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## Which metacognitive components of insight in schizophrenia? The relationship between subjective and objective measures of metacognition and insight

### Summary

#### Objectives

*It has been well documented that metacognition is compromised in people with a diagnosis of schizophrenia. Recent theories, concerning the roots of poor insight in schizophrenia, have proposed that it may result, in part, from impairments in metacognition, the capacity to think about thinking. Metacognition is a complex construct including both objective and subjective elements not necessarily overlapping. Aim of this study is to investigate the relationship of these elements with insight.*

#### Methods

*Metacognitive abilities were assessed using both objective [i.e. Wisconsin Card Sorting Test (WCST), metacognitive adaptation] and subjective measures [Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS)] in 44 individuals with schizophrenia. The G12 item of the Positive and Negative Symptoms Scale (PANSS) was used for Insight evaluation. Functional performance was evaluated using Global Assessment of Functioning.*

#### Results

*Table I shows the means of symptoms, insight, metacognition and functional ability in the studied sample. Table II shows Pearson r correlations between metacognitive evaluations and symptomatology, insight, cognitive and functional variables. No relationship was found between objective and subjective measures of metacognition. Subjective metacognition, but not the objective one was related to PANNS depressive score. Lack of Insight did not correlate with objective metacognition, but was significantly related to subjective metacognitive complaints and positive, negative, disorganized and excited PANNS symptoms. Global functioning was related only to the PANSS Positive Factor.*

#### Conclusions

*Subjective and objective metacognitive measures in schizophrenia could be considered as distinct domains, supporting the hypothesis of the independence of cognitive functioning in schizophrenia from its subjective measures. Our results support the hypothesis of the lack of insight as a complex psychopathological construct related to phenomenology, cognition and psychotic symptoms.*

#### Key words

Metacognition • Insight • Psychotic symptoms • Functional assessment • Schizophrenia

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#### Introduction

Metacognitive function concerns the ability to self-monitor and self-regulate knowledge about one's own cognitive abilities and real cognitive performance, which are fundamental determinants of a competent function-

ing in the real world: “knowing about knowing”. Studies have consistently shown that metacognition is compromised in persons with schizophrenia<sup>1</sup>, related to functionality, symptomatology<sup>2,3</sup> and insight of illness<sup>4</sup>.

Lack of insight (LoI) is commonly observed in the persons with schizophrenia. It has been well documented that they have a specific LoI into their condition in comparison to other mental health disorders, both at early<sup>5</sup> and chronic<sup>6</sup> phases of the illness.

Several etiological models of LoI have been proposed that have led however to equivocal results. Since the predictive powers of symptoms<sup>6,7</sup> and neurocognition<sup>8</sup> on insight appear to be limited, some authors have hypothesized LoI as impaired metacognition<sup>4,9</sup>. From the metacognitive perspective, the development of insight requires an individual that not only notices and reflects upon historical events related to one’s own illness, but also make sense of such experiences and develop a personally meaningful and consensually valid narrative of the illness. An individual, to develop insight, would need to construct a coherent and integrated account of his psychiatric state. Therefore, impaired metacognition is a promising potential contributor to LoI<sup>4,10</sup>.

However, research on the relationship between metacognition and insight has yielded mixed results with some studies showing an association<sup>9,11</sup> while others no<sup>12</sup>. These contradictory results could be explained by many factors, such as the complexity of the insight construct, likely multidimensional, the use of different measures of insight and metacognition as well as differences in the diagnostic groups investigated in different studies<sup>9</sup>.

Several assessment tools of metacognition have been put forward, usually self-administered instruments<sup>13,14</sup>. These instruments assess the capacity to self-monitor and self-regulate knowledge about one’s own cognitive abilities and cognitive performance<sup>15</sup>. Therefore, the subjective cognitive impairments can provide additional information to tell about the severity of clinical and functional outcomes of the patient. The Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS)<sup>13</sup> is a simple and ecological scale to assess patients’ subjective experiences of cognitive impairment. Although several instruments have been used to measure self-perceived cognitive functioning, only SSTICS was designed to particularly measure subjective complaints regarding the cognitive deficits constantly reported in schizophrenia<sup>16</sup>.

On the other hand, a direct objective measure of metacognition is also needed. An objective measure of metacognition has been elaborated by Koren et al.<sup>17</sup> based on the awareness of performance on the Wisconsin Card Sorting Test (WCST). The WCST is the mostly used task to investigate executive functions, whose impaired performance is significantly associated with functional disability<sup>18,19</sup>.

This paradigm investigates two important aspects of metacognitive functioning: monitoring (i.e. the mechanism that is used to subjectively assess the correctness of potential responses) and control (the mechanism that determines whether or not to volunteer the best available candidate answer). Through this version of WCST it is possible obtain both efficiency quantitative indices of cognitive function and metacognitive ability<sup>2</sup>.

