Subjective cognitive complaints and its relation to objective cognitive performance, clinical profile, clinical insight, and social functioning in patients of schizophrenia: A cross-sectional study

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Context: Neurocognitive deficits are well documented in schizophrenia. Neurocognitive insight (NI), described as awareness of neurocognitive deficits, has not been evaluated in the Indian context. Its relation to clinical profile and social functioning also remains unexplored.

Aims: The aim of this study was to evaluate the subjective cognitive complaints (SCCs) and their relation to objective cognitive performance, clinical profile, clinical insight, and social functioning in patients of schizophrenia.

Settings and Design: This was a cross-sectional study at the outpatient department of a tertiary care teaching hospital.

Materials and Methods: One hundred individuals with schizophrenia were evaluated using Positive and Negative Syndrome Scale, Subjective Scale To Investigate Cognition in Schizophrenia, abbreviated version of Scale to Assess Unawareness in Mental Disorders, and Schizophrenia Research Foundation–Social Functioning Index. Cognitive performance was assessed using (1) Digit Span Test (attention) from Wechsler Adult Intelligence Scale, 3rd edition and (2) Passages Test (explicit memory), (3) Verbal n-back Test (working memory), and (4) Stroop Test (executive functioning) from the National Institute of Mental Health and Neuro Sciences Battery.

Statistical Analysis: Statistical analysis was done using descriptive statistics, nonparametric tests, and Pearson’s coefficient of correlation.

Results: Participants showed impairment in all cognitive domains. Except for working memory, there was no correlation between SCC and objective performance for other cognitive domains correspondingly, implying poor NI. Severity of psychosis and clinical insight did not have any correlation with SCC. Higher SCC correlated with poorer social functioning, especially in “occupational” and “other social roles” domains.

Conclusions: Individuals with schizophrenia have poor NI. This is independent of severity of psychosis or clinical insight into illness. Socio-occupational functioning and depression should be actively enquired into when patients present with SCC.

Key words: Metacognition, neurocognitive insight, schizophrenia, subjective cognition

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INTRODUCTION

Cognitive dysfunction is now considered as one of the core features of schizophrenia.\(^1\) Nearly, all patients have been shown to demonstrate cognitive dysfunction across various domains, such as attention/vigilance, processing speed, working memory, verbal learning and memory, visual learning and memory, problem-solving, and verbal comprehension.\(^2,3\) The severity of cognitive impairment has been consistently shown to be associated with poor functional outcome in schizophrenia, rather than the degree of positive and negative symptoms.\(^4,5\) They cause difficulties in social problem-solving, acquiring skills, and community functioning.\(^6\) Hence, addressing the cognitive dysfunction has formed an important part of rehabilitation of individuals with schizophrenia. Over the past decade, nonpharmacological techniques such as cognitive remediation therapy (CRT) have gained foothold. However, such programs require long-term follow-up for the therapy sessions. For this, it is important that patients have an awareness of their cognitive deficits and perceive a need to undergo treatment.

Research has shown that when individuals with schizophrenia are asked to subjectively assess their cognitive prowess, their subjective cognitive complaints (SCCs) do not match with objective findings assessed using neuropsychological tests.\(^7\) Thus, contrary to what was previously thought, they do come up with cognitive complaints. However, these are vague and are not representative of their actual deficits. This aspect of insight was labeled as neurocognitive insight (NI) and defined as “awareness of neuropsychological dysfunction (such as attention, memory, and problem-solving).”\(^8\) It is now known that patients of schizophrenia, if at all, show only partial awareness of their cognitive deficits.\(^9\) It has also been seen that clinicians’ ratings of patients’ cognitive functioning are only slightly better than self-reports of the patients, thereby stressing the importance of objective neuropsychological tests for evaluating their cognitive status.\(^10,11\) Research has also consistently shown that there is no correlation between clinical insight into illness and NI.\(^12\)

