Mentalising deficits in schizophrenia

Summary of Ph. D. thesis

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Introduction

In the last decade there is an increasing interest in neurocognitive aspects of schizophrenia and its relationship with functional outcome. Particularly the role of executive functions, verbal memory, attention and working memory seems to be very important. Social cognition is placed between basic neurocognition and functional outcome as a mediating variable. The impaired social cognition is one of the key features of schizophrenia. Several retrospective and prospective studies found that preschizophrenic children show premorbid social impairments, which influence their social relationships. Social cognitive deficits can be regarded as a vulnerability factor to schizophrenia. On the basis of all these impaired social functioning is one of the central behavioural characteristic of schizophrenia. Any pharmacological or psychological intervention which can influence social functioning can be a crucial factor in the outcome of the illness.

One key aspect of social cognition is the ability to conceptualize other people's mental states (e.g. their beliefs, knowledge and intentions) and hence to explain and predict their behaviour. This ability is called theory of mind (ToM) or mentalisation. Autism was the first disorder where theory of mind deficit was revealed. Research on theory of mind in schizophrenia started in the second part of the last decade, and studies demonstrated that theory of mind is impaired in schizophrenia. It is widely accepted that theory of mind deficits in schizophrenia have a late onset in comparison to autism. ToM deficits in schizophrenia appear after a relatively normal development of mentalising skills, and people with schizophrenia lose their control above ToM skills throughout the course of the illness.

The aim of our studies was to clarify some aspects of mentalisation in schizophrenia. We investigated the presence or absence of "theory of mind" impairments among people with schizophrenia during remission, the relationship with pragmatics, neurocognition and quality of life.

1. Theory of mind deficit during remission

Early studies suggested that theory of mind deficit in schizophrenia is most striking in the acute phase of schizophrenia. The deficits are relatively IQ independent, associated with paranoid symptomatology and remit when these symptoms resolve. Latter studies found relationship with disorganized, behavioural and autistic symptoms as well. According to the recent studies ToM deficits in schizophrenia do not show direct relationship with specific symptoms. Results suggest that deficits relate to schizophrenia itself. Langdon and Coltheart gave support to this view when they found that people with schizotypal personality traits performed very similarly to people with schizophrenia in theory of mind tasks, and on the basis of continuity model of psychosis-proneness they state that defective mentalising can be a primary cause of schizophrenic symptoms.

According to the neurodevelopmental model of schizophrenia and the developmental aspects of theory of mind skills, appreciation of others' mental states can be impaired long before the onset of schizophrenia.

- *Objective*: The authors' goal was to investigate the presence or absence of "theory of mind" impairments among people with schizophrenia during remission.

Method and results

We investigated 20 patients with paranoid schizophrenia in remission. We used the Positive and Negative Symptom Scale to assess psychopathology at the time of assessment. The total PANSS scores were under 60 in each patient enrolled in the study. The control group consisted of non-psychiatric subjects. During the tasks the participants were shown short stories, and they were asked to interpret the characters' intentions, mental states. Participants were presented one "first-order theory of mind" task to assess the acknowledgement of a character's belief about the world in a short story, one "second-order theory of mind" task to assess the acknowledgement of what one story character thinks about another character's thoughts, and two metaphor and two irony tasks, that were embedded in a story, where the characters of the stories used metaphor and irony to express their intentions. In the literature the ability of understanding metaphor has been linked to first-order theory of mind skills and the ability of understanding irony has been linked to second-order theory of mind skills.

There were no significant differences between the groups in the "first-order theory of mind" task (p=0,171), in the "second-order theory of mind" task (p=0,171) and the metaphor

task (0,500). The schizophrenic patients performed a statistically significant impairment in the irony task (p=0,007).

Conclusions:

Our results suggest that the ToM deficits in schizophrenia are trait rather than state markers. The patients passed the more simple theory of mind tasks but they failed in the irony task, which requires more sophisticated "theory of mind" skills.

2. Deficits in pragmatic language skills in schizophrenia

Language can be seen as the most important input of ToM development. Pragmatics deals with the linguistic expression of intentions. Pragmatics is the study how language is used, especially how utterances are interpreted. Pragmatic language use can be described with the conversational maxims: maxim of relation or relevance (“be relevant”), quantity (“say enough to be informative, but do not say too much”), quality (be truthful) and the selection of the appropriate level of politeness. The violation of maxims expresses a hidden, negative opinion. Studies on developmental psychology clarified that the ToM development of children relates specifically to the development of conversational skills.

Only few studies dealt with the relationship between pragmatics and ToM in schizophrenia. Only Corcoran and Frith have examined this question in the light of conversational maxims. They found that it was difficult to select the appropriate level of politeness for paranoid patients. Patients with negative features exhibited deficits in all maxims except in maxim of relation. Later Abu-Akel published an analysis of two conversations with two patients with formal thought disorder, and found that patients were impaired in decoding the violation of the maxims of relevance and quality.

