

**Theses of Doctoral (PhD) Dissertation**

**An Option in Hungary for the Treatment of  
Social Cognitive and Metacognitive  
Impairments in Schizophrenia-  
The Metacognitive Training**

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# **An Option in Hungary for the Treatment of Social Cognitive and Metacognitive Impairments in Schizophrenia- The Metacognitive Training**

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## INTRODUCTION

Schizophrenia is a severe psychiatric illness of a pervasive and progressive nature. Nearly 1% of the world's population is affected by this highly disabling condition (GBD 2017, 2018). Core symptoms of the disorder are positive symptoms (e.g., hallucinations and delusions) accompanied in many cases by negative symptoms (e.g. abulia, affective decoloration), symptoms of disorganization (e.g. disorganized speech, disorganized behavior), and cognitive impairments (Andreasen, 1990; Sachs, Volz, 2013).

Neurocognitive impairments are crucial features of schizophrenia, where most attention, memory, and executive functions, language, processing speed, as well as spatial functions are adversely affected (Kéri, 2008).

In addition to neurocognitive deficits in schizophrenia, a large body of evidence has been collected in recent decades for deficits in social cognition. Its subdomains are emotion recognition, theory of mind (ToM), attributional style, and social perception, all of which show impairments in patients with schizophrenia (Pinham et al., 2014).

Metacognition can be defined as the knowledge of knowledge or cognition about cognitive phenomena. Thus, metacognition is a function that acts as a monitor and controller over our cognitive processes (Flavell, 1979). Subdomains of metacognition are self-reflectivity, understanding others' mind, decentration, and mastery. According to the integrative model of metacognition by Lysaker, it can be interpreted as an umbrella concept with elements ranging from discrete cognitive functions to complex and comprehensive cognitive functions including neurocognitive and social cognitive functions as well (Lysaker, Dimaggio, 2014).

There are evidences for the fact that better metacognitive functioning is associated with better neurocognitive and social cognitive performance in schizophrenia (Kukla, Lysaker, 2020). Impairments in metacognition have been determined to contribute to the development and persistence of schizophrenia symptoms (Lysaker et al., 2005, 2018).

Metacognitive Training (MCT) (Moritz, Woodward, 2007) is based on cognitive-behavioral therapy, and employs cognitive remediation techniques to improve neurocognition, as well as further techniques designed to improve social cognition. It is a small group computer-assisted training method that seeks to develop metacognitive awareness of cognitive impairments through targeted experiential tasks. The training, which was translated and adapted into Hungarian by us, contains 16 modules, where each module aims to improve a specific cognitive phenomenon.

MCT aims to improve metacognitive function by helping patients increase awareness of their cognitive processes, which is expected to improve symptom severity in schizophrenia.

This paper presents the study of efficacy of MCT and the qualitative content analysis of the verbal material of the training.

## **AIMS OF THE EFFICACY STUDY**

To study the efficacy of MCT in a Hungarian sample of patients with schizophrenia, we designed a single-blind randomised controlled trial with a six-month follow-up period.

- 1. Our primary research question was whether the effectiveness of MCT can be demonstrated in relation to symptom severity in a Hungarian schizophrenic sample.**

2. Secondly, we sought to answer the question whether the efficacy of MCT can be demonstrated in neurocognitive and social cognitive functions involved in the development and maintenance of schizophrenia symptoms.
3. Are there differences in the need for hospitalisation between patients who received MCT and those who did not?
4. Our fourth objective was to test the feasibility and subjective applicability of the training in a population of patients diagnosed with schizophrenia.
5. Are there positive changes in demographic indicators of the participants, reflecting a positive change in adaptive skills and functionality?

## **METHODS AND MATERIALS**

### **Study design and study participants**

We used convenience sampling to recruit participants: patients with schizophrenia diagnosis were referred into the study by their psychiatrist, and patients could voluntarily decide whether or not they wished to participate in the study.

Inclusion criteria included diagnosis of schizophrenia (DSM-5), general intelligence above 70 IQ points determined with the help of Wechsler's Adult Intelligence Scale (WAIS), and – in line with the recommendations of the applied training method – the absence of explicit antisocial, indiscrete, sexual or hostile behavior.