The concept of metacognition has been used in understanding the symptoms of schizophrenia.\(^13,14\) Misinterpretation of others’ intentions due to impaired theory of mind can lead to difficulty in discriminating between subjective representation and reality and can explain paranoid ideation. Similarly, NI can also be thought of as a kind of metacognitive knowledge which effectively helps in knowing the limits of one’s cognitive resources. For example, a person with memory impairment might plan: “I know that I have a difficulty in remembering list of grocery items to be bought, so I will write in on a piece of paper and keep it with me, in case I get confused.” With the current focus on cognition as a therapeutic target in individuals with schizophrenia, it becomes important for clinicians to acknowledge that self-reports of cognitive functioning by patients with schizophrenia are not sufficient to plan treatment. It might be prudent to objectively assess the patients using neuropsychological tests to know their exact cognitive status. Since the patients lacking NI will not be able to give an accurate estimate of their cognitive deficits, they are less likely to even perceive a need to undergo treatment such as CRT. This could even lead to decreased utilization of these therapies, as well as decreased motivation for adherence to the therapy sessions.\(^13\)

The aim of this study was to assess whether patients with schizophrenia have NI – judged by whether SCC correlates with objective cognitive performance on various neuropsychological tests – since it has not been studied in the Indian population. We also wanted to explore its relationship with clinical profile and clinical insight into illness. Further, we found no research focusing on the relationship between SCC and social functioning in schizophrenia. However, with the effects of NI on self-esteem, it possible that awareness of deficits in one’s cognition could by itself affect social functioning. Hence, we wanted to assess whether there existed a relationship between SCC and social functioning.

MATERIALS AND METHODS

The research study was approved by the institutional ethics committee. It was a cross-sectional study conducted at a tertiary care teaching hospital. The current literature suggests that generalized impairment in various cognitive domains is prevalent in nearly all patients of schizophrenia. Hence, 100 patients diagnosed with schizophrenia as per the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition were included using nonprobability convenience sampling. Written informed consent was obtained. The participants were in the age group of 18–50 years; spoke English, Hindi, or Marathi; were educated till at least 5th standard; and had adequate hearing and visual abilities. Those with a history of receiving electroconvulsive therapy in the last 6 months, any significant history of head injury with loss of consciousness or documented cognitive sequelae, clinically diagnosed mental retardation, or a concurrent diagnosis of substance dependence (other than nicotine) were excluded.

Assessment of participants

The participants were interviewed during their visit to the psychiatry outpatient department. Sociodemographic details and past and family history were documented in a semi-structured pro forma. The following scales/tests were used:

1. Positive and Negative Syndrome Scale (PANSS) was used to assess the severity of psychotic symptoms.\(^16\)
2. Subjective Scale To Investigate Cognition in Schizophrenia (SSTICS) was used to evaluate SCC.
It is a 21-item self-report questionnaire that covers self-awareness of problems in working memory, explicit memory (comprising episodic and semantic memory), attention, executive function, language, and praxis, with higher scores signifying higher SCC.[19] The scale was translated into Hindi and Marathi, and face validity of the translated versions was then done by language experts. A pilot study was also conducted to validate the translated versions.

3. Wechsler Adult Intelligence Scale, 3rd Edition is an intelligence test used to measure the IQ and cognitive skills of adults and adolescents.[17] Of its 14 subtests, the Digit Span Subtest was utilized in the present study as a test of attention.

