Proverb comprehension reconsidered—‘theory of mind’ and the pragmatic use of language in schizophrenia

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Abstract

Background: For decades, impaired proverb comprehension has been regarded as typical of schizophrenic thought disorder. Testing patients’ proverb understanding has widely been abandoned, however, due to poor reliability and validity of the assessment procedures. Since the underlying cognitive deficit of impaired proverb interpretation remained obscure, this study sought to determine the relation of proverb understanding with other cognitive domains, particularly ‘theory of mind’ or ‘mindreading’, in schizophrenia.

Methods: 31 patients diagnosed with schizophrenia were assessed using a novel German Proverb Test [Barth, A., Küfferle, B., 2001. Die Entwicklung eines Sprichworttests zur Erfassung konkretistischer Denkstörungen bei schizophrenen Patienten. Nervenarzt 72, 853–858.], a theory of mind test battery, a variety of executive functioning tests and verbal intelligence.


Results: ‘Theory of mind’, executive functioning and intelligence were strongly correlated with patients’ ability to interpret proverbs correctly. In a regression analysis ‘theory of mind’ performance predicted, conservatively estimated, about 39% of the variance of proverb comprehension in the patient group.

Conclusions: The ability to interpret such metaphorical speech that is typical of many proverbs crucially depends on schizophrenic patients’ ability to infer mental states. Future studies may further address differences between schizophrenia subtypes or the relation to specific symptom clusters.

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1. Introduction

Psychiatrists have recognized for at least 100 years that patients with schizophrenia tend to interpret proverbs literally (e.g., Finckh, 1906; Vigotsky,
Several scholars even asserted that impaired proverb understanding was almost pathognomonic for schizophrenia (Gorham, 1956), but the use of proverbs as a diagnostic tool was criticized due to its poor reliability and the concept was subsequently widely abandoned (Andreasen, 1977). However, the cognitive deficit underlying schizophrenic patients’ impaired ability to accurately interpret proverbs is still inadequately understood (Gibbs and Beitel, 1995). For example, it is unclear whether poor proverb comprehension in schizophrenia is linked to a more general cognitive impairment such as intelligence, poor executive functioning or to a more specific problem in information processing, or whether the ability to think abstractly is indispensable for proverb comprehension at all (Gibbs and Beitel, 1995).

Research into communication disturbances has revealed syntactical and semantic speech abnormalities in schizophrenia (Thomas et al., 1996; Docherty et al., 1996), as well as deficits in patients’ pragmatic use of language (Frith and Allen, 1988; Langdon et al., 2002a,b). The rules of pragmatics involve the capacity to extract the figurative meaning of an utterance (Grice, 1975; Sperber and Wilson, 2002). Therefore, a speaker and his interlocutor must be able to go beyond the literal meaning of a phrase—precisely what many schizophrenic patients’ so-called ‘concretistic’ way of thinking is lacking (Goldstein and Scheerer, 1941).

According to what has been termed ‘Relevance Theory’, both encoding and decoding of speech involves the expression and recognition of intentions in both speaker and hearer. This process requires a metapsychological inference mechanism that is commonly referred to as having a ‘theory of self and others’ minds’ (ToM; Sperber and Wilson, 2002). Many studies have shown that schizophrenic patients often fail on tasks involving ToM (overviews in Lee et al., 2004; Brüne, 2005). Poor ToM in schizophrenia has been associated with impaired metaphor and irony comprehension (Mitchley et al., 1998; Langdon et al., 2002a,b; Tényi et al., 2002) and with thought, language and communication deficits (Sarfati and Hardy-Baylé, 1999). The association of poor ToM with impaired proverb understanding has remained under-explored, except in a recent study using Gorham’s proverbs and a subjective rating of ‘bizarreness’ of the given responses (Greig et al., 2004). Indeed, establishing a link between proverb comprehension and ToM could substantially support the assumption that an intact ToM is a prerequisite for efficient verbal communication of schizophrenic patients as, for instance, during clinical interviews (McCabe et al., 2004).

In this study, we sought to explore the relationship between impaired proverb understanding and ToM performance in schizophrenia. We hypothesized according to ‘Relevance Theory’ that ToM task performance would be specifically linked to schizophrenic patients’ ability to interpret proverbs, and that impaired ToM would predict deficits in proverb comprehension in patients better than general intelligence, executive functioning or measures of psychopathology.

2. Methods

2.1. Participants

Thirty-one schizophrenic patients (23 males, 8 females) diagnosed with schizophrenia according to DSM-IV (APA, 1994) participated in the study after giving informed consent. All patients were on antipsychotic medication and naive to the aims of the study. Patients’ mean age at onset of the disorder was 26.4 years (12–59 years, S.D. ±9.1 years) and the mean duration of illness was 11.8 years (0–35 years, S.D. ±8.1 years). Patients mean age at time of assessment was 38.6 years (range 20–66 years). The comparison group consisted of 21 healthy control subjects (10 males, 11 females; mean age 33.9 years, range 19–62 years) with no history of psychiatric disorders, who were recruited from the community and hospital staff. All control subjects were unaware of the study hypotheses.

