. [11]. The examiner scored one for the correct answer and zero for the incorrect one: the sum of the reported scores for each condition (i.e. ToM and Physical) constituted the objective score.

The subjects were also required to *subjectively* grade each cartoon for *humour* and *difficulty* on a visual analogue scale ranging from 1 to 5 (i.e. one for not funny or very easy and five for very funny and very difficult). The sum of the reported scores for each condition (i.e. ToM and Physical) divided by the number of the correctly interpreted jokes, constituted the subjective scores.

Symptomatology was evaluated by using the Positive and Negative Symptoms Scale (PANSS) [7] the same day of the irony comprehension assessment. The PANSS cognitive component was calculated summing the following seven items: difficulty in abstract thinking, stereotyped thinking, cognitive disorganization, lack of judgment and insight, poor attention, tension, mannerism and posturing according to Bell et al. [1] and Daneluzzo et al. [5]. The PANSS cognitive component has been reported to reflect cognitive dysfunction in schizophrenia [1].

Premorbid IQ was also assessed using the "Test di Intelligenza Breve" (TIB), Italian version of the National Adult Reading Task (NART). All participants provided written informed consent after complete description of the study, in accordance with the local university institutional review board.

Results

Sample characteristics are reported in Table 1. Considering the physical as control condition, comparison between physical and ToM jokes scores was performed using paired sample *t*-test.

Table 2 Pearson *r* correlations among irony appreciation, TIB and PANSS scores

Irony appreciation assessment	TIB	PANSS scores		
		Positive score	Negative score	Cognitive score
<i>Objective scores</i>				
Physical score	0.17	−0.49*	−0.33	−0.30
ToM score	0.33	−0.48*	−0.16	−0.33
<i>Subjective scores</i>				
Physical average humour score	0.46*	−0.42	−0.22	−0.26
Physical difficulty score	−0.02	−0.03	−0.33	−0.37
Physical time for correct response	0.19	−0.06	−0.24	0.01
ToM average humour score	0.47*	−0.51*	−0.12	−0.20
ToM difficulty score	−0.00	−0.22	−0.33	−0.56**
ToM time for correct response	0.59**	−0.09	−0.26	−0.13

* $p < 0.05$

** $p < 0.01$

Objective scores comparison was highly significant ($t = 6.55$; $df = 19$, $p < 0.0005$).

Subjective physical average humour score was higher than the correspondent ToM score ($t = 3.74$, $p < 0.001$, i.e. physical more funny than ToM jokes). Similarly physical difficulty score was higher than ToM condition ($t = 4.53$, $p < 0.0005$, i.e. physical more difficult than ToM jokes). No difference was found in time for correct response between the two conditions ($t = 0.85$, NS).

Objective Physical score and ToM scores correlated with PANSS positive score (i.e. higher symptoms less jokes comprehended) ($r = -0.49$ and -0.48 respectively, $p < 0.05$).

Subjective ToM average humour score significantly correlated with positive symptoms (Pearson $r = -0.51$; $p < 0.05$) (i.e. more severe symptoms, less funny the cartoon); difficulty in understanding ToM jokes was related to PANSS cognitive cluster score ($r = -0.56$ $p < 0.01$) (i.e. more cognitive symptoms, less difficult the ToM jokes). No statistically significant correlations were seen between Objective or Subjective Physical and ToM scores and PANSS negative symptom score (Table 2).

Estimated IQ correlated with the Physical, ToM average humour score (i.e. higher IQ, higher joke comprehension) and ToM time for correct response (i.e. higher IQ more time spent in joke comprehension) ($r = 0.46$, 0.47 and 0.59 , respectively). No statistically significant correlations were seen between estimated IQ and PANSS scores.

Discussion

We report a significant relationship between ToM performances and positive symptoms. Although, in disagreement with Marjoram et al. [11] results, our finding is however coherent to with previous studies showing paranoid delusions to be significantly related to poor ToM performance [3, 4]. The differences be-

tween these results could be due to the different rating scale used.

The correlation between ToM difficulty score and PANSS cognitive score is counterintuitive, as patients with more severe PANSS cognitive score report less average difficulty score, as is the result of the correlation between time spent in comprehension of ToM jokes and estimated premorbid IQ.

A parsimonious explanation of these two correlations is that the more PANSS cognitive compromised patients did not succeed in deploying attention resources to the task perceiving it less difficult (i.e. *time discounting*) while higher TIB patients would show the opposite efforts (i.e. *time spending*), spending more time, but really appreciating ToM irony. ToM subjective scores instead show that these jokes are less funny and difficult to comprehend than the physical condition. Moreover for a more complex task, such as the ToM, no more time is spent for comprehension and giving a correct response: the mean time for correct answer is even lower in absolute value than that of the time spent in comprehension of the physical jokes. Similar results are reported by Marjoram et al. [11]: at the contrary of schizophrenics, controls spent more time for the ToM condition.

Interpretation of these preliminary observations is that schizophrenic patients use no more cognitive effort when involved in task requiring comprehension of indirect speech and inferring what is going in the mind of other people, such as in ToM jokes. The subjects seem to cope the ToM cartoon as would be physical one not engaging those processing mechanisms required for a ToM task. This condition could be related to an attention deficit as the correlation with the PANSS cognitive score support [10].

Some possible pitfalls of this study have to be considered: the sample is relatively small and no control group has been evaluated. However, the physical 'condition' could be considered as internal control of the ToM condition within the schizophrenic group. The aim of this preliminary study was the investigation of the relationship between irony and symptoms; moreover the possibility of the physical 'condition' as control of the ToM condition has been suggested by Marjoram et al. [11]. No alpha correction has been considered for correlation analysis, due to the preliminary and explorative nature of

this study performed in a different group for language and 'culture' compared to the pivotal studies of Gallagher et al. [6] and Marjoram et al. [11]. Controlled studies in larger samples are warranted to further explore the meaning of irony and its relation with psychotic symptoms.

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