

# Communicative-pragmatic impairment in schizophrenia: the role of executive function and theory of mind

## BACKGROUND

Individuals with schizophrenia frequently exhibit a wide range of communicative-pragmatic disorders. Previous studies reported deficits in the comprehension of non-literal and figurative forms of language, such as indirect speech acts, irony, metaphors and idioms, as well as deficits in conversational and narrative skills and in the recognition and recovery of communicative failures<sup>1-4</sup>. In addition, some studies found that schizophrenia is associated with an impairment in the ability to communicate using extralinguistic communicative modality, i.e. gesture and facial expressions<sup>5-7</sup>. Colle et al. (2013)<sup>5</sup> found that participants with schizophrenia performed worse than controls in all the tasks of the Assessment Battery for Communication (ABaCo<sup>8,9</sup>), and they also exhibited a trend of decreasing ability in the comprehension and production of different pragmatic phenomena, i.e. sincere communicative acts, deceit and irony, in the linguistic and extralinguistic scales of the ABaCo. The authors explained this pattern of decreasing ability on the basis of the increasing inferential complexity involved in the different pragmatic tasks examined.

Moreover, impairment in cognitive functions, such as Executive Functions (EF) and Theory of Mind (ToM), are an integral part of schizophrenic pathology<sup>10,11</sup>. A few previous studies examined at the same time the role that ToM and EF can play in the comprehension and production of different communicative acts, such as sincere communicative acts, deceit and irony<sup>12,6,13</sup>. In addition, few attention has been paid to examine the cognitive underpinnings of pragmatic impairment in extralinguistic, i.e. gestural modality. Thus, the relation between ToM, EF and pragmatic ability in schizophrenia is still not completely clear.

The aim of this study is to evaluate the relationship between the ability to manage different communicative pragmatic phenomena (i.e. sincere, deceitful and ironic communicative acts) using both linguistic and extralinguistic expressive modalities, and ToM and EF in schizophrenia. We want also to investigate the role of these cognitive functions in explaining the trend of increasing difficulty in the comprehension and production of different pragmatic phenomena, i.e. sincere communicative acts, deceit and irony, that Colle et al. (2013)<sup>5</sup> found in individuals with schizophrenia, and we hypothesized to be present also in this study.

## METHODS

Twenty-six individuals with schizophrenia (sex: 21 males, 5 females; age: M = 40.01; SD = 10.26; education: M = 10.81, SD = 2.43) and 26 matched controls (sex: 21 males, 5 females; age: M = 39.85; SD = 10.68; education: M = 10.05, SD = 2.45) took part in the study. Exclusion criteria were: 1) the presence of severe cognitive or linguistic deficits 2) evidence of current or past neurological disorder (e.g., epilepsy) 3) substance or alcohol use disorder 4) anamnesis of major neurological or neuropsychological disease 5) hearing or vision problems 6) history of head injury. Individuals with schizophrenia were in the chronic phase

of the illness and clinically stable. All the participants were Italian native speaker.

We evaluated communicative pragmatic-ability using the linguistic and extralinguistic scales of the ABaCo<sup>8,9</sup>. We evaluated background cognitive functions - general intelligence, selective attention and speed processing, EFs - working memory, inhibition and flexibility- and ToM, using a battery of standardized neuropsychological tests.

## RESULTS

To investigate the presence of significant differences in communicative-pragmatic performance, we performed a series of 2x3 repeated-measures ANOVAs with Group (individuals with schizophrenia, healthy control) as between-subjects factor, and the Type of pragmatic phenomena (sincere, deceitful and ironic communicative acts) as within-subjects factor. We found a main effect of Group for both the linguistic ( $F = 26.178$ ,  $p < .001$ ), and extralinguistic ( $F = 38.19$ ,  $p < .001$ ) scales of ABaCo, showing that experimental group performed significantly worse than control group. We also found a linear trend in pragmatic performance (linguistic:  $F = 36.04$ ,  $p < .001$ ; extralinguistic:  $F = 65.99$ ,  $p < .001$ ), that revealed a linear decrease in scores depending on the pragmatic phenomenon investigated: sincere communicative acts were the easiest to understand, followed by deceit and irony (see Figure 1).

To evaluate the role of cognitive factors – EF and ToM – on pragmatic performance in patients, we performed a hierarchical regression analysis. We included relevant predictors in the model in three consecutive steps: first step – cognitive background factors –, second step – EF – third step – ToM –. We found that the only significant predictor was ToM, that contributed to increase the quote of explained variance in the comprehension and production of linguistic sincere and deceitful communicative acts. We have not found any significant correlation between the global symptomatology, measured with PANSS total, total positive and total negative symptoms scores, and the communicative phenomena investigated.

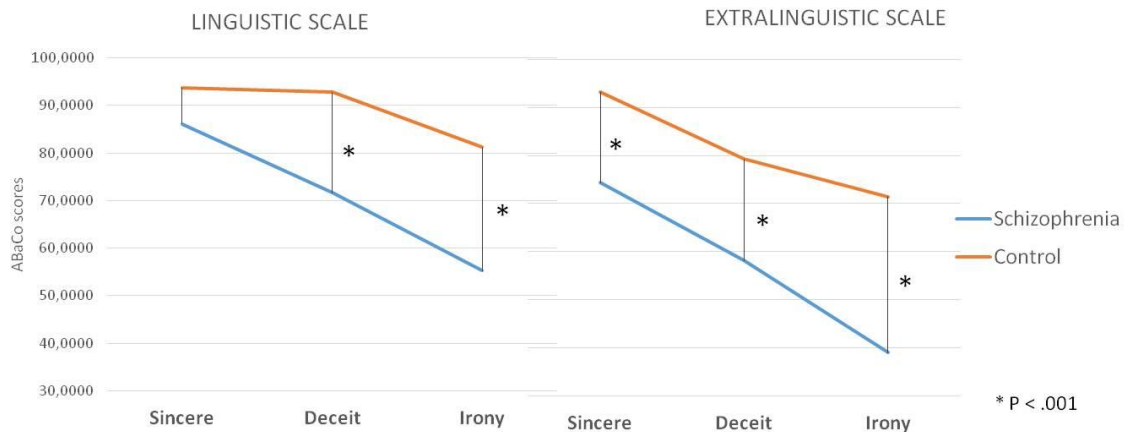
## CONCLUSIONS

Results showed the individuals with schizophrenia performed poorly, compared to healthy controls, in the comprehension and production of different kinds of pragmatic phenomena, i.e. sincere, deceitful and ironic communicative acts. This result confirms that communicative-pragmatic impairment is a core deficit in schizophrenia, in line with recent studies<sup>14</sup>. We also found that patients are specifically impaired in the comprehension and production of deceit and irony, while their performance with sincere communicative acts is similar to those of healthy controls.

Regression analyses showed an association between ToM and comprehension and production of sincere and deceitful communicative acts, while no association between irony and ToM was found; this result confirms the role that ToM play in managing deceitful communicative acts, while do not seem to support previous evidences indicating ToM as the main factors in explaining irony understanding<sup>1,15</sup>. In particular, results seem not to support the role of ToM in explaining the increasing trend of difficulty showed by individuals with schizophrenia in managing deceit vs. irony. We propose that, in addition to cognitive factors, i.e. EF and ToM, the inferential complexity necessary to recognize and produce any

specific pragmatic phenomenon may be considered in order to better explain the communicative-pragmatic difficulties exhibited by individuals with schizophrenia.

Figure 1. Percentage of correct responses of individuals with schizophrenia and controls for sincere, deceitful and ironic communicative acts, in the linguistic and extralinguistic scales of the ABaCo.



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