Understanding the communicative impairments in schizophrenia: A preliminary study

(Article begins on next page)

01 August 2024

UNIVERSITÀ DEGLI STUDI DI TORINO

Understanding the communicative impairments in schizophrenia: A preliminary study

Livia Colle [a,b,c], Romina Angeleri [a,c], Marianna Vallana [c], Katiuscia Sacco [a,b,c,d], Bruno G. Bara [a,b,c], Francesca M. Bosco [a,b,c],*

a Center for Cognitive Science, University and Polytechnic of Turin, Italy

b Neuroscience Institute of Turin, Italy

c Department of Psychology, University of Turin, Italy

d CCS fMRI Neuroradiology at Koelliker Hospital, Turin, Italy

A B S T R A C T

The aim of the present study was to evaluate the pragmatic abilities of patients with schizophrenia in a variety of pragmatic phenomena expressed through different communicative means (language, gestures, and paralinguistic modality). For this purpose we used the Assessment Battery of Communication (ABaCo; Sacco et al., 2008). The ABaCo is a validated clinical tool for assessing pragmatic skills, which comprises five evaluation scales—linguistic, extralinguistic, paralinguistic, context, and conversational—investigating both comprehension and production of the main pragmatic phenomena involved in a communicative exchange, such as direct and indirect speech acts, irony, deceit, the violation of Grice's maxims, topic management, and turn-taking. The battery was administered to a group of seventeen patients with schizophrenia, and matched healthy controls. We expected the clinical group to perform widely worse than the control group in the different pragmatic dimensions investigated. Results showed that patients with schizophrenia performed significantly worse than controls on all the five scales of the battery, both in comprehension and production tasks. Moreover, the results within each scale showed a differentiated performance in the clinical group among the pragmatic phenomena, with irony assessed as the most difficult task. The implications of these results for research and treatment in schizophrenia are discussed.

Learning outcomes: After reading this article, the reader will be able to: (1) summarize thepreliminary assessment of pragmatic impairments in patients with schizophrenia; (2) describea variegated communicative profile regarding different pragmatic phenomena; and (3) discuss the planning and evaluating specific rehabilitation programs.

1. Introduction

Schizophrenia is a complex pathology, the distinctive symptoms of which range from delusions and hallucinations to catatonic behavior and affectivity problems. Among the typical impairments in patients with schizophrenia, language dysfunction has been long acknowledged (Bleuler, 1911; Kraepelin, 1919). This poor performance relates to different aspects of language production, from the phonological level to

word forms (Rieber & Vetter, 1994; Stassen et al., 1995; DeLisi, 2001). Some of these difficulties were included in the definition of Schizophasia, a syndrome which comprises various dysphasialike impairments, such as clanging, neologism, and unintelligible utterances (Covington et al., 2005; Kraepelin, 1913; Lecours & Vanier-Cle`ment, 1976). Prosody is also often affected, as is apparent from the flat intonation or unusual voice quality of patients (Stein, 1993; Stassen, 1991; Stassen et al., 1995); there are also semantic issues, such as the use of word approximation and neologism (Chaika & Lambe, 1989; Chaika, 1990; Hoffman, Hogben, Smith, & Calhoun, 1985; Thomas, King, Fraser, & Kendell, 1990).

However, the most impaired level in the language of patients with schizophrenia is pragmatics, traditionally defined as the linguistic domain that relates to how language is used to convey meanings in context (see Levinson, 1983). Even when such important linguistic components as syntax and semantics are intact, people with schizophrenia may show pervasive difficulties at the discourse level (Andreasen, Hoffman, & Grove, 1985; Frith & Allen, 1988; Frith, 1992). Specific linguistic-pragmatic impairments in schizophrenia are in fact well documented. Different studies focused on single pragmatic phenomena have shown that patients with schizophrenia may have difficulties in the comprehension of indirect speech acts (Corcoran, 2003; Corcoran, Mercer, & Frith, 1995), in the comprehension of deceits, ironies, metaphoric and idiomatic expressions (Drury, Robinson, & Birchwood, 1998; Frith & Corcoran, 1996; Langdon, Davies, & Coltheart, 2002; Tavano et al., 2008), in the recognition and recovery of communicative failures (Bosco, Bono, & Bara, 2012), in sensitivity to the Grice's maxims violation (Mazza, Di Michele, Pollice, Casacchia, & Roncone, 2008; Te´ny, Herold, Szii, & Trixler, 2002), and finally in the comprehension of narratives (Marini et al., 2008). Narrative impairments are also evident in the discourse production, varying from a poverty of speech and content (wordy vagueness) to tangentiality (partly irrelevant replies), from loss of goal to derailment (loss of goal in gradual steps) and circumstantiality (numerous digressions) (Deese, 1984).

Similarly, a number of studies have focused on affective paralanguage – i.e., functions such as prosody and facial expression recognition that are necessary in order to comprehend the emotional 'flavor' of the communicative interaction. The difficulty in comprehending and producing the emotional tinge of a communicative interaction has been addressed as stable impairment of schizophrenia (for a review, see Edwards, Jackson, & Pattison, 2002).

Taken together, these results on pragmatics abilities in schizophrenia suffer from a restrictive definition of the pragmatics domain which considers only language as a communicative mean, excluding gestures or other expressive modalities from investigation. A few studies have extended the analysis to different forms of communication, and generally they have focused on the communicative production. Meilijson, Kasher, and Elizur (2004), for example, examined the communicative performance of patients with schizophrenia, testing verbal, non-verbal and paralinguistic aspects of conversation. The results showed that patients with schizophrenia exhibited inappropriate pragmatic abilities in comparison with participants with mixed anxiety-depression disorder and participants with hemispheric brain damage. Linscott (2005), using the Profile of Functional Impairment in Communication (PFIC, Linscott, Knight & Godfrey, 1996), also pointed out that patients with schizophrenia demonstrate a higher index of pragmatic impairment compared with healthy controls. The PFIC measured how much communicative acts are appropriated to the conversational rules (such as consistency with the aim of the interaction), informative needs (providing neither too little nor too much information), qualitative needs (being clear and concise), and the quality of non-verbal communication (using expressive behavior to facilitate the listener's engagement). Similar results have been shown by Bazin, Sarfati, Lefre` re, Passerieux, and Hardy- Bayle` (2005), using the Schizophrenia Communication Disorder Scale (Scale-SCD). This scale showed that individuals with schizophrenia performed worse than people affected by mania or depression in integrating the contextual information of

everyday conversation (such as family, professional activity, hobbies, and so on) according to the listener's knowledge and background. These results suggested a multi-dimensional communicative-pragmatic impairment in patients with schizophrenia. Unfortunately, these fields of research suffer from two major problems: a limited view of pragmatics competence which confines this ability to the use of language overlooking non-verbal and paralinguistic abilities of patients with schizophrenia, and a lack of uniformity in the procedures and stimuli used (from written sentences and communicative vignettes to on-line conversations) which makes it very difficult to directly compare different results. To the best of our knowledge, there is no single study that systematically measures the ability of patients with schizophrenia to comprehend and produce a variety of pragmatic phenomena (e.g., direct and indirect speech acts, deceit and irony), expressed by different expressive means (verbal, non-verbal, paralinguistic) in a unified, broad, and controlled experimental protocol.

In this paper we aim to provide a wide preliminary overview of communicative abilities in patients with chronic schizophrenia, using a single assessment tool, the Assessment Battery for Communication (ABaCo, Bosco, Angeleri, Zuffranieri, Bara, & Sacco, 2012; Sacco et al., 2008), which was created to evaluate a variety of pragmatic phenomena and different communicative modalities. The battery was devised on the basis of the Cognitive Pragmatics theory (Bara, 2010, 2011), a theory focused on the cognitive processes involved in communication which is able to predict and explain the development of pragmatic skills in children (Bara, Bosco, & Bucciarelli, 1999; Bosco & Bucciarelli, 2008; Bosco, Bara, & Bucciarelli, 2004, Bosco, Bucciarelli, & Bara, 2006), as well as their decay in patients with traumatic brain injury (Angeleri et al., 2008).

The ABaCo is made up of five different evaluation scales—linguistic, extralinguistic, paralinguistic, context, and conversational—investigating all the main pragmatic aspects involved in communicative exchanges (e.g., direct and indirect communication acts, irony, deceit, violation of conversational maxims, turn-taking, and topic maintenance). Each scale investigates the ability to both comprehend and produce different communication acts. Using ABaCo, we aimed to obtain wide profile of the communicative impairment in patients with schizophrenia; we compared their performance with that of control participants, to determine the extent of their pragmatic impairment and to evaluate whether there are specific domains which are more compromised in the clinical group.