The study was conducted in 46 patients at two study sites. All of them met the inclusion criteria for IQ and behavioral characteristics. The participants were in remission.

Participants were randomly assigned into the treatment or the control group. Patients in the treatment group took part in a standard MCT along with psychiatric treatment as usual (TAU, psychopharmacological therapy and regular psychiatric control and care), while patients in the control group only received TAU. All participants received all the sixteen modules of standard MCT (one module/week).

To avoid biases that might arise from the unequal distribution of patients' symptom severity, stratified randomisation was used after the pre-test. Stratification was done along the PANSS score (Positive and Negative Syndrome Scale for Schizophrenia) of 75, which divides patients into two groups based on symptom severity.

Assessment of symptom severity, neurocognition, and social cognition was conducted before and after the training, and after a six-month follow-up period by a blinded clinical psychologist at each site. Altogether, ten months elapsed between the baseline and follow-up assessments.

## **Study materials**

- General Intelligence. We used *Wechsler's Adult Intelligence Scale (WAIS)* to measure participants' intelligence when screening them for inclusion criteria.
- Symptom Severity. The *Positive and Negative Syndrome Scale for Schizophrenia (PANSS)* was used in our study for assessing symptom severity. For scoring we adopted the scoring method of van der Gaag et al. (2006). It is a five-factor model of PANSS. The five factors are the following: positive symptoms, negative symptoms, disorganization, excitement, and emotional distress. We computed total PANSS values by the summation of the scores of the items.

- Neurocognition. To assess executive functions, the shortened version of the *Wisconsin Card Sorting Test* was used with 64 cards (*WCST-64*). This test assessing mental flexibility can help us can gain information regarding total errors, perseverative responses, perseverative errors, conceptual level responses, and the number of categories completed. In this study we focused on the number of errors and perseverative errors, since the results of the other three outcome data depend on the amount of errors.  
To assess the other neuropsychological functions of our patients we employed the *Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)*. The battery is designed to identify neurocognitive deficits. It provides scores for five subscales: Immediate Memory, Visuospatial Functions, Language, Attention, and Delayed Memory.
- Social Cognition. Emotion recognition was assessed with the help of Baron-Cohen's *Reading the Mind in the Eyes Test (RMET)*. In this test thirty-six pictures representing eyes belonging to female and male faces are presented, which show different emotions with four response options per trial. The task of the subject is to identify the emotion.  
*Theory of Mind Picture Stories Task (ToM PST)* evaluates the ability to infer mental states to others, and predict their behavior on different levels of intentionality. For the scoring of the answers we used our own scoring method, which showed appropriate psychometric properties. The task contains four scales: Sequencing; Theory of a Single Person's Mind; Switching Between Minds, and Comprehension of Misleading.
- Hospital admissions. A further outcome measure of our study was the number of days spent in hospital due to the illness.

Data on hospital admissions were retrieved from the medical documentation of the participants at the end of the six-month follow-up period.

- Subjective acceptance and feasibility. The efficacy of the training to be evaluated by group members was measured by asking ten questions important for psychological interventions (e.g. usefulness for daily life, whether they would recommend it to others, etc.)

### **Statistical Analyses**

Normality was evaluated with the help of the Kolmogorov–Smirnov test. Comparisons between dichotomous variables were conducted using the chi-squared test or Fisher's exact test. The Mann–Whitney *U*-test or independent samples *t*-test was used for independent samples, based on the normal or non-normal distribution of data. To study the relationship between a dependent variable and one or more explanatory variables linear regression analyses were computed.

Data were analyzed using generalized linear mixed models due to the ability of the model to handle the lacking data as well as different types of variables simultaneously at multiple levels (McGilchrist, 1994). Models analyzing changes within treatment conditions over time included time (baseline, post-treatment, and follow-up) as fixed factor. To select the best-fitting model, fixed and random intercept models were compared. Models analyzing differences in changes between treatment conditions included treatment condition as fixed factor, and the interaction between treatment condition and time. Thus, when analyzing differences between groups, the models also took into account the results of the previous assessment. Models in both cases applied a relevant covariant: duration of illness – the only value that proved to be marginally significant when comparing the intervention group



and control group at baseline. This complex model was set up in several steps. First, models with interaction terms were compared to models without interaction terms. Second, models with random intercepts and fixed intercepts were compared. Model fit was evaluated in all cases using Akaike's information criterion. To adjust for type I error rate, we corrected our results using Bonferroni's correction method for multiple comparisons ( $\alpha=0.0031$ ).