- Objective: We hypothesized that patients with schizophrenia would be impaired in tasks requiring the decoding of violation of the maxim of relevance.

Method and results

We have examined 26 paranoid schizophrenic patients and 26 normal control subjects by the use of 4 “question and answer” vignettes, where the Gricean maxim of relevance was violated. The subjects were asked to judge these opinions and were scored by the investigators on a score from points zero to two.

Statistical analyses have shown that schizophrenics made significantly more mistakes during the decoding of the violated maxim as compared to controls ($p<0,001$), reflecting on the difficulties during correct exploration of a social context.

Conclusions

We conclude that patients with schizophrenia show a failure in the decoding of intentional violations of conversational implicatures. These results point at the dysfunctional pragmatic language use among schizophrenic patients.

3. Pragmatic language skill deficits in children with mental retardation

Theory of mind and pragmatic abilities have been described as a core deficit in several psychiatric disorders (e.g. autism, Asperger-syndrome and Williams syndrome). Research on different psychiatric disorders can contribute to the clarification of the similarities and differences in the "common pathways" between the etiological background and the clinical picture. Relatively few study investigated mental retardation. The disorder is traditionally treated as an illness with intact mentalisation, although several studies have questioned this fact recently. It is well-known that the development of pragmatics depends on the verbal mental age. In our study we investigated hypoxia-related mental retardation. The disorder can represent some analogy with schizophrenia research as individuals with hypoxia-related obstetric complications were more than five times more likely to develop schizophrenia than individuals with no hypoxia-related obstetric complications. Hypoxia-related complications have been related to structural brain abnormalities among schizophrenic patients. The most frequently reported anomaly is the enlarged lateral ventricles, which is associated with reduced volume in the hypoxia sensitive amygdala-hippocampal complex, and these latter structures are definitely involved in mentalisation processes.

- Objective: The authors' goal was to investigate the presence or absence of pragmatic language skill impairments among children with hypoxia-related mental retardation.

Method and results

We have examined 20 children with hypoxia-related mental retardation and 20 normal control subjects by the use of 5 "question and answer" vignettes, where the Gricean maxim of relevance was violated.

Statistical analyses have shown that children with hypoxia-related mental retardation made significantly more mistakes during the decoding of the violated maxim as compared to controls ($p<0,001$).

Conclusions

Children with hypoxia-related mental retardation exhibit impairment in pragmatic language skills, which can contribute to their problems in mentalising. Our data can serve as a point of reference for skill training in education of the handicapped. The results can have some consideration for obstetric complications related schizophrenia model as well.

4. The role of pragmatics in theory of mind deficits in schizophrenia

Thinking about others' thoughts and the adequate use of language are closely related. According to this, we can suppose that a close relationship and interaction exist between theory of mind and pragmatics. Relatively few studies dealt with the relationship between pragmatics and ToM in schizophrenia. According to developmental psychopathological studies marked behavioural and language deviances are present early in the childhood of preschizophrenic children, which predict schizophrenia in the adulthood. The results of developmental psychopathology and the connection between ToM and language development suggest the hypothesis that abnormality in language development of preschizophrenic children may result in disturbed ToM development and the ToM deficits among patients with schizophrenia may be connected with pragmatic language skills.

- *Objective:* According to earlier data we hypothesized that patients with schizophrenia would be impaired in tasks requiring the decoding of violation of the maxim of relevance and it would relate to weak performance in tasks requiring the understanding of irony as selecting relevant information is crucial in understanding irony.

Method and results

28 patients with schizophrenia and 20 patients with depression took part in the study. According to former data the ToM performance of non-psychotic depressed patients do not differ from normal population. Participants were presented two "first-order theory of mind" tasks, two "second-order theory of mind", and two metaphor and two irony tasks. Four

"question and answer" vignettes were used to assess decoding the violation of maxim of relevance.

There were significant differences between the groups in the irony task (p=0,012) and in the maxim of relevance tests (p<0.001). Considering the studied population as a group as a whole a strong correlation was detected between the performances in irony and maxim tasks (p<0,001). The significance level of the correlation between the performances in irony and maxim tasks hardly exceed 5% (p=0,056) in the depression group, which suggest - although the correlation is weak - that the two capacities are not independent. The correlation between irony and maxim of relevance tasks was not present in the schizophrenic group.

Conclusions

The relationship between irony and decoding the violation of maxim suggests that the theoretical correlation prevails in non-schizophreniform states only. Our results suggest that higher order ToM skills are definitely disturbed in schizophrenia, but the weak performance in ToM tasks cannot be attributed only to decoding problems arising from deficits in language skills and other factors can contribute to this.