2. Material and methods

2.1. Participants

Twenty individuals with a diagnosis of schizophrenia according to the DSM-IV (APA, 1994) took part in the research. Three patients did not complete all of the questionnaires and were thus excluded from the study, thus statistical analyses were conducted on seventeen patients. All participants were outpatients of the Ceva and Mondovì district health authority and of the Turin district health authority. All patients were chronically ill, and as a group they experienced different degrees of autonomy: eleven patients were able to live independently or with minimal support, while the other six patients lived in sheltered accommodation or rehabilitation units. None of them required chronic hospitalization. All but one of the participants were unemployed at the time of the test, and they were all Italian native speakers. The inclusion criteria for participants with schizophrenia were: (1) no acute or florid psychotic state: all were tested in their chronic phase; (2) provision of informed consent; (3) achieve at least normative levels for the Raven's Coloured Progressive Matrices (RCPM, Raven, 1956, cut-off: IQ 80, using the norms established by Orme, 1966, cit. in

Belacchi, Scalisi, Cannoni, & Cornoldi, 2008); and (4) the achievement of a cut-off score in the following neuropsychological tests: MiniMental State Examination (MMSE, Folstein, Folstein, & McHugh, 1975; cut-off: 24/30); denomination scale of the Aachener Aphasie Test (AAT, Huber, Poeck, K, Weniger, & Willmes, 1983; Italian version in Luzzatti, Willmes, & De Bleser, 1996; cut-off: 70/120) and Token Test (De Renzi & Vignolo, 1962; cut-off: 5/6). The test scores of patients with schizophrenia are displayed in Table 1.

The symptomatology of the patients with schizophrenia at the time of testing was investigated with the Positive and Negative Syndrome Scale (PANSS: Kay, Fiszbein, & Opler, 1987). This consists of thirty items subdivided into 3 scales: one for positive symptoms (7 items), one for negative symptoms (7 items) and a general psychopathology scale (16 items); each item is assessed on a 7-point scale ranging from ''absent'' (1) to ''extremely serious'' (7). The PANSS scores of patients with schizophrenia are displayed in Table 1. Six of the patients were taking typical and nine were taking atypical antipsychotic medications; ten of the patients were also treated with other medications, including diuretics and cardiac medications. The literature on the dopaminergic medications highlighted their effects in the processing and encoding of emotionally salient information, and a critical issue is elucidating their role in delusions and hallucinations showed by patients with schizophrenia (e.g., Laviolette, 2007); however, in the pragmatics literature, patients with schizophrenia, treated with atypical antipsychotic, are generally included (Dickinson, Bellack, & Gold, 2007; Ford, Mathalon, Whitfield, Faustman, & Roth, 2007; Langdon, Coltheart, Ward, & Catts, 2002).

A control group of healthy participants was also included in the study. The two groups were matched for sex (participants with schizophrenia: 2 females, 15 males; control participants: 4 females, 24 males), age (participants with schizophrenia: M = 36.6; SD = 10.3; control participants: M = 36.2; SD = 9.9), and years of formal education (participants with schizophrenia: M = 10.9; SD = 2.4; control participants: M = 10.9; SD = 2.4).

Exclusion criteria for both schizophrenic and control participants included an anamnesis of neurological or neuropsychological disease, leucotomy, head injury, vision or hearing impairments and substance or alcohol abuse (both defined as per DSM-IV).

Table 1
Clinical details of patients with schizophrenia (N = 17).

	Participant ID																	Mean (SD)
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	
Age	23	30	44	56	35	53	34	40	38	53	26	31	27	24	43	30	35	36.3 (9.9)
Sex	M	M	F	M	M	M	M	M	F	M	M	M	M	M	M	M	M	
Duration of illness (yrs)	10	15	4	20	18	14	14	20	17	28	2	12	11	6	20	12	13	14.07 (6.8)
Treatment																		
Typical neuroleptics				√						√		√	√			√	√	
Atypical neuroleptics	√	√	√		√	√	√	√	√		√			√	√			
Other medications			√	√			√	√	√			√	√	√	√	√		
PANSS																		
Negative symptoms	13	42	17	10	35	19	18	18	7	17	20	16	21	15	42	33	16	20.1 (10)
Positive symptoms	13	42	9	12	22	25	23	29	10	18	18	23	33	12	31	34	14	21 (9.1)
General symptoms	39	94	32	30	62	36	76	41	32	24	41	48	74	37	69	88	32	47.9 (19.9)
Total score	65	178	58	52	119	80	117	88	49	59	79	87	128	64	142	166	62	93.7 (40.6)
Cut-off test scores																		
Raven's Coloured Matrices	21	21	35	31	21	23	32	31	29	35	31	34	25	27	35	21	29	28.3 (5.3)
MMSE	24	24	29	28	28	26	25	28	28	29	28	29	27	30	29	28	29	27.5 (1.8)
AAT	100	100	120	117	120	111	118	112	118	116	114	114	117	116	120	109	117	114.1 (6.1)
Token test	6	6	6	5	6	6	6	6	6	6	6	5	6	6	6	6	6	5.9 (.3)

2.2. Procedure

The PANSS was completed for each participant by qualified psychiatrists. Diagnosis of schizophrenia was made by qualified clinicians linked to the clinical units using DSM-IV criteria.

The experimental phase was conducted in three different sessions: (1) Cognitive-neuropsychological assessment; (2) the first part of the ABaCo; and finally, (3) the second part of the ABaCo. Each session lasted nearly 45 min. Breaks lasting a few minutes were scheduled, if necessary, during each session (maximum two interruptions per session).

One of the authors or a research assistant administered both the Assessment Battery for Communication and the cognitive and neuropsychological tests to determine the achievement of cut-off scores (see below). Each participant took part in the study in a quite room. The neuropsychological tests and the ABaCo were administered individually to each participant; patients with schizophrenia were tested at their rehabilitation or clinical units, while healthy controls were tested at home.

3. Material

3.1. The Assessment Battery for Communication

The Assessment Battery for Communication (ABaCo) consists of 5 different evaluation scales: (1) Linguistic Scale, (2) Extralinguistic Scale, (3) Paralinguistic Scale, (4) Context Scale, and (5) Conversational Scale. The tool is designed for Italian speakers; however three of the five scales (extralinguistic, paralinguistic and conversational) are language and cultural free and thus also suitable for non-Italian speakers. The whole protocol comprises 122 items: 40 items are based on the examiner's prompts and the remaining 108 items on videotaped scenes. Each videotaped scene lasts 20–25 s and comprises a controlled number of words (range: 7 ——————————————— 2). In more detail, the items were divided as follows: (1) Linguistic Scale – Comprehension tasks: Standard (direct and indirect) communicative acts (4 items), deceit (4), and ironies (4); Production tasks: Standard (direct and indirect) communicative acts (4 items), deceit (4), and ironies (4); (2) Extralinguistic Scale – Comprehension tasks: Standard communicative acts (4 items), deceit (4), and irony (4); Production tasks: Standard communicative acts (4 items), deceit (4), and irony (4); (3) Paralinguistic Scale – Comprehension tasks: Basic communication acts (8 items), basic emotions (8), and paralinguistic contradiction (4); Production tasks: Basic communication acts (8 items), and basic emotions (8); Context Scale – Comprehension tasks: Social norms (8 items), and Grics Maxims (8); Production tasks: Social norms (4 items); Conversational Scale: Topic and turn-taking maintenance (8 items). A detailed description of the items and some examples are reported in Appendix A. Appendix A also provides the scoring criteria and some examples of patients' answers.

3.2. Scoring

The experimental sessions were video-recorded with the participants' consent. Participants' performance was coded offline by two independent judges, blind with respect to the aims of the research. The two judges kept the scores on specific score sheets, while watching the subjects' video-recorded experimental sessions. For each task it was possible to obtain a score of 0 or 1: a score of 1 was awarded for each correct answer and a score of 0 for each incorrect answer. In case of ambiguous participant's answers the experimenter was trained to ask a series of additional questions, in order to be able to attribute a scoring

more accurately on a dichotomic level (for a detailed description of scoring criteria see Appendix A, they are also reported in Angeleri et al., 2008; Sacco et al., 2008).

The level of agreement among rates assigned by the two independent judges was calculated for the ABaCo using the Intraclass Correlation Coefficient (ICC), which provided a generalized measure of inter-rater concordance adjusted for chance agreement between measurements. The ICC for our scores was .89, indicating good inter-rater agreement (Altman, 1991).

4. Results

4.1. Overview

The analysis began with an overview of the participants' communicative performance. Table 2 summarizes the scores obtained both by the patients with schizophrenia and healthy controls. All comparisons were significant at the $p < .01$ level (see Table 2).