## **RESULTS**

### **Demographic features of the sample**

Considering the whole sample, nearly half of the study participants were male ( $n=22$ , 47.83%), and the mean age of the participants was 41.30 years ( $SD=10.73$ , range: 18-60 years). They had been suffering from schizophrenia symptoms for 13.74 years on average ( $SD=8.53$ , range: 1-34 years), and had been hospitalized due to the illness 6.28 times on average ( $SD=4.52$ , range: 1-33 times). More than two thirds had at least a high school certificate ( $n=37$ , 80.43%), and almost all were single at the start of the study ( $n=44$ , 95.65%); two thirds were employed ( $n=32$ , 74.42%). The mean PANSS total score of the sample was 80.24 ( $SD=22.56$ ), and the mean IQ was 105.65 ( $SD=13.37$ ). The mean olanzapine equivalent dose according to the method of defined daily doses (DDD) was 12.83 mg/d ( $SD=7.84$ ). When comparing baseline demographic data at randomization we found that participants in the TAU and TAU+MCT groups did not differ regarding their demographic data, PANSS symptom severity scores, general intelligence, or olanzapine equivalent dose. However, the statistical comparison of the duration of the illness remained only marginally above the pre-defined level of significance.

### **Symptom severity**

Our primary outcome was change in symptom severity. When comparing intervention group and control group ( $B = -14.34$ ,  $p = 0.026$ ), an improvement in overall symptom severity was found in favor of the TAU + MCT group ( $B = -14.34$ ,  $p = 0.026$ ). A further improvement could be detected during the 6 months follow-up period ( $B = -14.95$ ,  $p = 0.033$ ). Within-group changes further confirm these results (TAU + MCT from baseline to post-treatment:  $B = -10.44$ ,  $p = 0.029$ ). Results showed that patients with a baseline PANSS total score  $\geq 75$  presented a greater improvement in symptom severity compared to patients with a lower symptom severity at baseline (baseline to post-test: ( $F(1, 21) = 15.550$ ,  $p < 0.001$ ,  $R^2 = 0.425$ ,  $B = -21.800$ ; and (baseline to follow-up: ( $F(1, 21) = 4.501$ ,  $p = 0.046$ ,  $R^2 = 0.177$ ,  $B = -16.938$ ).

When considering the subscales of PANSS a decline in positive symptoms was seen between the baseline and the post-treatment assessment in favor of the TAU + MCT group ( $B = -4.66$ ,  $p = 0.045$ ), and a further difference between the groups was detectable between the end-of-training and the follow-up assessments ( $B = -4.78$ ,  $p = 0.046$ ). The scores of disorganized symptoms of the PANSS also improved in the TAU + MCT group between the baseline and the post-treatment assessment ( $B = -5.98$ ,  $p = 0.018$ ) compared to the control group. This difference was still detectable 6 months after the training ( $B = -6.89$ ,  $p = 0.018$ ).

### **Neurocognition**

Cognitive outcomes were assessed as secondary outcomes. No relevant differences between the TAU and the TAU + MCT group were detected at any assessment point, either in terms of total errors or perseverative errors (WCST).

The TAU + MCT group also showed improvement compared to the TAU group in visuospatial functions between baseline assessments and post-treatment assessments ( $B=2.71$ ,  $p=0.028$ ); this effect, however, did not persist into the follow-up assessment ( $B=2.41$ ,  $p=0.073$ ).