Aim of the study is to explore the relationship between the subjective and objective metacognitive evaluations (SME and OME) in a sample of patients with schizophrenia spectrum disorders and their relationships with insight into illness, psychotic symptoms and functional ability.

## Materials and methods

### Participants

Participants in the study were persons hospitalized for an index episode of schizophrenic disorder at the Department of Mental Health of L’Aquila. Inclusion criteria were a diagnosis of schizophrenia according to the DSM-IV-TR, and an age between 18 and 65 years. Exclusion criteria were: neurologic disorders; substance abuse in the past 6 months or lifetime history of substance dependence; mental retardation; medical illnesses associated with neurocognitive impairment and inability to provide an informed consent.

The institutional ethics committee approved all recruitment and assessment procedures. All patients provided written informed consent after receiving detailed explanation of the study. This study adheres to the Declaration of Helsinki.

### Measures and procedures

The evaluation was made during the illness episode remission, immediately before discharge. This stabilization level was chosen as a criterion for evaluating the subjects in order to minimize state-dependent effects and maximize testing validity.

### Clinical assessment

The Positive and Negative Syndrome Scale (PANSS) is a 30-item scale designed to obtain a measure of positive, negative and general symptoms. We used the five-factor model proposed by Wallwork et al.<sup>20</sup> comprising a positive factor (items P1, P3, P5, G9), a negative factor (items N1, N2, N3, N4, N6, G7), a disorganized/concrete (cognitive) factor (items P2, N5, G11), an excited factor (items P4, P7, G8, G14) and a depressed factor (items G2, G3, G6), including a total of 20 items.

### Insight assessment

The item “Lack of judgement and insight” (G12) from PANSS has been used for the insight assessment. Lack

of insight (LoI) was defined as impaired awareness or understanding of one's own psychiatric condition and life situation. The measure is a 7-point, clinician-rated item: from "1", no impairment, to a "7", emphatic denial of past and present psychiatric illness. This item did not enter into the Wallwork et al.<sup>20</sup> model.

### *Metacognitive functioning*

#### **Objective Metacognitive Evaluation (OME)**

Objective Metacognitive abilities were assessed using the paradigm of Koren et al.<sup>17</sup>, which is an adaptation of the 64-card WCST. In addition to the standard "forced responses", the procedure yielded a measurement of "free responses". To each participant was asked to rate his level of confidence in the answer on a scale of 0 (just guessing) to 100 (completely confident) and to decide whether he wanted the answer count toward his overall performance score. The metacognitive variables used were: 1) Accuracy score (the proportion of correct volunteered responses); 2) Free-response improvement (the difference between the free-response output-bound accuracy score and the forced-choice input-bound (quantity) score); 3) Global monitoring (the truthfulness of one's overall sense of knowledge, defined as the difference between the total number of correct responses and the total number of responses asked to be included); 4) Monitoring resolution (i.e. the extent to which the confidence judgments distinguished between correct and incorrect sorts); 5) Control sensitivity indexed by the gamma correlation calculated across all sorts between the level of confidence and the decision to venture the sort and 6) Gain (the score gain calculated as the overall difference between correct and incorrect responses)<sup>17</sup>. Perseverative errors have been also used as index of executive function performance.

#### **Subjective Metacognitive Evaluation (SME)**

The Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS) was developed as a measure of self-appraisal cognitive deficit. The questionnaire contains 21 items focusing on memory, attention, executive functions and praxia. Sustained executive function, Memory of information, Consciousness of effort, Daily life, Distractibility and Alertness subscales were calculated<sup>13</sup>. Lecardeur and colleagues<sup>16</sup> demonstrated that the SSTICS is a good instrument for evaluating the subjective cognitive complaints of patients with schizophrenia and also revealed good concordance between cognitive impairments experienced by patients and cognitive disorders assessed by a clinical rater.

### *Community functioning ability*

Functional performance was evaluated using Global Assessment of Functioning (GAF), a rating scale used to assess the social and occupational functioning of adults.

### **Statistical analyses**

Descriptive statistics were computed for all variables of interest. Cronbach's alpha for subjective and objective metacognitive (SME and OME) evaluations was calculated. A factor analysis was done on the metacognitive measures using a principal components analysis with oblimin rotation using Kaiser's criterion for factor retention (i.e. eigenvalue > 1).

We examined potential bivariate relationships between insight, cognitive and metacognitive variables, clinical and functional assessment using Pearson's product-moment correlations.

All analysis yielding a p value of less than 0.05 were considered significant. Statistical analysis was performed using SPSS software (V 20.0).