4. The National Institute of Mental Health and Neuro Sciences Neuropsychology battery was used to assess neurocognitive performance. It is a comprehensive tool for assessing cognitive functions in Indian population.[18] Of its subtests, Verbal n-back Test was used as a test of working memory, Stroop Test was used as a test of executive functioning, and Passages Test was used to test learning and memory. For each subject, the scores on neuropsychological tests were compared to appropriate norms as per age, sex, and education, and percentile scores were calculated. The 15th percentile score (1 standard deviation [SD] below mean) was taken as the cutoff score signifying moderate cognitive impairment.[19]

5. Abbreviated version of Scale to Assess Unawareness in Mental Disorder (SUMD) was used to measure the clinical insight into illness.[20]

6. Schizophrenia Research Foundation India-Social Functioning Index (SSFI) was used to assess the level of social functioning.[21]

Statistical analysis
The data were tabulated and the results were calculated using Statistical Package for the Social Sciences version 20 for Windows. (IBM Corp., Armonk, NY). Qualitative data such as sex, educational status, and occupation were expressed using descriptive statistics. Comparison between SSTICS scores, subscale scores of the different neuropsychological tests, severity of psychopathology (PANSS), clinical insight (SUMD-abbreviated version), and social functioning (SSFI) was done using Pearson’s correlation. Relationship between SSTICS total score and other variables in clinical profile was computed using nonparametric tests. Statistical testing was performed at <0.05 significance level.

RESULTS

Characteristics of the participants
Of the 100 participants assessed, 57 were males. The age of the participants ranged from 18 to 50 years, with the mean age being 33.38 (±8.53) years. Sociodemographic and clinical characteristics of the participants are depicted in Table 1.

Objective cognitive performance and its relation to subjective cognitive complaints
Based on the 1 SD cutoff, we found that 79%–86% of participants had impairment in explicit memory, 82% in attention, 63% in executive function, and 34%–48% in working memory. SSTICS total and subscale scores were then correlated with the neuropsychological test scores using Pearson’s coefficient of correlation [Table 2]. We found that among all cognitive domains, only working memory test scores (1 back and 2 back hits) correlated with corresponding SSTICS scores of working memory domain. Significant positive correlation was also seen between working memory test scores and SSTICS subscales of semantic memory, executive function, and the SSTICS total scores. In other words, higher working memory test scores correlated with higher subjective awareness of working memory deficits, as well as of deficits in explicit memory and executive function. Importantly, subjective awareness about deficits in other three domains (attention, explicit memory, and executive function) did not correlate with objective performance on corresponding objective tests.

Relation between subjective cognitive complaints and clinical profile
In clinical profile, total duration of illness (TDI), duration of untreated psychosis (DUP), number of psychotic episodes, family history of psychosis, and severity of psychopathology (PANSS scores) were noted and their relation to SCC (SSTICS total scores) was assessed. As the SSTICS scores were not normally distributed, nonparametric tests were used. As seen in Table 3, only family history showed a significant association: Mann–Whitney U-test showed that those with a family history of psychosis had significantly greater SSTICS total scores (Mdn = 27.5) than those who did not have a history (Mdn = 14, U = 800.5, P = 0.002, r = 0.3). We found no significant correlation between SSTICS total and PANSS positive, negative, and general psychopathology subscale scores, implying that SCC was, in general, independent of severity of psychopathology. However, when Pearson’s correlation was computed with individual items of PANSS, a significant correlation was seen between SSTICS total scores and emotional withdrawal (P = 0.044, r = 0.202), depression (P = 0.001, r = 0.334), motor retardation (P = 0.033, r = 0.214), and disorientation (P = 0.014, r = −0.245) items of PANSS.

Relation between subjective cognitive complaints and clinical insight into illness
Relation between SSTICS and SUMD scores was computed using Pearson’s correlation [Table 4]. There was no significant correlation between the two scores, implying that patients with clinical insight into illness may or may not have awareness of their cognitive deficits.
Relation between subjective cognitive complaints and social functioning

Relation between the SSTICS and SSFI scores was analyzed using Pearson’s correlation [Table 5]. There was a significant negative correlation between SSTICS executive function and SSFI total scores ($r = -0.204, P = 0.042$) as well as the SSFI occupational role and other social roles subscales. Similarly, significant negative correlation was also observed between SSTICS episodic memory and SSFI total scores ($r = -0.204, P = 0.042$) as well as the SSFI subscales of occupational role and other social roles. Significant negative correlation was also observed between SSTICS total score and SSFI other social role scores ($r = -0.200, P = 0.046$). Thus, higher SCC regarding episodic memory and executive function correlated with lower social functioning, especially in domains of occupational role (quality of occupation, performance, regularity, etc.) and other social roles (relationship with relatives, neighbors, friends, colleagues, etc.).