We also provide, for qualitative analysis, the performance of each patient in each battery sub-scale compared to the mean value scored by the corresponding demographic group in the normative study (reported in Angeleri, Bosco, Gabbatore, Bara, & Sacco, 2012; see Table 3). Overall, differences between patients and the general population were evident on all the ABaCo evaluation scales (80% of scores fell below the 20th percentile).

The results are reported in detail, separately for each assessment scale, in the following sections.

4.2. Linguistic and extralinguistic scale

Statistical analysis of the data was conducted using repeated measures ANOVAs for each scale, in order to assess participants' performance in different pragmatic phenomena expressed through linguistic and extralinguistic means.

Table 2
Comparison between schizophrenic patients and controls on the nine evaluation scales.

	Patients		Controls				95% CI	
	M	SD	M	SD	t(43)	p	LL	UL
Comprehension								
Linguistic scale	0.71	0.16	0.93	0.06	6.73	<.0001	−0.29	−0.16
Extralinguistic scale	0.59	0.19	0.85	0.12	5.69	<.0001	−0.36	−0.17
Paralinguistic scale	0.61	0.17	0.87	0.1	6.67	<.0001	−0.35	−0.19
Context scale	0.61	0.18	0.92	0.1	7.41	<.0001	−0.39	−0.23
Conversational scale	0.82	0.21	0.95	0.07	3.05	.004	−0.22	−0.02
Production								
Linguistic scale	0.64	0.17	0.89	0.11	6.07	<.0001	−0.34	−0.17
Extralinguistic scale	0.59	0.17	0.85	0.15	5.28	<.0001	−0.36	−0.15
Paralinguistic scale	0.79	0.15	0.94	0.1	4.87	<.0001	−0.22	−0.09
Context scale	0.75	0.25	0.93	0.13	3.13	.003	−0.29	−0.06

Note. CI: confidence interval; LL: lower limit; UL: upper limit.

Table 3
Percentages of correct responses in patients with schizophrenia (N = 17) compared with normative data on the 9 ABaCo scales.

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
Participant ID																	
Comprehension																	
Linguistic																	
%	44	69	68	92	83	38	64	100	56	75	83	78	75	61	83	63	75
Norms	94	91	90	92	90	90	94	90	90	90	94	94	91	91	90	94	90
Extralinguistic																	
%	44	56	61	67	56	8	78	56	44	67	78	89	78	78	44	50	44
Norms	94	85	81	85	83	81	94	81	83	81	94	94	85	85	81	94	83
Paralinguistic																	
%	76	76	42	60	67	40	76	76	60	69	62	49	82	29	77	61	29
Norms	88	88	89	81	84	89	88	89	84	89	88	88	88	88	89	88	84
Context																	
%	54	100	51	78	57	39	64	64	38	61	45	41	90	49	60	69	84
Norms	87	85	87	88	87	87	87	87	87	87	87	87	85	85	87	87	87
Conversational																	
%	100	58	88	27	95	83	100	87	92	66	100	100	83	70	100	88	54
Norms	96	93	97	95	97	97	96	97	92	97	96	96	93	93	97	96	92
Production																	
Linguistic																	
%	50	67	50	50	67	47	92	83	42	67	50	92	67	83	67	42	69
Norms	92	86	90	88	87	90	92	90	87	90	92	92	86	86	90	92	87
Extralinguistic																	
%	61	75	64	44	28	69	89	33	44	42	53	64	81	78	50	72	53
Norms	83	83	86	85	84	86	83	86	84	86	83	83	83	83	86	83	84
Paralinguistic																	
%	100	84	53	75	87	60	84	78	81	88	78	69	91	88	75	46	100
Norms	97	96	98	94	95	98	97	98	95	98	97	97	96	96	98	97	95
Context																	
%	75	100	25	75	75	75	100	75	100	75	50	50	100	100	100	75	25
Norms	96	96	94	83	95	94	96	94	95	94	96	96	96	96	94	96	95

Effect of group and type of pragmatic phenomenon were analyzed using a repeated measures ANOVA with one betweensubjects factor (type of subject, with two levels: patient and control) and one within-subjects factor (type of phenomenon, with three levels: standard, deceit and irony). On the linguistic scale, the analysis revealed a main effect of the type of subject ($F(1,43) = 45.26$; $p < .0001$; $h2 = .51$): patients with schizophrenia performed significantly worse than control participants on linguistic comprehension tasks (see Fig. 1). In both groups, there was a main effect of the type of pragmatic phenomenon ($F2,86) = 4.82$; $p = .01$; $h2 = .1$). The linear contrast revealed a linear decrease in scores depending on the type of pragmatic phenomenon ($F(1,43) = 6.77$, $p = .013$; $h2 = .14$): standard communication acts were the easiest to understand, followed by deceit and irony (see Fig. 1). For the extralinguistic scale the ANOVA analysis revealed a main effect of the type of subject ($F(1,43) = 32.43$; $p < .0001$; $h2 = .43$): patients with schizophrenia also performed significantly worse than controls on the extralinguistic comprehension scale. Again there was a main effect of the type of pragmatic phenomenon, i.e. standard, irony and deceit ($F(2,86) = 13.35$; $p < .0001$; $h2 = .24$) in both patient and control group. Also in this case, there was a linear decrease in scores depending on the type of pragmatic phenomenon ($F(1,43) = 19.55$, $p < .0001$; $h2 = .31$): standard communication acts were the easiest, followed by deceit and finally by irony, the most difficult task (see Fig. 1).
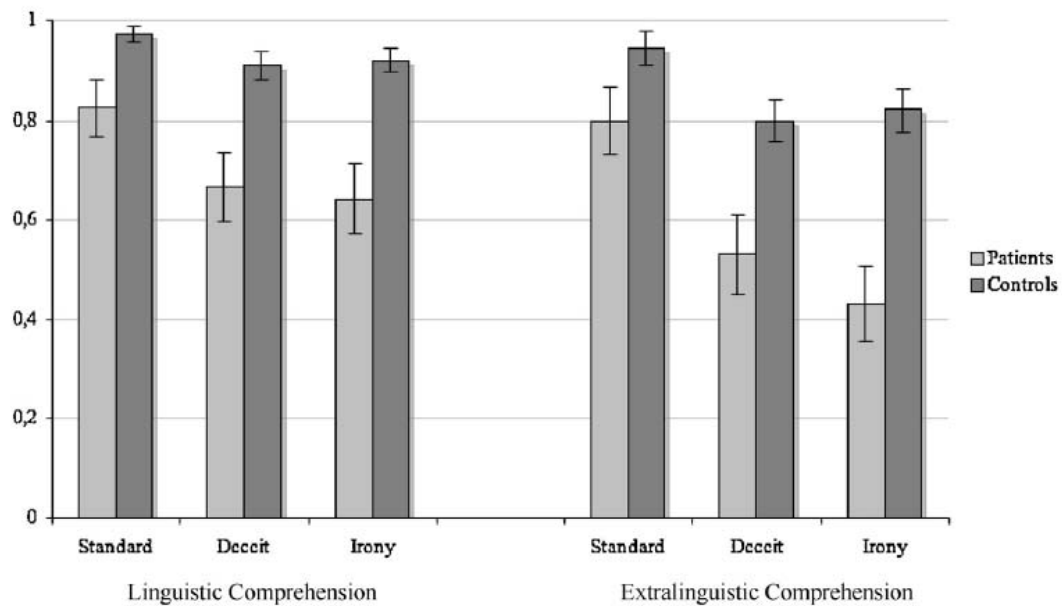
Fig. 1. Linguistic and extralinguistic comprehension performances.

Similarly, for the production of standard, deceitful and ironic communication acts, a repeated measures ANOVA was conducted, with one between-subjects factor (type of subject, with two levels: patient and control) and one within-subjects factor (type of phenomenon, with three levels: standard, deceit and irony). On the linguistic scale, the ANOVA analysis revealed a main effect of the type of subject ($F(1,43)$ = 36.81; $p < .0001$; h2 = .46): as for comprehension, patients with schizophrenia performed significantly worse than control participants on the linguistic production scale (see Fig. 2). There was a main effect of the type of pragmatic phenomenon ($F(2,86)$ = 28.28; $p < .0001$; h2 = .4). The linear contrast revealed a linear decrease depending on the type of pragmatic phenomenon ($F(1,43)$ = 37.15; $p < .0001$; h2 = .46): standard communication acts were the easiest, followed by deceit and then irony, the most difficult phenomenon to produce (see Fig. 2).

For the extralinguistic scale, as well, there was a main effect of the type of subject ($F(1,43)$ = 27.9; $p < .0001$; h2 = .39): patients with schizophrenia performed significantly worse than controls on the extralinguistic production scale (see Fig. 2). There was a main effect of the type of pragmatic phenomenon ($F(2,86)$ = 24.19; $p < .0001$; h2 = .36), in both the patient and control groups. Again linear contrast revealed a linear decrease in scores depending on the type of pragmatic phenomenon ($F(1,43)$ = 29.03; $p < .0001$; h2 = .4) (see Fig. 2).