### **Results**

Forty-four persons (28 men and 16 women) were recruited: mean age of 40.16 years (SD 12.74), educational level 10.28 years (SD 3.20), 24.9% were married and 81.8% unemployed at the time when they were interviewed. The mean age at onset of illness was 26.65 (SD 10.82) and the mean duration of illness 13.68 (SD 10.73). All participants were on antipsychotic medication at the time of the evaluation and the mean chlorpromazine equivalent dose was 500 (SD 195.09)<sup>21</sup>. Mean and SD of the studied variables are reported in Table I.

Cumulative scores for subjective and objective metacognitive evaluations (SME and OME respectively) were obtained through factor analysis. Firstly, Cronbach's alpha was calculated. Cronbach's alpha on the six SS-TICS subscales was .85 with no items whose exclusion increased the overall reliability value. Cronbach's alpha on the six WCST metacognitive indexes showed 4 items (Accuracy score, Improvement due to free choice, Monitoring resolution, Control sensitivity) whose exclusion increased the overall reliability value. These items were then excluded from calculations and Cronbach's alpha on the 2 remaining items was .87.

Exploratory Factor Analysis performed on the 6 SME and the 2 OME items showed a Kaiser-Meyer-Olkin value of .748 and a Bartlett's test of Sphericity of 179.547, d.f. 28,  $p < .0005$ . Two factors had eigenvalues greater than 1 explaining the 70.39% of the total variance (46.98 and 23.41 respectively). All the items of the SS-TICS highly loaded on the first cluster (all coefficients > .74), while the WCST metacognitive items very highly loaded of the second one (all coefficients > .95). The factorial scores obtained (regression method) were then considered in subsequent correlations.

No correlation was found between SME and OME. SME correlated with PANSS depressive factor ( $r = .32$ ,  $p < .05$ , i.e. higher cognitive complaint – higher depression) and lack of insight ( $r = -.37$ ,  $p < .01$ , i.e. higher

**TABLE I.** Means (standard deviation) of symptoms, insight, metacognition and functional ability in the studied sample ( $n = 44$ ).

Five-factor model PANSS	Positive factor	13.74 (4.24)
	Negative factor	17.94 (8.38)
	Disorganized/concrete factor	9.59 (3.35)
	Excited factor	12.33 (4.67)
	Depressed factor	7.02 (2.18)
	Total	90.78 (20.19)
	Lol	4.51 (1.33)
WCST cognitive index	Perseverative errors	12.39 (8.39)
WCST metacognitive indexes	Accuracy score	.58 (.19)
	Improvement due to free choice	.02 (.04)
	Global monitoring	-23.40 (15.89)
	Monitoring resolution	.30 (.40)
	Control sensitivity	.36 (.55)
	Gain	9.02 (23.50)
SSTICS	Sustained executive function	4.79 (3.53)
	Memory of information	4.51 (3.36)
	Consciousness of effort	5.62 (3.35)
	Daily life	3.63 (3.26)
	Distractibility	3.49 (2.22)
	Alertness	.86 (1.17)
	Total score	23.67 (13.70)
GAF		44.08 (10.37)

Note. PANSS: Positive and Negative Syndrome Scale; Five-factor model PANSS (Wallwork et al., 2012); Lol: Lack of judgement and insight (Item 12 PANSS General Psychopathology); WCST: Wisconsin Card Sorting Test; SSTICS: Subjective Scale to Investigate Cognition in Schizophrenia; GAF: Global Assessment of Functioning

cognitive complaint – better insight). On the other hand, OME highly correlated with WCST perseverative errors ( $r = -.62$ ,  $p < .0005$ , i.e. higher metacognitive performance – less perseverative errors) (Tab. II).

Lack of Insight item (G12) was correlated with PANSS positive symptoms ( $r = .30$ ,  $p < .05$ ), negative symptoms ( $r = .35$ ,  $p < .01$ ), Disorganized/Concrete Factor ( $r = .49$ ,  $p < .001$ ), Excited Factor ( $r = .41$ ,  $p < .01$ ) and total score ( $r = .58$ ,  $p < .0005$ ).

The GAF was related only to the PANSS Positive Factor ( $r = -.50$ ,  $p < .0005$ ).

## Discussion

Our data revealed that the SSTICS subscales did not correlate with any of the WCST indexes, nor perseverative errors or metacognitive. Previous studies on subjective and objective measures of metacognition reported mixed results<sup>22</sup>. Correlations were found between SME and OME by some authors<sup>14 23 24</sup>, while other ones reported only a small or no relationship<sup>25</sup>. These last findings are similar to our results, suggesting that the subjective evaluation of cognition in schizophrenia could be a specific dimension of cognition, which is independent from its objective measurements<sup>4 18 26</sup>.