Looking at the results within the group, we managed to detect improvements in language ( $B=3.16$ ,  $p=0.006$ ) and delayed memory ( $B=2.83$ ,  $p=0.004$ ) in the TAU + MCT group, and improvement in delayed memory ( $B=3.96$ ,  $p=0.003$ ) in the TAU group between the baseline and the post-treatment assessments. The results regarding delayed memory proved to be significant in the TAU group and marginally significant in the TAU + MCT group at the adjusted significance level. A further improvement of these functions could be detected in the TAU + MCT group between the post-treatment and the follow-up assessments (language:  $B=2.30$ ,  $p=0.016$ ; delayed memory:  $B=2.17$ ,  $p=0.047$ ). Furthermore, the improvement in immediate memory proved to be significant in the TAU + MCT group during the follow-up period ( $B=3.83$ ,  $p=0.003$ ).

### **Social cognition**

No significant change in emotion recognition (RMET) was found either within or between groups at the post-test and the follow-up assessment.

The TAU + MCT group showed improvements in the "Switching Between Minds" ( $B=0.70$ ,  $p=0.006$ ) and "Comprehension of Misleading" ( $B=0.65$ ,  $p=0.012$ ) scales of ToM PST, and produced a better overall theory of mind performance ( $B=3.61$ ,  $p=0.048$ ) between baseline and post-treatment assessments. These effects were not detectable six months after the training, though, or between the TAU and TAU + MCT groups.

It is important to note that the majority of our results remain above the adjusted  $\alpha$ .

### **Hospital admissions**

Participants in the TAU + MCT group had an average of 3.5 ( $SD = 6.01$ ) days of hospital admission during the 10 months of the trial, while participants in the TAU group had an average of 12.39 ( $SD = 13.67$ ) days of hospital admission, which proved to be statistically significant at a large effect size ( $U = 219.00$ ,  $p = 0.048$ , Cohen's  $d = 0.842$ ).

### **Subjective acceptance and feasibility**

More than half of the participants of MCT totally agreed that the training was useful ( $n = 12$ , 52.17%); it was an important part of their treatment ( $n = 12$ , 52.17%), and it was fun ( $n = 12$ , 52.17%). Nearly two thirds totally agreed they would recommend the training to others ( $n = 16$ , 69.57%), and also found it advantageous that the training was administered in a group setting ( $n = 16$ , 69.57%). Nearly half of the participants found the sessions totally useful for their daily routine ( $n = 11$ , 47.83%), and considered the goals of the training crystal clear ( $n = 11$ , 47.83%). Half of the subjects did not have to force themselves to go to the training ( $n = 12$ , 52.17%), and would not have preferred to spend the time doing something else ( $n = 14$ , 60.87%). Only two (8.7%) of the 23 participants totally agreed that they would not apply the lessons learnt in their everyday lives.

Also, we found evidence for the fact that MCT has beneficial effects on real-life adaptation. When considering the demographic data of the 36 outpatients of the study, we can see that four patients in the MCT+ TAU group changed their marital status in a positive sense. At the same time, only one patient in

the TAU group established a romantic relationship. Two participants in the MCT+TAU group made favorable progress in their occupational status. Both of them started to work full-time. Two patients in the TAU group made progress, even though both of them got a part-time job only.

## **DISCUSSION**

### **Symptom severity**

Looking at the results for overall symptom severity, we can see that compared to the TAU group, the TAU + MCT group showed a considerable improvement at the time of the post-treatment assessments, and this effect was still evident 6 months after the end of the training. Moreover, our results indicate that patients in the TAU+MCT group with more severe symptoms benefitted more from the training regarding the severity of their symptoms. The TAU + MCT group also showed a notable improvement in positive symptoms at the end of the training compared to the TAU group. Six months after the training, this difference was still detectable between the groups. In addition, the TAU + MCT group was superior to the TAU group in improved disorganized symptoms; this difference was detected both at the time of the post- and follow-up assessments. It is also important to note that within the TAU + MCT group improvement in negative symptoms was found between baseline and post-treatment assessments, while this was not true within the TAU group. Results regarding overall symptom severity and the positive and disorganized symptoms may imply a long-lasting effect of training on schizophrenia symptomatology. Even if p values remain above the adjusted significance level, our results show a trend consistent with the findings of previous studies (Penney et al., 2022).