4.3. Paralinguistic scale

Similarly, a repeated measures ANOVA with one between-subjects factor (type of subject, with two levels: patient and control) and one within-subjects factor (type of element, with three levels: basic communication act, basic emotion and paralinguistic contradiction) was applied to the paralinguistic scale, both in comprehension and production.
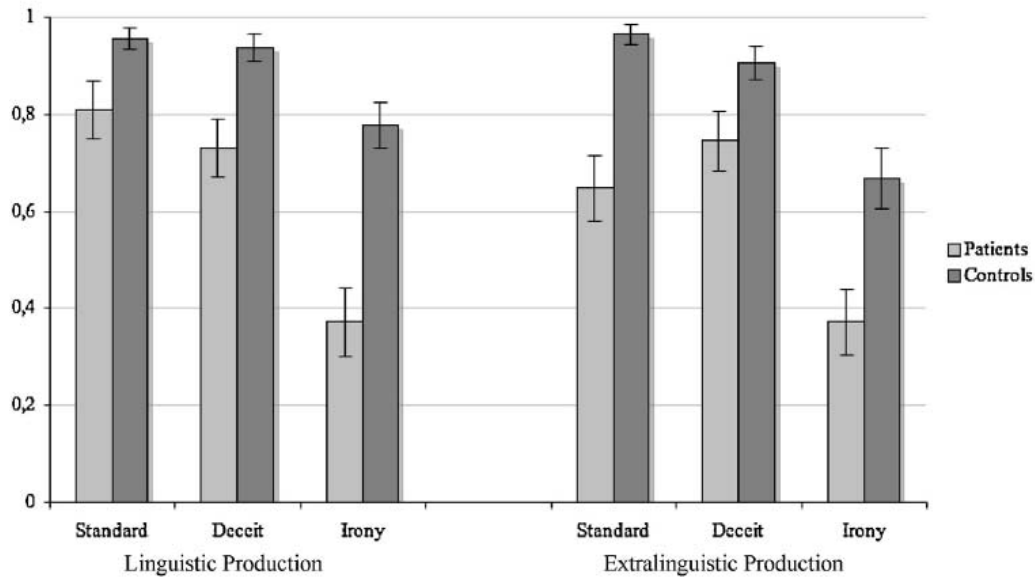
Fig. 2. Linguistic and extralinguistic production performances.

Table 4
Comparison between schizophrenic patients and controls on the scores in the paralinguistic scale, both comprehension and production tasks.

	Patients		Controls				95% CI	
	M	SD	M	SD	t(43)	p	LL	UL
Comprehension								
Basic Communication Act	0.46	0.24	0.72	0.2	4.03	<.0001	−0.39	−0.13
Basic Emotion	0.78	0.16	0.95	0.1	4.28	<.0001	−0.24	−0.08
Paralinguistic Contradiction	0.58	0.37	0.96	0.1	5.16	<.0001	−0.52	−0.23
Production								
Basic Communication Act	0.86	0.18	0.95	0.1	2.29	.027	−0.18	−0.01
Basic Emotion	0.72	0.15	0.94	0.08	6.14	<.0001	−0.29	−0.15

Note. CI: confidence interval; LL: lower limit; UL: upper limit.

In comprehension, the analysis revealed a main effect of the type of subject ($F_{(1,43)} = 44.43$; $p < .0001$; $h2 = .51$): patients with schizophrenia performed significantly worse than control subjects on paralinguistic comprehension tasks. In both groups a main effect of the type of paralinguistic element was the following: basic communication act, basic emotion and paralinguistic contradiction ($F_{(2,86)} = 25.26$; $p < .0001$; $h2 = .37$). The results are summarized in Table 4.

The same statistical analysis was performed for the production, revealing a main effect of the type of subject ($F_{(1,43)} = 23.72$; $p < .0001$; $h2 = .36$): patients with schizophrenia performed significantly worse than control participants on paralinguistic comprehension tasks. The different type of paralinguistic element also showed an effect ($F_{(1,43)} = 12.97$; $p = .001$; $h2 = .23$): the production of paralinguistic elements linked to basic communication acts was easier than the production of paralinguistic elements linked to basic emotions (see Table 4).

4.4. Context scale

The repeated measures ANOVA analysis in the context scale, revealed a significant effect of the type of subject ($F_{(1,43)} = 54.91$; $p < .0001$; $h2 = .56$), and of the type of violation, social norm and Grice's maxim ($F_{(1,43)} = 31.51$; $p < .0001$; $h2 = .42$). In more detail, the comprehension of social norms was more difficult than the comprehension of Grice's maxim violation both in patients (t-test: $t_{(16)} = 4.21$; $p = .001$) and in control participants (t-test: $t_{(27)} = 2.77$; $p = .01$). The results are displayed in Table 5.

Similarly, in the Production tasks, the analysis revealed a main effect of the type of subject (F(1,43) = 9.05; p = .004; h2 = .17), indicating that the group with schizophrenia performed significantly worse than the control group (see Table 5). There was also a main effect of the type of context involved in the different tasks (F(1,43) = 5.93; p = .02; h2 = .12), whereas appropriate communication acts in formal contexts are easier to be produced than in informal contexts.

4.5. Conversational scale

On the same line, for the conversational scale a repeated measures ANOVA revealed a significant effect of the type of subject (F(1,43) = 9.29; p = .004; h2 = .18) and of the type of element (F(1,43) = 17.45; p < .0001; h2 = .29). In more detail patients found topic management more difficult than turn-taking (t-test: t(16) = 2.7; p = .016). The results are displayed in Table 6.

4.6. Correlations between ABaCo, PANSS, and Raven's Progressive Coloured Matrices

We correlated the total score obtained by patients with schizophrenia on the PANSS questionnaire with the total score on the ABaCo, and found a significant negative correlation, i.e. higher scores on the PANSS correspond to lower scores of the ABaCo, of r = .55 (p = .023).

Table 5
Comparison between schizophrenic patients and controls on the scores in the context scale, both comprehension and production tasks.

	Patients		Controls				95% CI	
	M	*SD*	*M*	*SD*	*t*(43)	*p*	*LL*	*UL*
Comprehension								
Social Norms	0.76	0.18	0.97	0.06	5.45	<.0001	−0.28	−0.13
Grice's Maxims	0.46	0.27	0.88	0.18	6.2	<.0001	−0.57	−0.26
Production								
Informal	0.75	0.25	0.97	0.1	1.8	.08	−0.22	.01
Formal	0.87	0.28	0.93	0.13	3.13	.003	−0.29	−0.06

Note. CI: confidence interval; LL: lower limit; UL: upper limit.

Table 6
Comparison between schizophrenic patients and controls on the scores in the conversational scale.

	Patients		Controls				95% CI	
	M	*SD*	*M*	*SD*	*t*(43)	*p*	*LL*	*UL*
Topic	0.78	0.23	0.90	0.14	2.26	.029	−0.23	−0.13
Turn Taking	0.85	0.20	0.99	0.02	3.67	.001	−0.21	−0.06

Note. CI: confidence interval; LL: lower limit; UL: upper limit.

This corresponds to R2 = .30, meaning that the two variables share 30% of their variance. We also correlated the total score obtained by patients on the ABaCo with the scores obtained on the Raven's Progressive Coloured Matrices; we did not find any significant correlations (r = .25; p = .36).

5. Discussion

The aim of this research was to provide a preliminary overview of the communicative abilities of patients with schizophrenia on a large range of pragmatic phenomena expressed through different modalities. In line with our hypothesis, patients with schizophrenia performed significantly worse than healthy controls on all the evaluation scales—linguistic, extralinguistic, paralinguistic, context and conversational—on both comprehension and production tasks.

Overall, these results suggest that the communicative impairment in schizophrenia is broad and it is extended to many other dimensions involved in pragmatics beyond language, as traditionally conceived (Byrne, Crowe, & Griffin, 1998; Docherty, DeRosa, & Andreasen, 1996). To better interpret the scores obtained by patients with schizophrenia, we also compared them with population norms of the ABaCo that can serve as reference standards (Angeleri et al., 2012). To compare patients' scores with normative values, differences with population norms were analyzed by age and education groups to the level of the 20th percentile. Differences between patients and the general population were evident on all the ABaCo evaluation scales. Moreover, the comparison between an individual patient's score and the corresponding normative baseline on each specific scale—linguistic, extralinguistic, paralinguistic, context and conversational—provided us with information not only about the patient's specific deficit, but also about the severity of such deficit, given by the distance of the patient's score from the normative baseline.