**DISCUSSION**

The participants in our study had a mean age of 33.38 years, signifying a young age group. Explicit memory was the most commonly affected cognitive domain (up to 86% participants), followed by attention, executive function, and then working memory, in that order. The findings are similar to that of previous literature, which have also shown verbal explicit memory as one of the most affected domains in schizophrenia.[3]

The SSTICS total and subscale scores of the participants in the present study were similar to those in previous ones that have examined NI.[7,12,22] We found it interesting that these scores are much higher than those reported by normal population using the same scale. It can thus be said that individuals with schizophrenia do perceive and report problems in their cognitive functioning. However, when their SSTICS total and subscale scores were correlated with scores on corresponding neuropsychological tests, we found that of the four cognitive domains, only working memory test scores positively correlated with SCC regarding working memory. These also correlated with SSTICS total scores and other subscale scores. Patients were thus self-aware and could subjectively express their cognitive functioning with regard to working memory as it reflected in their working memory test performance. In addition, better the working memory (signified by higher performance on working memory tests), better was their self-awareness, not only about their working memory status but also about their cognitive status, in general, including explicit memory and executive function. This finding is different from other studies which have found that self-perceived cognitive deficit in any domain did not correlate with objective test findings.[12,23,24]

Apart from working memory, patients’ SCC failed to reflect objectively assessed cognitive performance for explicit memory, attention, and executive function, implying poor NI. A recent meta-analysis on studies assessing NI suggested that while patients with schizophrenia did complain of cognitive problems, they seemed more like
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Table 2: Correlation between subjective cognitive complaints and objective cognitive performance

| SSTICS subscale               | Digit span scaled score | Verbal 1 back hits | Verbal 2 back hits | Passages test immediate recall | Passages test delayed recall | Stroop effect score |
|-------------------------------|-------------------------|--------------------|--------------------|--------------------------------|-----------------------------|--------------------|
| Total score                   |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.158                   | 0.239*             | 0.237*             | 0.193                          | 0.185                       | −0.122             |
| $P$                           | 0.117                   | 0.017              | 0.018              | 0.055                          | 0.066                       | 0.225              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |
| Explicit memory               |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.092                   | 0.198*             | 0.187              | 0.132                          | 0.113                       | −0.015             |
| $P$                           | 0.361                   | 0.048              | 0.063              | 0.192                          | 0.262                       | 0.881              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |
| Episodic memory               |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.079                   | 0.158              | 0.118              | 0.123                          | 0.095                       | 0.018              |
| $P$                           | 0.437                   | 0.117              | 0.243              | 0.223                          | 0.345                       | 0.856              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |
| Semantic memory               |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.121                   | 0.246*             | 0.217*             | 0.103                          | 0.163                       | −0.170             |
| $P$                           | 0.232                   | 0.014              | 0.030              | 0.307                          | 0.105                       | 0.091              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |
| Working memory                |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.103                   | 0.290*             | 0.264*             | 0.154                          | 0.205*                      | −0.180             |
| $P$                           | 0.306                   | 0.003              | 0.008              | 0.126                          | 0.041                       | 0.073              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |
| Attention                     |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.167                   | 0.178              | 0.185              | 0.217*                         | 0.210*                      | −0.174             |
| $P$                           | 0.096                   | 0.076              | 0.066              | 0.030                          | 0.036                       | 0.083              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |
| Executive function            |                         |                    |                    |                                |                             |                    |
| Pearson’s $r$                 | 0.210*                  | 0.227*             | 0.245*             | 0.144                          | 0.090                       | −0.105             |
| $P$                           | 0.036                   | 0.023              | 0.014              | 0.154                          | 0.372                       | 0.300              |
| $n$                           | 100                     | 100                | 100                | 100                            | 100                         | 100                |