It would be hypothesized that the absence of correlation is due to cognitive impairment without awareness

and, subsequently, complaints about it. This absence of awareness would be encompassed within a more general concept of lack of insight<sup>26</sup>.

As a matter of fact we found a negative correlation between awareness of illness, measured by the item G12 of the PANSS and SME. Previous studies confirm this result<sup>13 27 28</sup>, although not confirmed by others ones<sup>16 28 29</sup>. It is conceivable that more a patient lacks insight, less he perceives cognitive difficulties. As suggested by Medalia and Thysen<sup>14</sup>, who compared insight into clinical symptoms vs insight into neurocognitive symptoms, patients have significantly less cognitive insight than clinical insight. We found no correlation between insight and OME as far as concerned metacognitive and cognitive indexes of WCST. As emerged from the meta-analysis by Aleman et al.<sup>8</sup>, some studies found associations between the WCST (cognitive or metacognitive indexes) and poor insight<sup>17 30 31</sup>, while a number of studies failed to replicate such relationship<sup>9 10</sup>.

On the other hand, OME highly correlated with WCST perseverative errors. The more there is higher metacognitive performance, the less perseverative errors are present confirming our previous findings<sup>2 3</sup>.

A relevant aspect that emerged in our study is the relationship between SSTICS and depressive symptoms. Our findings are consistent with previous reports showing significant correlations<sup>4 21 27-29</sup>; however, contrasting

**TABLE II.** Pearson *r* correlations between metacognitive evaluations and symptomatology, insight, cognitive and functional variables (*n* = 44).

	Subjective metacognitive evaluation	Objective metacognitive evaluation
PANNS		
Positive factor	-.17	-.06
Negative factor	.01	-.21
Disorganized/concrete factor	-.24	-.10
Excited factor	-.06	-.05
Depressed factor	.32*	.07
Total	-.09	-.16
Lol	-.37**	-.10
WCST perseverative errors	.04	-.62***
GAF	.06	.10

\**p* < .05; \*\**p* < .01; \*\*\**p* < .0005

reports do exist<sup>32</sup>. It could be possible to hypothesize a role of Lol as third variable that could mediate the relationship between SSTICS and depressive symptoms, i.e. an enhanced risk of depression could be present in patients more aware of their disability. Such a condition is well known as the “Insight paradox”, with those persons with schizophrenia with higher levels of Insight showing increased levels of depression<sup>33,34</sup>.

As far as the relationship between Lack of Insight with clinical symptomatology, we found significant correlation with PANSS positive, negative, disorganized, excited symptoms as well as with total score. These results confirm previous studies supporting the hypothesis of the lack of insight as a complex psychopathological construct related to phenomenology, cognition and psychotic symptoms<sup>6,7,35</sup>.

Our study has significant strengths. We used objective and subjective metacognitive performance, which are thought to be dissociated in some psychiatric disorders, particularly in psychosis. Regarding the SME we used SSTICS<sup>13</sup> the only one designed to specifically measure subjective complaints regarding the cognitive deficits in schizophrenia<sup>16</sup>. About the OME, the adaptation of the 64-card Wisconsin Card Sorting Test (WCST), proposed by Koren et al.<sup>17</sup> is a good instrument that investigate both cognitive and metacognitive functioning.

Limitations however have to be considered. The main one is that the study is cross-sectional in a naturalistic clinical setting. A prospective study is needed to confirm the stability over time of the relationships identified herein.

We used one item only from PANSS to evaluate insight while other studies used more detailed measures. However, several studies employed single-item insight

measures embedded in scales to assess symptomatology, such as the PANSS.

The sample size is relatively small reducing the power of the analysis; it however can be sufficient to heuristically investigate the relationship among the studied variables.

## Conclusions

On the basis of our data subjective and objective metacognitive measures can be considered distinct domains. On the other hand, Insight is a complex construct interacting with neurocognitive, social-cognitive and metacognitive abilities<sup>9</sup>.

Several studies suggested that metacognitive impairments, particularly self-reported/subjective metacognition may play a role in the development of poor insight<sup>4</sup>. Cognitive complaints are informative about the patient's own psychological status and long term symptom improvement. Indeed, self-perception of cognitive dysfunction has been found to be a good predictor of long-term symptomatic deterioration and it is a critical aspect in schizophrenia for implementing appropriate coping strategies<sup>25</sup>.

The pattern of correlation between Lol, symptoms and self-perceived cognitive deficit that we found, suggests that Insight in schizophrenia may be better considered as a more global concept of “awareness” encompassing different constructs such as insight into clinical symptoms and insight into cognitive impairment<sup>9,32</sup>.

## Conflict of Interest

The authors do not have conflicts of interest about this article.

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