5.1. Linguistic and extralinguistic scales

Despite the reduced number of patients with schizophrenia taking part in our study, we observed differences in performance on the different pragmatic phenomena, as shown by a more detailed analysis of the results for each scale investigated.

On the linguistic and extralinguistic scales, the results highlight a pattern of increasing difficulty in both the comprehension and production of direct and indirect communication acts, which are the easiest tasks, followed by deceit and then irony, which is the most difficult task to solve. Such findings hold both for the linguistic and the extralinguistic modalities, with the sole exception of extralinguistic production, where standard communication acts and deceit showed the same level of difficulty.

Consistent with these results, previous results showed the same trend of difficulties in different pragmatic phenomena in schizophrenia. A discrepancy between indirect speech acts, deceit and irony has separately been shown both in comprehension (Corcoran, Mercer, & Frith, 1995; Corcoran, 2003; Frith & Corcoran, 1996; Drury, Robinson, & Birchwood, 1998; Langdon, Davies, & Coltheart, 2002) and in production (Vallana et al., 2007). However, our findings provide additional data which extend the same trend of pragmatic disabilities in schizophrenia to the extralinguistic modality.

Difficulties in irony and deceit comprehension have often been interpreted as a consequence of a deficit in theory of mind. An extended literature has pointed out that patients with schizophrenia suffer from a deficit of theory of mind (Frith, 1992; Bosco et al., 2009; Lysaker et al., 2005). Some authors have suggested that the impairment in ability to attribute mental states would explain the difficulties of patients with schizophrenia to comprehend complex pragmatic phenomena such as irony (Drury, Robinson, & Birchwood, 1998; Langdon, Davies, & Coltheart, 2002) and deceit (Frith & Corcoran, 1996). Furthermore Salvatore, Dimaggio, and Lysaker (2007) and Salvatore, Dimaggio, Popolo, and Lysaker (2008) described, at the phenomenological level, the use of understanding mental states to solve pragmatic communicative

problems, arguing that the social withdrawal typical of patients with schizophrenia might be due to an underlying inability to understand others' intentions on a pragmatic level.

However, the exact role played by the theory of mind in explaining the communicative ability in healthy persons (see Sperber & Wilson, 2002; Tirassa, Bosco, & Colle, 2006a, Tirassa, Bosco, & Colle, 2006b) and pragmatic deficit in patients with schizophrenia remains an object of discussion in the current literature (for a review see Bell, Langdon, Siegert, and Ellis, 2010), and further studies will be necessary to clarify this point.

5.2. Paralinguistic, context sensitivity, and conversational measures

Another original contribution of this paper concerns the additional domains measured by ABaCo: paralinguistic scale, context sensitivity scale, and conversational scale. Each provides us with some additional information on the communicative competence in schizophrenia.

In relation to the paralinguistic scale, our results showed that patients with schizophrenia have problems not only in the recognition and production of affective prosody and facial affect, as previously suggested (for a review, see Edwards et al., 2002), but also in the non-affective paralinguistic cues (basic speech acts, i.e., assertions, questions, requests and commands expressed by paralinguistic modalities). However, in a direct comparison between basic emotion and basic communicative speech acts, patients with schizophrenia performed worse in producing the paralinguistic aspect of basic emotions than basic communication acts.

An additional dimension investigated by the ABaCo concerns context sensitivity. Once again, the group of patients with schizophrenia performed worse than the controls with regard to sensitivity concerning the violation of both discourse norms (Grice's maxims) and social norms. While difficulty in decoding violation of Grice's maxims has been reported in previous studies (Mazza et al., 2008; Te´ nyi et al., 2002), our findings also provided a direct comparison between sensitivity to social norms and communicative norms (Grice's maxims) and showed that patients performed better on tasks concerning the recognition of social norms rather than the violation of discourse norms. We explain this result as due to the fact that recognition of the violation of social and politeness rules only requires knowledge of a conventional nature, whereas recognition of the violation of a Grice's maxim requires an additional inferential ability. To the best of our knowledge, no other studies have made a direct comparison between different forms of sensitivity to contextual violations in schizophrenia.

Similarly, in production, we compare the ability to produce speech acts in both formal and informal contexts. Patients with schizophrenia performed worse when requested to proffer an appropriate speech act in a formal context than in an informal one. Our results showed that patients with schizophrenia have difficulty taking into account the relationship between the conversational partners (e.g., friends, family members, medical staff), as well as the interlocutors' background knowledge about the setting, topic, and so on. We explain this result as due to the fact that recognition of the violation of social and politeness rules only requires knowledge of a conventional nature, whereas recognition of the violation of a Grice's maxim and how to appropriately refer to a specific conversational partner requires additional inferential processes and theory of mind abilities. Further investigations focusing on different types of social norms and on the cognitive mechanisms responsible for decoding these aspects of communicative interactions might have a crucial impact on clarifying the unusual behavior typical of patients with schizophrenia and on developing social skills training specific to this purpose.

Finally, in the conversational scale, patients were less accurate than controls in solving both topic management and turntaking. Our result on topic management is in line with a large amount of evidence in the literature. It is well known that patients with schizophrenia fail to organize their speech appropriately for the intended message (Chaika, 1982; Leroy, Pezard, Nandrino, & Beaune, 2005; Meilijson et al., 2004).

Focusing on patients' performance, our results showed that they found topic management more difficult than turntaking. We argue that topic management requires more planning activity than turn-taking. Several studies in the literature have shown that planning is impaired in schizophrenia (Goldberg, Saint-Cyr, & Weinberger, 1990, Morris, Rushe, Woodruffe, & Murray, 1995), and we suggest that our result could be explained by a planning deficit in patients with schizophrenia and by the greater involvement of such cognitive factors in topic management than in turn-taking.

5.3. Clinical features, intellectual functioning, and communicative abilities

We also conducted a correlational analysis between the pragmatic performance of patients with schizophrenia, measured by the total scores obtained on the ABaCo, and the severity of their symptoms, measured by the total scores obtained on the PANSS. Our results showed a negative relationship between the two measures: the higher the scores on the PANSS, the lower the patients' scores on the ABaCo. This finding is unsurprising; it seems likely that the severity of symptoms in schizophrenia will affect such a complex ability as pragmatic competence. Further investigations with a larger clinical sample are necessary to provide a more detailed indication of the correlation between pragmatic competence and specific clinical profiles.

We also conducted a correlation analysis between the total scores obtained by the patients on the ABaCo and their total scores on the Raven's Coloured Progressive Matrices. We did not find any significant correlations between the patients' pragmatic performance and their intellectual ability; thus in this study, intellectual functioning does not appear to account for the pragmatic impairment seen in patients. Our result is not consistent with a robust literature that shows a relationship between language impairments in schizophrenia and a general intellectual impairment, which also characterizes schizophrenia (Rodriguez-Ferrera, McCarthy, & McKenna, 2001). This discrepancy could be due to the fact that all these studies focus on the linguistic performance of patients with schizophrenia, whereas our pragmatic assessment involved a variety of communicative tasks and communicative modalities. However, given the small number of participants in our study, further empirical evidence is necessary in order to draw a more generalized conclusion about the relationship between communicative and cognitive impairment in schizophrenia.

6. Limitations and conclusions

In summary, we have provided a broad assessment of pragmatic skills in a preliminary sample of patients with schizophrenia, and the data revealed that the impairment in patients with schizophrenia is extended to many domains of communicative skills, much beyond language. The data also suggest a differentiated profile of disabilities, with some domains more compromised than others. However, given the small number of patients participating in our study, these findings need to be confirmed by further empirical investigations in order to draw a more generalized conclusion.

Another limitation of the present study is that we did not take into account other cognitive mechanisms, such as theory of mind, executive functions or cognitive impairments. It is plausible to expect that these abilities could affect pragmatic abilities in patients with schizophrenia. Moreover, the comparison between patients with schizophrenia and healthy controls offers only a limited understanding of the specific profile

of communicative impairments in schizophrenia. Comparison of this population with individuals with inappropriate pragmatic abilities with different pathology, such as patients with brain damage or anxiety-emotion disorder, would provide further information about the specificity of communicative impairments in schizophrenia.

An accurate assessment of communicative abilities seems crucial not only for assessing patients' impairments, but also for planning and evaluating specific rehabilitation programs. In this regard, the ABaCo would be particularly effective, since two equivalent forms of the battery are available (Bosco et al., 2012a), to evaluate the effectiveness of rehabilitation treatments. The next step in our research will be to conduct a systematic study using the parallel forms of the ABaCo to test the effectiveness of a new rehabilitation program aimed at improving patients' communicative abilities and their social interactions.

Appendix A. Scoring criteria and examples of items, responses, and raters' scoring

In the following sections, we summarize the scoring criteria for the ABaCo tasks, reporting the questions posed to the participants during the administration of the battery, the in-depth questions posed in case of ambiguous answers by patients, and some examples of answers given by patients with schizophrenia.