## **Neurocognition**

In terms of executive functions, we could not find any relevant differences between the intervention and control group, or within the groups. However, even if our results are not statistically relevant, it is worth looking at the WCTS-64 results. We can see that at baseline the TAU + MCT group produced slightly more total errors. The reason behind it might be the following: the fact that we failed to find any relevant difference in the extent of changes between the groups at post-treatment and follow-up assessments does not only mean there was no change in the quality of executive functions, but also reveals that intervention group members "caught up". This is quite important, as ToM processing in schizophrenia is related to executive function deficits (Hardy-Baylé, 1994), and ToM deficits contribute to the onset and prevalence of symptoms. In addition, deficits in executive function may be related to symptoms of disorganization in schizophrenia (Hardy-Baylé et al., 2003). Subsequently, improvements in executive function may be expected to be associated with symptom remission.

Group members performed significantly better in immediate memory during the follow-up period compared to their own performance at earlier assessments. Nevertheless, this difference was not found significant when comparing the TAU + MCT and TAU groups.

In terms of other memory functions, our results are contradictory. We found improvements regarding delayed memory both in the TAU and TAU + MCT groups, but no significant differences were seen between the two groups. This is regarded to be rooted in a learning effect phenomenon. RBANS contains many subtests that can be completed in a short period of time, so subjects may

have remembered some of the tasks from the previous assessment(s).

Finally, the TAU + MCT group also showed improvement in visuospatial function between baseline and post-treatment assessments compared to the TAU group. Visuospatial inattention is related to impaired illness awareness (Curtin et al., 2019; Daniell et al., 2021). For this reason, our results may potentially imply improved awareness, which has been associated with improvements in metacognition.

### **Social cognition**

No significant difference was found in emotion recognition between the two groups. The reason behind this may be that although MCT employs some tasks aimed at emotion recognition, the more explicit focus is on ToM functions. Accordingly, we found an improvement regarding ToM within the TAU + MCT group. Members of the TAU + MCT group showed a considerable improvement on the scale measuring third-order ToM processes (baseline to post-treatment). Similarly, better performance was found on the "Comprehension of Misleading" scale, which measures higher-order theory of mind functions as well. The TAU + MCT group showed an improvement in overall ToM (baseline–post-treatment), while no improvement was detectable within the TAU group. These differences were not detectable when comparing the two groups at any time point, and the mentioned results did not show up in the post-training period. At the same time, our results can be of importance: as the trait-like ToM impairment in schizophrenia is well known, it is present even in the remissive stages of the illness (Herold et al., 2002; Kelemen et al., 2019). Alterations in ToM functions play a marked role in the prevalence of

delusional, disorganized, hallucinatory, and negative symptoms (Frith, Corcoran, 1996; Shamay-Tsoory et al., 2007).

We consider the improvement in higher-order and overall ToM important, as these are the most complex operations, which require the most comprehensive and recursive thinking and perspective taking (Valle et al., 2015). Consequently, improvements in this area can be of paramount importance for the proper social adaptation of schizophrenic patients. Moreover, it can contribute to symptom severity reduction.

### **Subjective acceptance and feasibility**

MCT participants reported good subjective applicability and acceptability. It can be regarded momentous, knowing the motivational difficulties and low level of adherence and cooperation among patients diagnosed with schizophrenia. All these results are further supported by the drop-out rate; no intervention group member left the study prematurely. Moreover, members of the intervention group attended 97.55% of the group settings.

## **THE QUALITATIVE STUDY**

### **Study design and study participants**

The participants in the control group of our quantitative study had the opportunity to take part in the MCT training after the follow-up phase of the study, if they decided so. Therefore, the subjects of the qualitative study were these patients: the participants of the two Metacognitive Training groups, 7 schizophrenic patients altogether.

All training sessions were audio-recorded, then verbatim transcribed. However, we only used the four modules of Theory of Mind (ToM) (a total of eight modules in the two small groups,



i.e., eight sessions) for content analysis, as their complexity can provide deep enough insight into social cognitive and metacognitive operations at the same time.

The transcribed verbal contents of the groups were merged into one body text serving as the only material for content analysis.