2.2. Proverb test

The proverb test used in this study was developed by Barth and Küsserle (2001). It comprised 14 metaphorical proverbs in German, of which the figurative, non-literal meaning had to be construed by choosing 1 out of 5 written statements given in random order. Type I answer was meaningful and abstract (the only correct choice). Type II answer was meaningful and partially concretistic. Type III answer was meaningful but highly concretistic. Type IV answer was meaningless.
and concretistic, and type V answer was meaningless and abstract. For example, for the proverb “if the cat’s away, the mice will play”, the following multiple choice answers were presented: (1) If there’s no control person, one can do what he/she wants (type I); (2) if no-one’s there to watch, the mice can do what they want (type II); (3) if the cat’s away, one can do what he/she wants (type III); (4) cats eat mice. Thus, the mice can play only after the cat has left the house (type IV); (5) if no-one’s there, you are on your own (type V). In an evaluation study of their Proverb Test, the authors found that schizophrenic patients interpreted the proverbs significantly more concretistically than a comparison group of patients with major depression (Barth and Küfferle, 2001). Only fully correct (type I) answers were rated (max. 14 pts.).

2.3. Neuropsychological tasks

General intelligence was estimated using the ‘Mehrfachwahlwortschatztest’ (MWT, which may best be translated as ‘Multiple Choice Verbal Comprehension Test’; Lehrl, 1976). English readership may note that the German MWT is similar to the ‘Spot-The-Word Test’ (Baddeley et al., 1993), with the difference that in the MWT subjects have to select the correct word from five instead of two choices.

Two tests of executive functioning were given to the participants: (1) a computerized and simplified version of the Wisconsin Card Sorting Test (WCST; Nelson, 1976), where changes to the rules of allocating the cards were made known to the participants. Errors and perseverations were recorded separately, the latter as a measure of cognitive flexibility. In addition, the Zoo Map Test (ZMT), which involves executive planning skills, was taken from the Behavioural Assessment of the Dysexecutive Syndrome (BADS; Wilson et al., 1996). Scores ranged from 0 to 4 points (max.).

2.4. Theory of mind tasks

‘Theory of mind’ (ToM) was assessed using a series of six cartoon picture stories (Brüne, 2003a), an advanced version of the test used in a previous study (Brüne, 2003b). The cartoons depicted scenarios of mutual cooperation, deception and cooperation of two characters while cheating a third character. Each picture story consisted of four cards. The cards were presented face down in jumbled order. The participants were asked to turn the cards over and to order them in a logic sequence of events. The sequencing time was measured for each picture story. The way of rating the sequencing task was adopted from Langdon et al. (1997), that is, two points were given for the first and last correctly sequenced cards, and one point each for correct sequencing of the two middle cards (thus, 6 pts. maximum per picture story, max. sum score 36 pts.). Two practicing examples were included from Langdon et al.’s (1997) picture stories and presented prior to ToM assessment.

In addition, a ToM questionnaire comprising twenty-three questions was given to the subjects in order to test the participants’ ability to appreciate the mental states of the characters involved in the cartoon stories (Brüne, 2003a,b). The questions referred to the mental states of the characters of the picture stories according to different levels of complexity. For example, a so-called ‘first order question’ was: “What do you think (1) this person (pointing to the respective character) intends?” An example of a second order question was: “What do you think (1) this person believes (2) the other intends to do?” Overall, questions addressed the participants’ ability to recognize cooperation, deception, to detect cheating and to comprehend true and false beliefs of the characters in the picture stories. A total score of sequencing and questionnaire sub-scores was calculated (59 pts. maximum).

2.5. Behavioral measures

Psychopathology was measured using the Positive and Negative Symptom Scale (PANSS; Kay et al., 1989). The rating of psychopathology (M.B.) was carried out blind to the patients’ performance on the MWT, executive tests and ToM tasks (assessed by L.B.).

Statistical analyses were carried out using SPSS 11.0 for Windows.

3. Results

3.1. Between-group differences

IQ as measured using the MWT and age were normally distributed in both the patient and the control
group. Thus, a parametric one-way ANOVA was carried out. Patients and controls did not differ with respect to their index age \( (F(1,51)=1.736, p=.194) \). They differed, however, with respect to their IQ \( (F(1,51)=4.322, p=.043) \) as measured using the MWT.