Examples of battery items, patients' responses, and raters' scoring are provided in the table below.

A.1. Scoring criteria

A.1.1. Comprehension tasks

A.1.1.1. Linguistic and extralinguistic scale

At the end of each video, the participants were asked to answer a general question related to the comprehension of the videotaped interaction. The question was ''What did A say to B?'', where A and B were the characters (a male and a female) depicted in the scene, referred to by the examiner as ''the girl'' or ''the boy''. In many cases, the answers were ambiguous, not clearly understandable, or did not directly answer the question; consequently, we provided a series of in-depth questions aimed at verifying the participants' comprehension and scoring their responses correctly.

- If the participants simply echoed what the actor said in the videotaped scene, they were asked the following question: 'What would s/he say?'. Simply repeating what the actor said (echo) was not sufficient to demonstrate comprehension, and they had to provide at least a paraphrase of what was said to prove that they had actually understood.

- If the participants paraphrased the actors' utterance, they were asked 'What does s/he mean?' to verify whether they understood what the utterance/gesture implied.

- In non-standard communication acts (i.e., deceit and irony) the participants had to understand whether what the actor said was not true/not serious; if there was any doubt about whether they had understood, an additional depth-question was posed: 'Was s/he telling the truth?'

- The participants were asked to identify the reason why the actor produced a specific act when this was not clear from their first answer. For example, they were asked 'Why did s/he answer like that?' to find out whether they understood that the actor had stated something that was not true in order to conceal her/his guilt (deceit) or as a joke (irony).

In non-standard communicative acts, the participants scored 1 point if they understood the reason why the actor produced the particular communicative act; for example, if they understood that the actor had stated something that was not true in order to conceal her/his guilt (deceit) or as a joke (irony).

A.2. Paralinguistic scale

For both basic communication acts and basic emotions, participants were asked to identify the correct interpretation of the intonation/mimic with which the act was expressed in the videotaped scene from a set of multiple choice answers. For the items related to the paralinguistic contradiction, participants were asked the open question ''What did s/he mean?''; if they gave an ambiguous or echoic answer, the examiner posed an in-depth question related to the content of the scene aimed at disambiguating their response, for example ''Was she really happy to meet him?''. If the participants identified the correct interpretation, they scored 1 point.

A.3. Context scale

The participants were asked to recognize if there was something inappropriate in the proposed videotaped interaction with the question ''What do you think of the answer?''. If they gave an ambiguous answer, the in-depth questions were: 'Why is it not OK?' or 'How did you understand that?', to verify whether they had detected the cause of the inappropriateness. For example, in the 'social norm' items, the participants should have understood that the inadequacy was referred to the external social context/ situation. If they detected the element of inappropriateness correctly they obtained a score of 1.

A.4. Production tasks

A.4.1. Linguistic and extralinguistic scale

The participants were asked to complete the videotaped communicative interaction with the question: ''How could the actor answer?''. They scored 1 point if they produced a communication act that was plausible with respect to the communicative context, and if there was a logical connection between the answer and the communicative context shared by the interlocutors in the videotaped interaction.

In more detail, in irony and deceit production the participants scored 1 point if they produced a communication act fulfilling the requested goals of the communicative phenomenon at issue. In the case of deceit, the participants had to say (on the linguistic scale) or communicate with a gesture (on the extralinguistic scale) something that was not true, with the purpose of concealing their guilt/deceit. In the case of irony, the participants had to say or communicate something through gestures with the aim of joking or making fun.

In case of ambiguous answers, the in-depth question was: ''What do you mean?''.

A.5. Paralinguistic scale

The participants were asked to produce a specific utterance with an appropriate intonation, for example ''Ask me: where is the doctor? with a frightened tone of voice''. They scored 1 point if they produced a communication act with the requested mimic/ intonation appropriate to the given context or situation.

A.6. Context scale

The participants were asked to produce a communication act that was appropriate for the proposed social context in a brief exchange with the examiner. For example ''You are late meeting your wife. How would you apologize?'' and then ''You are late meeting your lawyer. How would you apologize?'' They obtained a score of 1 if they produced a communication act that was appropriate for the requested context. In particular, the production had to respect the characteristics of formality and informality required by the context/situation; the intonation and gestures had to respect the type of act and the social setting.

A.7. Conversational scale

On the conversational scale, comprehension and production were evaluated together. On this scale, points were assigned to each of the following aspects of the conversation:

A.7.1. (a) Topic management

Topic maintenance. Participants obtained a score of 1 if they respected the proposed topic and maintained the thread of the discourse.

Table A.1
Examples of items, responses, and raters' scoring.

	Videotaped item	Test question	Participant's response	Score
Linguistic scale				
Comprehension				
[1] Standard	Girl: "Did you go to the gym?" Boy: "I haven't felt so tired for so long!"	1. What did the boy say? 2. What did he mean by that? Did the boy go to the gym?	1. He was tired. 2. He had been working really hard. 3. Yes.	1
[2] Deceit	The child knocks a vase over. Mum: "Who knocked the vase over?" Child: "It was Bobi"	1. What did the child say? 2. What did he mean by that? 3. Did the child tell the truth?	1. The dog had broken the vase. 2. The dog had broken the vase. 3. Yes.	0
[3] Irony	The girl is wearing a dress that is too tight. Girl: "How does it fit me?" Boy: "Your diet is working well!"	1. What did the boy say?	1. He was joking.	1
Production				
[4] Standard	Husband and wife are sitting on the sofa. The husband is reading the newspaper, while the wife seems annoyed. Wife: "What would you like to do this afternoon?"	1. What could the husband answer?	1. He could tell her what he wants to do in the afternoon, and if he's going to put down that book.	1
[5] Irony	Brother and sister are having breakfast. Paying no attention, he's put his elbow in a rusk with jam. Brother: "Can you pass me the jam, please?"	1. What could the girl answer to make fun of the boy? 2. What do you mean by that?	1. I don't know... it's an everyday situation... 2. He is too concentrated on his breakfast.	0
Extralinguistic Scale				
Comprehension				
[6] Standard	The boy performs a gesture to ask the girl: "Do you want some coffee?" The girl looks at her watch with a gesture meaning "It's late"	1. What did the girl say?	1. She refused the offer.	1
[7] Irony	Boy and girl are eating a disgusting soup. The boy smacks his lips with a gesture meaning "It's very good!"	1. What did the boy say? 2. What did he mean by that? 3. Did the boy tell the truth? 4. Why did the boy answer like that?	1. He meant to say that she cooked a delicious soup.	0
[8] Deceit	The boy performs a gesture with which he asks for some candies. The girl doesn't want to give him any candy. So, she looks at the candies with a disgusted expression that means: "They are awful!"	1. What did the girl say? 2. What did she mean by that? 3. Did the girl tell the truth? Why did the girl answer like that?	1. The candies were not good. 2. They tasted awful. 3. No. 4. To make fun of him.	0
Paralinguistic Scale				
Comprehension				
[9] Basic emotion	The actor is speaking an invented language with a very sad expression.	1. In your opinion, what emotion does he want to express? angry ashamed sad (target) happy	1. Sad.	1
[10] Basic speech acts	The actor makes a request using an invented language.	1. The actor wanted to: say something he thought make a request (target) give an order deceive	1. Give an order.	0
[11] Paralinguistic contradiction	It's Robert's birthday, and Paola gives him a gift saying: "Happy birthday!" Robert unwraps the gift and discovers an awful tie. With an annoyed expression, he says: "Thanks, really, I needed one of those..."	1. What did the boy say? 2. In your opinion, did the boy like the tie? Why?	1. He liked the tie. 2. Kind of. 3. He made a perplexed expression.	1
Production				
[12] Basic emotion	–	1. I'm going to ask you to say some sentences. You must say them the way I tell you: Ask me what time it is. Do it as if you were bored.	1. *"What time is it"* with a neutral tone of voice.	0

Table A.1 (*Continued*)

	Videotaped item	Test question	Participant's response	Score
[13] Basic speech acts		1. Ask me to give you the pen.	1. *"Could you give me the pen?"* in a requesting tone of voice.	1
Context scale *Comprehension* [14] Social norms	A woman is sat in a waiting room. The waiting room is full, and the woman occupies the chair next to her. Paul arrives into the waiting room and asks to the woman: "Is this chair occupied?" The woman caddishly replies: "Of course! Don't you see that I put my coat on it?"	1. In that situation, was the woman polite? 2. Why?	1. No. 2. She had an unfriendly expression, she was rude.	1
[15] Grice Maxims	Husband asks his wife: "Where did John go to live?" She evasively replies: "You know, he's gone far away..."	1. In your opinion, is the wife's reply fine? 2. Why?	1. Yes 2. Because she replied that he's gone far away.	0
Production [16] Social norms	–	1. I'm going to ask you to say some sentences: Imagine that you are late for an appointment with your lawyer, and you have to apologize. How do you apologize?	1. Please excuse me for being late.	1
Conversational scale [17] Free conversation	*The examiner engages the participant in four brief conversation about her/his:* *(1) free time occupation (2) preferred tv show (3) summer vacation (4) city* *For each conversation, the rater assigns a score based on participant's topic and turn-taking maintenance.*			

Topic introduction/initiation. Participants scored 1 point if they introduced new themes or cues for broadening the conversation.