*Correlation is significant at the 0.05 level (two-tailed). SSTICS – Subjective Scale To Investigate Cognition in Schizophrenia

Table 3: Relationship between clinical profile and subjective cognitive complaints (Subjective Scale To Investigate Cognition in Schizophrenia total score)

| Variable                        | Statistics   | $P$  |
|---------------------------------|--------------|------|
| Total duration of illness months| $r=0.071$    | 0.481|
| Duration of untreated psychosis in months | $r=0.038$ | 0.710|
| Number of episodes               | $\chi^2=1.351$ | 0.509|
| Family history of psychosis      | U=800.5*     | 0.002|
| Severity of psychosis (PANSS)    |              |      |
| Positive symptoms subscale       | $r=0.060$    | 0.552|
| Negative symptoms subscale       | $r=0.118$    | 0.243|
| General psychopathology subscale | $r=0.144$   | 0.154|
| Total score                      | $r=0.123$    | 0.223|

*Significance level set at 0.05 level. $r$ – Pearson’s correlation coefficient; U – Mann-Whitney U statistic; $\chi^2$ – Kruskal-Wallis Chi-square statistic; PANSS – Positive and Negative Syndrome Scale

a diffuse discomfort or malaise and did not accurately portray the objective findings of neuropsychological tests. Currently, a lot of research has been focusing on finding ways to improve cognition via nonpharmacological measures such as CRT. In such a scenario, it becomes important that while selecting patients for starting CRT or potential drugs targeting cognition, relying merely on a patient’s self-report is not feasible. Considering the ubiquity of cognitive dysfunction in schizophrenia, it becomes essential that along with an enquiry into their objective findings, each individual should also be evaluated objectively using formal testing. This is because, just as acutely-ill patients of schizophrenia frequently do not perceive the need to seek treatment for their psychotic symptoms, it is possible that they may also not perceive a need to seek help for their cognitive dysfunction due to poor NI. While administering neuropsychological tests, we observed that many participants who were confident about their cognitive abilities, however, became aware that there might be something wrong when they realized that they had performed poorly.

Current research suggests that working memory deficits are one of the core deficits and are now considered as one of the endophenotypes. Based on this and our current findings, we hypothesize that working memory might have a bearing on NI, regarding multiple cognitive domains. In this case, could simple techniques to improve working memory possibly help in improving self-awareness about one’s cognitive functioning? Research has shown that computer-based working memory retraining programs had helped improve working memory in both healthy individuals and those suffering from schizophrenia. A recent study done by Hegde et al. used simple home-based techniques for cognitive retraining in patients of the first episode psychosis and found positive effects in multiple cognitive domains including working memory. The task to improve working memory involved rearranging jumbled...
words to make meaningful words. Such simple measures could possibly be used to improve NI and require further research.

A finding unique to our study was that individuals with a positive family history of psychosis had a significantly higher SCC, as compared to those without a family history. Considering the role of prefrontal cortex in metacognition, in general and schizophrenia, in particular, a biological explanation is more likely. It could also be argued that participants with a family member suffering from schizophrenia could have had an early exposure to the cognitive challenges faced by their affected relatives in their daily lives, with these observations possibly helping them in their own cognitive self-appraisal. However, this needs further exploration.