Due to non-parametric distributions (except for the Zoo Map Test), partly due to ceiling effects in the control group, we carried out Kruskal–Wallis tests for group comparisons. In the proverb test, the patients diagnosed with schizophrenia chose less frequently the correct answer than healthy controls \( (\chi^2(1,52)=22.947, p<.001) \) and interpreted the proverbs more often in a ‘concretistic’ way. Both groups differed significantly in their performance on the executive functioning tests, ToM and proverb understanding. The schizophrenic patients made significantly more errors \( (\chi^2(1,52)=20.836, p<.001) \) and more perseverative errors \( (\chi^2(1,52)=12.101, p=.001) \) in the computerized WCST, and scored significantly lower in the Zoo Map Test \( (F(1,51)=5.739, p=.02) \) compared to controls (here we used a one-way ANOVA).

In addition, the patients made significantly more errors in sequencing the ToM picture stories \( (\chi^2(1,52)=22.57, p<.001) \), they were significantly slower in sequencing the cartoon stories \( (\chi^2(1,52)=6.598, p=.01) \), they performed more poorly in the ToM questionnaire \( (\chi^2(1,52)=20.5, p<.001) \), and thus had significantly lower ToM sum-scores compared to controls \( (\chi^2(1,52)=28.024, p<.001) \).

As expected, all psychopathology scores differed significantly between the groups \( (p<.001) \). Between-group differences are summarized in Table 1.

### 3.2. Correlations within the patient and control group

A non-parametric correlation analysis in the patient group revealed that proverb understanding correlated significantly with intelligence (Spearman \( \rho=.467, p=.008 \)), inversely with the number of perseverative errors in the WCST (Spearman \( \rho=-.398, p=.026 \)), with the performance on the Zoo Map Test (Spearman \( \rho=.534, p=.002 \)) and with patients’ performance on ToM tasks (Spearman \( \rho=.651, p<.001 \)). No correlation was found between proverb comprehension and the number of errors in the WCST, the sequencing time of the ToM cartoons or with any of the psychopathology scores as assessed using the PANSS.

In the control group, proverb understanding only correlated inversely with the number of errors in the WCST (Spearman \( \rho=-.551, p=.01 \)). Unlike the schizophrenia group, no correlations of proverb understanding were found with intelligence, executive functioning other than WCSTerr or ToM performance, which was probably mainly due to ceiling effects in the control group (see Table 1 for result details).

Partial correlation analyses in the patient group demonstrated that proverb comprehension remained significantly correlated with ToM performance when controlled for IQ \( (r=.51, df=28, p=.004) \). Conversely,
proverb understanding did not correlate with IQ when ToM performance was co-varied out \((r=0.275, \text{df}=28, p=0.141, \text{n.s.})\), suggesting that impaired proverb understanding was largely independent of intelligence.

3.3. Regression analysis

Two stepwise linear regression analyses were carried out to determine in the patient group which of the variables predicted best schizophrenic patients’ proverb comprehension. For the sake of statistical validity, we restricted the number of independent variables to three in each equation. When IQ (MWT), the ToM sum-score and the Zoo Map Test were fitted into the equation as independent variables, the overall model was highly significant \((F(1,29)=19.854, p<0.001)\). Conservatively estimated, this model predicted approximately 39% of the variance of patients’ ability to correctly interpret proverbs \((R^2=0.386)\). After stepwise regression, ToM alone remained in the equation \((\beta=0.637, t=4.456, p<0.001)\), whereas IQ \((\beta=0.246, t=1.513, p=0.141)\) and the Zoo Map Test \((\beta=0.295, t=1.953, p=0.061)\) were successively removed.

Similarly, when the number of perseverative errors in the WCST was fitted into the equation instead of the Zoo Map Test, the overall model was also highly significant \((F(2,28)=13.136, p<0.001)\). The number of perseverative errors in the WCST contributed approximately additional 6% of the amount of variance \((R^2=0.447)\). In the equation, the predictive power of ToM was considerably higher \((\beta=0.533, t=3.682, p=0.001)\) than that of the number of perseverative errors in the WCST \((\beta=-0.298, t=-2.053, p=0.049)\); again, IQ was removed from the equation \((\beta=0.223, t=1.439, p=0.162)\). In other words, understanding other minds (i.e. ToM) and, to some degree, fewer perseverative errors in the WCST predicted schizophrenic patients’ proverb comprehension best.

4. Discussion

In the present study, we sought to explore the association of impaired proverb understanding in schizophrenia with other cognitive impairments and behavioral measures of psychopathology. We predicted, according to the ‘Relevance Theory’ put forward by Sperber and Wilson (2002), that patients’ impaired ‘theory of mind’, that is, their compromised ability to represent their own and other people’s mental states, would best explain schizophrenic patients’ difficulties in interpreting metaphorical speech of the kind found in many proverbial sayings. In fact, we found strong correlations between patients’ intelligence, executive functioning and particularly ToM story comprehension with their ability to recognize the figurative meaning of proverbs. More importantly, the correlation of proverb comprehension with ToM remained significant even when intelligence and executive functioning were co-varied out. In a linear regression equation, ToM performance was the single-most significant predictor of correct proverb interpretation in the patient group and accounted for approximately 39% of the variance alone.