Topic shift. Participants scored 1 point if they managed to follow the topics of conversation without perseverations.

A.7.2. (b) Turn taking

Taking one's turn. Participants obtained a score of 1 if they filled in the silent pauses left by the examiner during the conversation, and did not impose on the examiner's voice.

Allowing the other person to have his turn. Participants scored 1 point if they allowed the examiner time to speak.

Reference to the interlocutor. Participants scored 1 point if they considered the contents expressed by the examiner, using lexical and cohesive devices. For example, in order to express a contrary opinion, if they began with 'On the contrary, I think that . . .'

A.8. Raters' agreement

All the participants' responses were scored by two independent raters. The level of agreement between raters was calculated using the intraclass correlation coefficient. The overall ICC was .89, considering the scores of all items included in the assessment battery. In addition, inter-rater agreement for each subscale is shown in Table A.1.

Appendix B. Continuing education

CEU Questions

1. The current literature suggests that communicative impairments in schizophrenia are due to:

- Linguistic deficits
- Memory dysfunctions
- Failure to understand communicative intention
- A lack of motivation to communicate

2. The Assessment Battery for Communication (ABaCo) consists of:

- A semi-structured clinical interview
- A multimodal pragmatic evaluation
- An extensive linguistic evaluation
- An experimental procedure

3. Results show that patients with schizophrenia:

- Have specific impairments in non-standard pragmatic phenomena
- Understand gestures better than linguistic exchanges
- Have communicative impairments that depend on their general cognitive functioning
- Are sensitive to the contextual information of the discourse

4. The original contribution of this paper is:

- To consider the different clinical features
- To evaluate different pragmatic phenomena typical of everyday life conversation
- To evaluate linguistic competence in a sample of Italian patients with schizophrenia
- To evaluate communicative performance in schizophrenia through different expressive modalities

5. Our results suggest that:

- Specific clinical profiles in patients with schizophrenia have a crucial role in communicative impairments
- A detailed assessment of linguistic impairments provides the guidelines for communicative rehabilitation
- Pragmatic phenomena expressed through linguistic and extralinguistic modalities are equally impaired in patients with schizophrenia
- The cognitive mechanisms involved in non-literal communication are mainly responsible for communicative impairments in schizophrenia
- Any rehabilitation of communicative skills in patients with schizophrenia should initially focus on their intellectual abilities

References

Altman, D. G. (1991). Practical statistics for medical research. London, UK: Chapman and Hall.

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders: DSM-IV. Washington, DC: American Psychiatric Association.

Andreasen, N. C., Hoffman, R. E., & Grove, W. M. (1985). Mapping abnormalities in language and cognition. In A. Alpert (Ed.), Controversies in schizophrenia (pp. 199–226). New York, NY: Guilford Press.

Angeleri, R., Bosco, F. M., Gabbatore, I., Bara, B. G., & Sacco, K. (2012). Assessment battery for communication: Normative data. Behavior Research Methods, 44, 845–861.

Angeleri, R., Bosco, F. M., Zettin, M., Sacco, K., Colle, L., & Bara, B. G. (2008). Communicative impairment in traumatic brain injury: A complete pragmatic bassessment. Brain and Language, 107, 229–245.

Bara, B. G., Bosco, F. M., & Bucciarelli, M. (1999). Simple and complex speech acts: What makes the difference within a developmental perspective. In M. Hahn & S. C. Stoness (Eds.), In Proceedings of the XXI annual conference of the cognitive science society (pp. 55–60). Mahwah, NJ: Lawrence Erlbaum Associates.

Bara, B. G. (2010). Cognitive pragmatics. Cambridge, MA: MIT Press.

Bara, B. G. (2011). Cognitive pragmatics: The mental processes of communication. Intercultural Pragmatics, 8, 443–485.

Bazin, N., Sarfati, Y., Lefre` re, F., Passerieux, C., & Hardy-Bayle` , M. (2005). Scale for the evaluation of communicative disorders in patients with schizophrenia: A validation study. Schizophrenia Research, 77, 75–84.

Bell, E. M., Langdon, R., Siegert, R. J., & Ellis, P. E. (2010). Schizophrenia and social functioning: The role of impaired metacognition. In G. Dimaggio & P. Lysaker (Eds.), Metacognition and severe adult mental disorders: From research to treatment (pp. 121–145). London, UK: Routledge.

Bleuler, E. (1911). Dementia praecox: On the group of schizophrenias. Translated by Zinkin, J. (1950). New York, NY: International University Press.

Byrne, M. E., Crowe, T. A., & Griffin, P. S. (1998). Pragmatic language behaviors of adults diagnosed with chronic schizophrenia. Psychological Report, 83, 835–846.

Bosco, F. M., Bucciarelli, M., & Bara, B. G. (2004). The fundamental context categories in understanding communicative intentions. Journal of Pragmatics, 36, 467–488.

Bosco, F. M., & Bucciarelli, M. (2008). Simple and complex deceits and ironies. Journal of Pragmatics, 40, 583–607.

Bosco, F. M., Bucciarelli, M., & Bara, B. G. (2006). Recognition and repair of communicative failures: A developmental perspective. Journal of Pragmatics, 38, 1398–1429.

Bosco, F. M., Colle, L., De Fazio, S., Bono, A., Ruberti, S., & Tirassa, M. (2009). Th.o.m.a.s.: An exploratory assessment of theory of mind in schizophrenic subjects. Consciousness and Cognition, 18, 306–319.

Bosco, F. M., Colle, L., & Tirassa, M. (2009). The complexity of theory of mind. Consciosness and Cognition, 18, 323–324.

Bosco, F. M., Angeleri, R., Zuffranieri, M., Bara, B. G., & Sacco, K. (2012). Assessment battery for communication: Development of two equivalent forms. Journal of Communication Disorders, 45, 290–303.

Bosco, F. M., Bono, A., & Bara, B. G. (2012). Recognition and Repair of communicative failures: The interaction between theory of mind and cognitive complexity in schizophrenic patients. Journal of Communication Disorders, 45, 181–197.

Chaika, E. O. (1982). Thought disorder or speech disorder in schizophrenia? Schizophrenia Bulletin, 8, 587–591.

Chaika, E. O. (1990). Understanding psychotic speech: Beyond Freud and Chomsky. Charles C. Thomas (Ed.), Springfield, Illinois.

Chaika, E. O., & Lambe, R. (1989). Cohesion in schizophrenic narratives, revisited. Journal of Communicative Disorders, 22, 407–421.

Corcoran, R. (2003). Inductive reasoning and the understanding of intention in schizophrenia. Cognitive Neuropsychiatry, 8, 223–235.

Corcoran, R., Mercer, G., & Frith, C. D. (1995). Schizophrenia, symptomatology and social inference. Schizophrenia Research, 17, 5–13.

Covington, M. A., He, C., Brown, C., Naci, L., McClain, J., Fjordbak, B., et al. (2005). Schizophrenia and the structure of language: The linguist's view. Schizophrenia Research, 77, 85–98.

DeLisi, L. E. (2001). Speech disorder in schizophrenia: review of the literature and exploration of its relation to the uniquely human capacity for language. Schizophrenia Bulletin, 27, 481–496.

De Renzi, E., & Vignolo, L. A. (1962). The Token Test: A sensitive test to detect receptive disturbances in aphasics. Brain, 85, 665–678.

Deese, J. (1984). Thought into speech: The psychology of a language. Englewood Cliffs: Prentice-Hall.

Dickinson, D., Bellack, A. S., & Gold, J. M. (2007). Social/communication skills, cognition, and vocational functioning in schizophrenia. Schizophrenia Bulletin, 5, 1213–1220.

Docherty, N., DeRosa, M., & Andreasen, N. C. (1996). Communication disturbances in schizophrenia and mania. Archives of General Psychiatry, 53, 358–364.

Drury, V. M., Robinson, E. J., & Birchwood, M. (1998). Theory of mind' skills during acute episode of psychosis and following recovery. Psychological Medicine, 28, 1101–1112.

Edwards, J., Jackson, H. J., & Pattison, P. E. (2002). Emotion recognition via facial expression and affective prosody in schizophrenia: A methodological review. Clinical Psychology Review, 22, 789–832.