## **AIMS OF THE QUALITATIVE STUDY**

Our aim was to find answers to the following study questions:

- 1. whether the qualitative study made on the verbal contents of patients with schizophrenia enables us to describe and structure the characteristics of cognitive operations;**
- 2. whether the results of the qualitative study are consistent with recent literature;**
- 3. whether the results provide relevant information on cognitive operations in schizophrenia.**

## **METHODS**

### **Data Analysis**

The mean duration of sessions was 65.1 minutes (SD = 13.87,  $\Sigma$ : 521 minutes, minimum: 44 minutes, maximum: 81 minutes). The verbatim transcribed verbal manifestations of the groups were merged into one body text (50,915 words; 211 pages). The verbal contents of the trainer were only used as context, not as an object of content analysis. No software was used for the analysis.

For data analysis, we applied conventional content analysis, in the framework of which we made use of inductive category development to avoid biases rooted in theoretical preconceptions and to gain an in-depth and comprehensive understanding of the studied complex experiences.

To ensure the reliability of the analysis, two independent coders carried out the coding, and a third independent reviewer was invited to check the coded transcriptions and suggest modifications when needed. All modifications were recorded. We accepted the suggestions when at least one of the two coders agreed with the peer reviewer (2/3 majority). First, categories were retrieved from the verbal materials. Second, categories were merged into nodes, then nodes were merged into themes. At each step, proper definitions were formulated to ensure the standardization of the coding.

Using the method described above, we were able to organize the patients' verbal contents into a hierarchical structure. Eventually, this structure developed in a bottom-up way was compared to the theoretical model of metacognition and social cognition.

## **RESULTS**

As a result of ordering contents into categories, nodes, and themes, and comparing them against literature, the analyzed verbal expressions confirmed a five-level hierarchical structure with 35 categories on the lowest level, 18 nodes on the second level, and 10 themes on the third level. On the fourth, penultimate level of the hierarchical structure, we saw subdomains of metacognition and social cognition, whereas on the top of the hierarchy we found metacognition and social cognition. In other words, it was possible to make detailed observations on the participants' way of thinking through their speech, and gain information on the hierarchy of domains of cognitive operations. Furthermore, the identified themes and their building blocks matched the theoretical constructions of metacognition and social cognition based on the results of quantitative studies.

## ***Metacognition***

*Understanding Others' Mind (Theme 1. Knowledge of Cognitive Perspectives).* Participants monitored and regulated their thinking to form complex knowledge about their own and others' cognitive contents, perspectives, and operations. Participants recognized that other people may have perspectives different from theirs.

*Self-Reflection (Theme 2. Self-Reflection).* We managed to identify several verbal contents reflecting participants' own internal traits and states, even in the form of self-criticism.

Although signs of metacognitive monitoring operations were seen, no signs of awareness of the consequences or effects of the verbalized states, traits, or perspectives could be detected in the transcripts.

## ***Social Cognition***

*Theory of Mind (Themes 3 and 4. Ideas about Others' Internal Characteristics and Knowledge about Others' Mind).* Patients draw conclusions from, or formed impressions about the essential trait-like characteristics of others. These assumptions often contributed to deducing others' mental states, i.e., guided processing on ToM tasks helped people with schizophrenia in first-order theory of mind processing. In addition, these assumptions contributed to the integration of their ideas about the protagonists' minds with the information rooted in the social context.

Apart from the verbal manifestations of first-order ToM operations, verbal contents identified as a result of higher-order ToM processes could also be detected. Our patients developed assumptions of others' knowledge about a third person's mental state.

It is important to note that we did not study the possible failures in mentalization or deficiencies in integrative operations.

*Emotion Recognition (Theme 5. Emotion Recognition).* According to our findings, patients could identify not only facial mimic but others' expressive gestures as well; they attempted to form a comprehensive picture based on expressive motions while identifying emotions.

*Social Perception (Themes 6 and 7. Non-Social Context and Social Context).* In addition to identifying social cues in a direct manner, patients also used the available contextual information where it was facilitated by MCT. Besides, the identified categories and nodes that built up these themes show that patients could identify non-social elements of the context, like externals of the characters seen in the training stimuli or visual elements of the context, then used them as a crutch while they were searching for social cues.