5. Mentalisation and neurocognition in schizophrenia

According to studies on developmental psychology the development of mentalisation is based on the maturation of neurocognitive processes. Neurocognitive deficit is the intrinsic part of the disease, and neurocognitive functioning determines the functional outcome of schizophrenia. Four basic neurocognitive factors play critical role in the outcome: card sorting, verbal working memory, attention, and secondary verbal memory. Relatively few study investigated the relationship between neurocognition and theory of mind. Studies detected connections between ToM and contextual processing, executive functions, executive planning and autobiographical memory.

- *Objective*:
- Our study investigated the correlation between the basic neurocognitive factors and theory of mind skills among patients with schizophrenia.

Method and results

20 patients with schizophrenia took part in the study. We investigated the dimensions relevant in the outcome of the illness: verbal working memory (Letter-Number Test), visuospatial working memory (Dot Test), attention (Continuous Performance Test), selective attention (Stroop Test), executive functions (Wisconsin Card Sorting Test), secondary verbal memory (Rey Word-List Learning Test). Participants were presented two "first-order theory of mind" task, two "second-order theory of mind", and two metaphor and two irony tasks. Four "question and answer" vignettes were used to assess decoding the violation of maxim of relevance. The test battery was completed with a picture recognition task to recognise basic and complex mental states from face and eye expressions.

Global verbal ToM score correlated with selective attention (p=0,012) and verbal working memory scores (p=0,024). Performance in selective attention correlated with the recognition of complex mental states from faces (p=0,002) and eyes (p=0,040), but the recognition of these mental states related to the correct detection of basic emotions from faces (facebasic-facecomplex: p=0,016; facebasic-facecomplex: p=0,002) and eyes (eyebasic-eyecomplex: p=0,036). Attention correlated with the recognition of basic emotions from faces (p=0,036), and complex mental states from eyes (p=0,048). The total ToM score correlated with second-order ToM (p=0,047) and irony (p<0,001) task performance. The total PANSS score correlated with irony performance (p=0,04).

Conclusions

Our data suggest that theory of mind deficits are connected with neurocognitive skills. It seems plausible, that theory of mind deficits fit in the impaired neurocognitive processing. Attention can be a particularly important factor. The correlation between selective attention and the recognition of basic emotions and complex mental states strengthens this dimension. The correlation between verbal theory of mind and verbal working memory performance confirms the relationship between basic neurocognition and social cognition. The impairment of theory of mind skills in schizophrenia is rather performative then representational.

6. Relationship between mentalisation and quality of life in schizophrenia

Lower level of quality of life in schizophrenia is well known. The richness of the interpersonal relationships and the appropriate level of role functioning is essentially important in terms of quality of life. Adequate use of mentalising and pragmatic language skills is indispensable for orientation in the social world. The impairment of social

functioning can be detected long before the onset of symptoms. Problems of the quality of life in schizophrenia include the reduction of social network, the narrowing of interpersonal relations and the deterioration of role functioning. Mentalisation can be a possible influencing factor of this dimension.

- Objective: In our study we hypothesized that quality of life (primarily interpersonal relations and instrumental role) would correlate with mentalising and pragmatic language skills.

Method and results

20 patients with schizophrenia took part in the study. Participants were presented two "first-order theory of mind" task, two "second-order theory of mind", and two metaphor and two irony tasks. Four "question and answer" vignettes were used to assess decoding the violation of maxim of relevance. We used the Heinrichs-Carpenter Scale to assess the quality of life. The scale has four subscales: (1) interpersonal relations, (2) inrapsychic foundations, (3) instrumental role, (4) common objects and activities.

Quality of life score correlated with the global ToM score (p=0.022). The interpersonal relations subscale correlated with the global ToM performance (p=0,046) and irony performance (p=0,025). The instrumental role subscale correlated with the detection of the violation of the maxim of relevance (p=0,037).

Conclusions

Our results suggest that mentalisation affects quality of life with the mediation of interpersonal competence and role functioning through the better understanding of social world.

Summary

1. In contrast to previous results we revealed that theory of mind deficits in schizophrenia are present even during remission, so they are independent from the acute phase of the illness. Our results suggest that theory of mind deficits are trait rather than state markers.

2. We demonstrated that patients with schizophrenia show a failure in decoding of intentional violations of the maxim of relevance.

3. Our study revealed that children with hypoxia-related mental retardation exhibit impairment in pragmatic language skills.

4. We proved that patients with schizophrenia performed significantly worse in decoding of violation of the maxim of relevance and in understanding irony than patients with non-psychotic depression in remission. According to our results the theoretical connection between mentalisation and pragmatics could not be verified in schizophrenia.

5. We revealed that theory of mind deficits relate to the deficits in verbal working memory and attention, which suggests that theory of mind deficits fit in the impaired neurocognitive processing.

6. We demonstrated for the first time that mentalisation affects quality of life. Particularly higher-order mentalising skills (irony and pragmatics) influence quality of life by the mediation of interpersonal competence and role functioning.

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Tudományos közlemények (Publications)

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