Frith, C. D., & Corcoran, R. (1996). Exploring 'theory of mind' in people with schizophrenia. Psychological Medicine, 26, 521–530.

Frith, C. D. (1992). The cognitive neuropsychology of schizophrenia. Hove. UK Lawrence Erlbaum Associates.

Frith, C. D., & Allen, H. A. (1988). Language disorders in schizophrenia and their implications for neuropsychology. In P. Bebbington & P. McGuffin (Eds.), Schizophrenia: The major issues (pp. 172–186). Oxford, UK: Heinemann Professional Pub.

Folstein, M., Folstein, S., & McHugh, P. (1975). Mini-Mental State: A practical method for grading the cognitive state of patients for the clinicians. Journal of Psychiatric Research, 12, 189–198.

Ford, J. M., Mathalon, D. H., Whitfield, S., Faustman, W. O., & Roth, W. T. (2007). Reduced communication between frontal and temporal lobes during talking in schizophrenia. Biologycal Psychiatry, 51, 485–492.

Goldberg, T. E., Saint-Cyr, J. A., & Weinberger, R. (1990). Assessment of procedural learning and problem solving in Schizophrenic patients by Tower Hanoi type tasks. The Journal of Neuropsychiatry and Clinical Neurosciences, 2, 165–173.

Hoffman, R. E., Hogben, G. L., Smith, H., & Calhoun, W. M. F. (1985). Message disruptions during syntactic processing in schizophrenia. Journal of Communication Disorders, 18, 183–192.

Huber, W., Poeck, K., Weniger, D., & Willmes, K. (1983). Der Aachener Aphasie Test (AAT). Gottingen, DE: Hogrefe. [Italian version: Luzzatti, C., Willmes, K., & De Bleser, R. (Eds.), 1996].

Kay, S. R., Fiszbein, A., & Opler, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophrenia Bulletin, 13, 261–276.

Kraepelin, E. (1913). Dementia Praecox. Psychiatrie. Barth, Leipzig.

Kraepelin, E. (1919). Dementia precox and paraphrenia. Edinburgh, UK: University of Edinburgh.

Langdon, R., Davies, M., & Coltheart, M. (2002). Understanding minds and understanding communicated meanings in schizophrenia. Mind and Language, 17, 68–104.

Langdon, R., Coltheart, M., Ward, P. B., & Catts, S. V. (2002). Disturbed communication in schizophrenia: The role of poor pragmatics and poor mindreading. Psychological Medicine, 7, 1273–1284.

Laviolette, S. R. (2007). Dopamine modulation of emotional processing in cortical and subcortical neural circuits: Evidence for a final common pathways in schizophrenia? Schizophrenia Bulletin, 33, 971–981.

Lecours, A. R., & Vanier-Cle`ment, M. (1976). Schizophasia and jargonaphasia. Brain & Language, 3, 516–565.

Leroy, F., Pezard, L., Nandrino, J. L., & Beaune, D. (2005). Dynamical quantification of schizophrenic speech. Psychiatry Research, 133, 159–171.

Levinson, F. C. (1983). Pragmatics. Cambridge, UK: Cambridge University Press.

Linscott, R. J. (2005). Thought disorder, pragmatic language impairment, and generalized cognitive decline in schizophrenia. Schizophrenia Research, 75, 225–232.

Linscott, R. J., Knight, R. G., & Godfrey, H. P. T. (1996). The profile of functional impairment in communication (PFIC): A measure of communication impairment for clinical use. Brain Injury, 10, 397–412.

Lysaker, P. H., Carcione, A., Dimaggio, G., Johannesen, J. K., Nicolo` , G., Procacci, M., et al. (2005). Metacognition amidst narratives of self and illness in schizophrenia: Associations with neurocognition, symptoms, insight and quality of life. Acta Psychiatrica Scandinavica, 112, 64–71.

Luzzatti, C., Willmes, K., & De Bleser, R. (1996). Aachener Aphasie Test (AAT): Versione Italiana. Firenze, IT: Giunti O.S. Organizzazioni Speciali.

Marini, A., Spoletini, I., Rubino, I. A., Ciuffa, M., Bria, P., Martinotti, G., et al. (2008). The language of schizophrenia: An analysis of micro and macrolinguistic abilities and their neuropsychological correlates. Schizophrenia Research, 105, 144–155.

Mazza, M., Di Michele, V., Pollice, R., Casacchia, M., & Roncone, R. (2008). Pragmatic language and theory of mind deficits in people with schizophrenia and their relatives. Psychopatology, 41, 254–263.

Meilijson, S. R., Kasher, A., & Elizur, A. (2004). Language performance in chronic schizophrenia: A pragmatic approach. Journal of Speech, Language, and Hearing Research, 47, 695–713.

Morris, R. G., Rushe, T., Woodruffe, P. W. R., & Murray, R. M. (1995). Problem solving in schizophrenia: A specific deficit in planning ability. Schizophrenia Research, 14, 235–246.

Orme, J. E. (1966). Hypothetically true norms for the progressive matrices test. Human Development, 9, 222–230, Cit. in Belacchi, C., Scalisi, T. G., Cannoni, E., & Cornoldi, C. (2008). Manuale CPM. Coloured Progressive Matrices. Standardizzazione italiana. Firenze, IT: Giunti O.S. Organizzazioni Speciali.

Raven, J. C. (1956). Coloured progressive matrices, Sets A, Ab. London, UK: BHK Levis & Co.

Rieber, R. W., & Vetter, H. (1994). The problem of language and thought in schizophrenia: A review. Journal of Psycholinguistic Research, 23, 149–195.

Rodriguez-Ferrera, S., McCarthy, R. A., & McKenna, P. J. (2001). Language in schizophrenia and its relationship to formal thought disorder. Psychological Medicine, 31, 197–205.

Sacco, K., Angeleri, R., Bosco, F. M., Colle, L., Mate, D., & Bara, B. G. (2008). Assessment battery for communication—ABaCo: A new instrument for the evaluation of pragmatic abilities. Journal of Cognitive Science, 9, 111–157.

Salvatore, G., Dimaggio, G., & Lysaker, P. H. (2007). An intersubjective perspecitve on negative symptoms of schizophrenia: implications of simulation theory. Cognitive Neuropsychiatry, 12, 144–164.

Salvatore, G., Dimaggio, G., Popolo, R., & Lysaker, P. (2008). Deficits in mindreading in stressful contexts and their relationships to social withdrawal in schizophrenia. Bulletin of Mennineger Clinic, 72, 191–209.

Sperber, D., & Wilson, D. (2002). Pragmatics, modularity and mind-reading. Mind and Language, 17, 3–23.

Stassen, H. H. (1991). Affective state and voice: the specific properties of overtone distributions. Methods of Information in Medicine, 30, 44–52.

Stassen, H. H., Albers, M., Pqschel, J., Scharfetter, C., Tewesmeier, M., & Woggon, B. (1995). Speaking behavior and voice sound characteristics associated with negative schizophrenia. Journal of Psychiatric Research, 29, 277–296.

Stein, J. (1993). Vocal alterations in schizophrenic speech. Journal of Nervous Mental Disorders, 181, 59–62.

Tavano, A., Sponda, S., Fabbro, F., Perlini, C., Rambaldelli, G., Ferro, A., et al. (2008). Specific linguistic and pragmatic deficits in Italian patients with schizophrenia. Schizophrenia Research, 102, 53–62.

Te´ ny, T., Herold, R., Szii, I. M., & Trixler, M. (2002). Schizophrenics show a failure in the decoding of violation of conversational implicatures. Psychopathology, 35, 25–27.

Thomas, P., King, K., Fraser, W. I., & Kendell, R. E. (1990). Linguistic performance in schizophrenia: A comparison of acute and chronic patients. British Journal of Psychiatry, 156, 204–210.

Tirassa, M., Bosco, F. M., & Colle, L. (2006a). Rethinking the ontogeny of mindreading. Consciousness and Cognition, 15, 197–217.

Tirassa, M., Bosco, F. M., & Colle, L. (2006b). Sharedness and privateness in human early social life. Cognitive Systems Research, 7, 128–139.

Tirassa, M., & Bosco, F. M. (2008). On the nature and role of intersubjectivity in human communication. Emerging Communication: Studies in New Technologies and Practices in Communication, 10, 81–95.

Vallana, M., Bosco, F. M., Angeleri, R., Sacco, K., Bara, B. G., & Colle, L. (2007). Communicative ability in schizophrenic patients: Executive functions, theory of mindand mental representations. In D. McNamara & G. Trafton (Eds.), In Proceedings of the XXVII annual conference of the cognitive science (pp. 1–6). Nashville, TN: Cognitive Science Society.