Sometimes patients made assumptions regarding the (social) background of the other person. In some cases, these hypotheses were useful in identifying social cues and context, while at other times this tendency to formulate hypotheses about other persons could also result in the common cognitive bias in patients with schizophrenia, i.e., the jumping-to-conclusions bias.

### ***Further Themes that Emerged***

*Theme 8. Inappropriate Verbalization.* A few but pronounced inappropriate verbal contents were found in the transcripts of the group sessions, which were inadequate contents not fitting the context of the ongoing conversation.

*Theme 9. Illness.* As the training process progressed, group members shared their experiences about the illness and discussed their fears of being stigmatized by the society, and the difficulties of being stigmatized by themselves.

*Theme 10. Training.* In many cases, patients verbalized the aids they used simply to get closer to the answer, such as the subjective feeling of lack of information. Furthermore, patients sometimes disclosed their opinion regarding the training and training material, and we could also gain some information regarding the subjective applicability of the training.

## **DISCUSSION**

There are only a few qualitative studies focusing on metacognitive or social cognitive functions in patients with schizophrenia.

As a result of our content analysis, we built a five-level hierarchical structure of the verbal contents of patients with schizophrenia in a bottom-up way. At the lower levels are the fine-grained and detailed building blocks of cognitive operations, above which come the subdomains of social cognition — such as emotion recognition, theory of mind, and social perception — and metacognition, such as self-reflection and understanding others' minds. At the top of the hierarchy metacognition and social cognition can be found. After comparing the obtained hierarchical structure with the literature of the topic, which is mainly derived from quantitative research, we found a high degree of fit between our results and the information subtracted from literature, with some cases letting us draw new important conclusions. In addition, some cognitive features specific to schizophrenia appeared in the verbal content identified.

*Metacognition.* We considered verbal contents to be manifestations of metacognitive processing at points where monitoring and control of operations or signs of awareness of one's own cognitive contents could be detected. Patients showed self-reflection, i.e., they were somewhat aware of their internal

functioning. We considered these verbal contents as manifestations of the subdomain of "Self-Reflection", while contents reflecting the monitoring and understanding of others' mental states were considered as productions of the subdomain called "Understanding Others' Mind". Participants recognized when other group members had different perspectives, and overruled their own viewpoint in many cases. During the bottom-up analysis, these verbal contents were organized into Theme 1: "Knowledge of Cognitive Perspectives", which partly reflects the operations of the above-mentioned subdomain. At the same time, the processing of the metacognitive subdomain of "Decentration" is implied in these verbalisations as well.

Lysaker et al. (2013) suggest that metacognition can be considered as a spectrum of discrete to synthetic monitoring and controlling mental activities, and the synthetization of metacognitive experiences and knowledge allows us to form comprehensive representations of the self and others. It is important to take into consideration that in the current analysis the correctness of patients' extrapolations was not studied, although the incorrect functioning of these operations can serve as a basis for metacognitive failures in patients with schizophrenia that may result in disorganisation, impaired sense of agency and self-monitoring, and lack of insight into one's own and others' cognitions and internal states (Koren et al., 2006).

In addition, no signs of awareness of consequences or effects of the concluded social phenomena on further social interactions or adjustment were detected, although the training would enable that. In other words, we have not found any verbal contents to be considered as manifestations of the operation of the subdomain of "Mastery". However, without being aware of the consequences it is hardly possible to integrate all the knowledge rooted in metacognitive operations into comprehensive

representations of the self and others, which can contribute to the occurrence and persistence of delusional ideation and poor social functioning (Dimaggio et al., 2009; Lysaker et al., 2005).

*Social cognition.* Our patients deduced ideas about their own and others' internal states and characteristics, which we considered as simple first-order ToM operations. In addition, they realized that another person can have ideas about the mental state of a third person, which is a higher-ordered ToM operation. Our current study is not suited to detect errors in ToM operations, it only examines their manifestations. In addition, we registered that patients tend to form intuitive ideas about essential internal characteristics or background information related to others. This reduced data gathering based on intuitive judgements of others' internal states and social background without further evidence may be the manifestation of the jumping-to-conclusions bias. This attributional bias may lead to false judgments and incidence of delusional symptoms (Freeman et al., 2006; Garety et al., 1991).