Our results are in line with previous studies examining the association of ToM performance with pragmatic aspects of language such as quantity, quality, relation and politeness (Corcoran and Frith, 1996; Abu-Akel, 1999), comprehension of irony (Mitchley et al., 1998; Langdon et al., 2002a,b), and with patients’ failure to recognize intentional violations of conversational rules such as the detection of a hidden negative opinion (Tényi et al., 2002). In a similar vein, Harrow and Miller (1985) have shown even earlier that schizophrenic patients disregard the shared knowledge between them and their interlocutors during conversation. More specifically with respect to the present study, De Bonis et al. (1997) revealed that schizophrenic patients have difficulties in matching metaphors similar or contrary to abstract proverbs, and Greig et al. (2004) have recently found similar correlation coefficients of a different ToM test battery with Gorham’s Proverb Test. In summary, all these studies indicate that schizophrenic patients’ violation of conversational rules and poor understanding of figurative speech is associated with impaired mental perspective taking, i.e. ToM.

In contrast to our results, however, Langdon et al. (2002a,b) failed to detect an association of poor ToM with impaired metaphor understanding in schizophrenia. This apparently divergent finding deserves further comment. According to Sperber and Wilson (1995), metaphors represent a descriptive use of language (such as “you are the cream in my coffee”), whereas
Irony represents an interpretative use of language (“he’s a fine friend”) (overview in Langdon et al., 2002a,b). Thus, metaphor and irony probably reflect different levels of language complexity. Happé (1993) has demonstrated in children with autism that understanding metaphor requires a level of first-order theory of mind, whereas irony entails an intact second-order level (Happé, 1993). Accordingly, ontogenetically irony comprehension develops later (around the seventh year) than children’s understanding of metaphorical speech in the sense above. Langdon et al. (2002a,b) have argued that metaphor and irony comprehension involve distinct cognitive processes, which could explain why impaired understanding of metaphors is associated with negative symptoms in schizophrenia and poor irony comprehension with positive formal thought disorder.

The finding in our study of a profound association of ToM with proverb understanding in schizophrenia suggests that many proverbs may be more complex than purely descriptive metaphorical utterances. Moreover, proverbs and metaphor are not synonymous terms in the strict sense. Although the vast majority of proverbs are indeed metaphorical, others may be not at all (e.g. “do not put off until tomorrow what you can do today”). However, the proverbs used in Barth and Küfferle’s (2001) Proverb Test exclusively express social rules, norms or behavioral instructions in the form of implicit conceptual metaphors that are to some degree universal across cultures (Gibbs and Beitel, 1995). In addition, we would emphasize the fact that many proverbs convey covert meaning of so-called ‘Social Contracts’ (Cosmides, 1989). According to ‘Social Contract Theory’, social exchange in cooperative species like humans is governed by domain-specific algorithms that operate on cost-benefit representations of exchange situations (Cosmides, 1989). Beside a mechanism for the assessment of mutual benefit, an additional algorithm must have evolved in humans to detect violations of social contracts; mutual cooperation would be selected against if an individual were unable to discover cheaters and would therefore experience fitness costs. Detection of perceived cheating, for instance, is perhaps precisely the cognitive mechanism, which is overactive in the formation of paranoid delusions. Now, the purpose of proverbs, in part, could be the activation of social contract algorithms as in “one good turn deserves another” or “birds of a feather flock together” (cooperation), whereas other proverbs rather express the risk of being cheated such as in the German proverb “a fox who wants to catch geese wags his tail”. Patients with schizophrenia, we propose, have profound difficulties in understanding this kind of social contracts, perhaps similar to patients with damage to the ventromedial prefrontal cortex (Adolphs, 1999; Ritter et al., 2004). We predict, therefore, that patients with schizophrenia are also more likely to violate the rules of social contracts due to their impaired ToM: either by paying an unnecessary cost (i.e. cooperating on an illogical basis), or by defecting in an inadequate manner, e.g. when delusions are present.

There are some limitations of the present study that need to be mentioned. For example, while we do not assume that schizophrenia represents a ‘disease entity’, we did not—in light of the relatively small sample size—differentiate between different subtypes of schizophrenia. In addition, we did not control for medication effects or gender. Other studies did not determine an association of ToM abilities with medication (Sarfati et al., 1999), but our knowledge in this area is still limited (Brüne, 2005). Furthermore, we did not include a clinical comparison group. It would be most interesting to address in future studies, for example, in patients with bipolar affective disorder with psychotic symptoms, whether the presence of formal thought disorder would be indicative of impaired ToM and a compromised pragmatic use of language.

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