When inferring others' emotional states, our patients with schizophrenia explicitly relied not only on facial expressions but also on the expressive gestures of the other person. Although the literature of emotion recognition considers facial expressions, prosody, and gestures as essential domains of emotion identification, facial expressions seem to be overrepresented, while gestures seem to be underrepresented in research and remediation methods aimed at the improvement of emotion recognition of patients with schizophrenia (Vass et al., 2018).

Our group members looked actively for information about social clues and roles, i.e., information rooted in operations of the social cognitive subdomain called social perception. They sought contextual information, which they later used for developing ideas about others minds, and building representations of other

persons. Our findings on looking for economic cues contradict literature, showing that patients with schizophrenia fail to use contextual information (Stratta et al., 1999, 2000).

Literature shows that patients with schizophrenia often fail to match internal contents to the context of external reality. The few but pronounced inadequate verbal contents in the transcripts of group sessions are perfect proof of this matching failure; we suppose that the manifestation of impairments of metacognitive control and regulation can be observed in these inappropriate contents.

Another important finding of our study is related to the verbal expressions on the importance of taking medications, the shared experiences regarding the symptoms of the illness, as well as the painful realization of stigmatization. The mentioned verbal contents can be considered valuable because these contents cannot be formulated without at least minimum awareness of the illness, e.g., without metacognitive monitoring. In addition, sharing this content can reduce the burden of being ill, contribute to the development of a more adaptive coping strategy regarding the illness, and strengthen adherence not only to the training but the administered psychiatric treatment as well.

## **SUMMARY**

This work summarizes the study on the efficacy of the training in a Hungarian sample with schizophrenia, and presents the results of a qualitative study on two training groups.

The training was translated and adapted into Hungarian by us. Therefore, this is the first study on Metacognitive Training in Hungary. Our results showed that compared to the control group the overall symptom severity of the patients who had participated in the training improved by the end of the training period, with



further improvement in the six-month follow-up period. Similar results were found regarding the positive symptoms and symptoms of disorganization.

Patients who had participated in the training showed improved visuo-spatial functioning at the end of the intervention period compared to the control group, and this improved functioning persisted over the next six months. Compared to their own performance, members of the training group showed better performance in third-order Theory of Mind operations, comprehension of misleading, and general Theory of Mind functioning. This improvement was maintained at the end of the six-month follow-up period.

MCT group members also showed achievement gains in their marital and occupational status.

Participants showed an excellent subjective acceptance and a high level of therapeutic adherence.

Our qualitative study relying on inductive content analysis revealed a five-level hierarchical structure of cognitive functioning, with metacognition and social cognition at the highest level, their sub-functions at the next level, and the finer building blocks of these functions at the lowest levels. We found a high degree of fit between our results and the information subtracted from literature.

While mobilizing their social cognitive functioning, our patients with schizophrenia relied heavily on information based on expressive movement. They also took into account contextual information that could help them infer others' mental states. In addition, we were able to directly observe cognitive distortions that are specific to schizophrenia, such as the jumping to conclusions bias or mismatching internal contents to the external reality.

The results of our study show that the Hungarian version of Metacognitive Training is suitable for improving the symptomatic characteristics of schizophrenic patients, and has a positive effect on certain neurocognitive and social cognitive functions. Moreover, the observation of verbal content provides an appropriate platform for understanding the underlying cognitive processes.



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### List of publications related to the dissertation

1. **Fekete, Z.**, Vass, E., Balajthy, R., Tana, Ü., Nagy, A. C., Oláh, B., Domján, N., Kuritárné Szabó, I.:  
Efficacy of metacognitive training on symptom severity, neurocognition and social cognition in  
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### **International presentations related to the dissertation**

**Fekete Z.**, Vass E., Kancsev A. (2015). Theoretical background and treatment of social cognitive impairment in schizophrenia – what is known and what is needed? 23rd European Congress of Psychiatry, Poster. Vienna, 2015. March 28-31.

### **National presentations related to the dissertation**

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