We also found that there was no effect of TDI, DUP, or even number of episodes on the severity of SCC. In general, there was even a lack of relationship between SCC and severity of psychopathology [Table 3], which is in line with the findings of the meta-analysis by Potvin et al. However, among individual items of PANSS, higher SCC correlated with higher emotional withdrawal, depression, motor retardation, and lower disorientation. Previous research shows similar findings in terms of relation to depression. It has been seen that severe self-rated depression is associated with an underestimation of one’s functional abilities and thus with more subjectively perceived difficulties in cognitive functioning, which could explain this finding. However, the authors would like to report their observations while interviewing participants who reported depressive symptoms secondary to the knowledge that they either were not able to “remember things” as they used to or could not “concentrate while working” as well as they used to. Participants also reported that they either tended to avoid social interactions as they could not recognize their past friends when they crossed them or avoided leaving the house as they tended to forget their way about and had to frequently ask other pedestrians multiple times for the way. Based on these observations, we hypothesize that self-awareness of cognitive deficits could in part be responsible for the so-called secondary negative symptoms of schizophrenia.

There was no correlation between SCC and clinical insight scores as well, which confirms the findings of previous research that individuals could have awareness of their cognitive deficits even when they had no insight into their illness and its symptoms. This reinforces the concept that insight is a multi-dimensional entity whose dimensions are likely to have biological mechanisms independent of each other. This aspect of lack of insight into cognitive deficits was labeled as schizo-anosognosia by Stip et al., to separate it from clinical insight into illness.

### Table 4: Correlation between subjective cognitive complaints and clinical insight

| SSTICS subscale       | SUMD                  |
|-----------------------|-----------------------|
|                       | Awareness of disease  | Awareness of positive symptoms | Awareness of negative symptoms | Total score |
| Total score           |                       |                                   |                               |
| Pearson’s r           | −0.041                | 0.052                             | 0.015                          | 0.015       |
|                       | 0.683                 | 0.606                             | 0.879                          | 0.883       |
|                       | 100                   | 100                               | 100                            | 100         |
| Explicit memory       |                       |                                   |                               |
| Pearson’s r           | −0.022                | 0.072                             | 0.011                          | 0.029       |
|                       | 0.831                 | 0.479                             | 0.913                          | 0.771       |
|                       | 100                   | 100                               | 100                            | 100         |
| Episodic memory       |                       |                                   |                               |
| Pearson’s r           | −0.018                | 0.115                             | 0.033                          | 0.059       |
|                       | 0.855                 | 0.253                             | 0.741                          | 0.557       |
|                       | 100                   | 100                               | 100                            | 100         |
| Semantic memory       |                       |                                   |                               |
| Pearson’s r           | −0.015                | −0.047                            | −0.012                         | −0.032      |
|                       | 0.886                 | 0.643                             | 0.908                          | 0.755       |
|                       | 100                   | 100                               | 100                            | 100         |
| Working memory        |                       |                                   |                               |
| Pearson’s r           | −0.020                | −0.009                            | −0.041                         | −0.028      |
|                       | 0.840                 | 0.929                             | 0.682                          | 0.785       |
|                       | 100                   | 100                               | 100                            | 100         |
| Attention             |                       |                                   |                               |
| Pearson’s r           | −0.108                | −0.005                            | −0.032                         | −0.054      |
|                       | 0.287                 | 0.965                             | 0.749                          | 0.593       |
|                       | 100                   | 100                               | 100                            | 100         |
| Executive function    |                       |                                   |                               |
| Pearson’s r           | −0.027                | 0.069                             | 0.043                          | 0.038       |
|                       | 0.787                 | 0.497                             | 0.669                          | 0.706       |
|                       | 100                   | 100                               | 100                            | 100         |

Correlation is significant at the 0.05 level (two-tailed). SUMD – Scale to Assess Unawareness in Mental Disorder; SSTICS – Subjective Scale To Investigate Cognition in Schizophrenia
To our knowledge, this is the first study to analyze the relationship between SCC and social functioning. We observed that higher SCC regarding episodic memory and executive functions was correlated with lower social functioning [Table 4]. Correlation levels were especially significant with the domains of occupational role and other social roles. “Occupational roles” domain of SSFI includes regularity at work, the quality of the occupation, the quality of individual’s performance in work, and the occupational interests of the individual. A study by Cella et al. evaluated the role of self-esteem as a predictor of NI. Self-esteem was used as a measure of metacognition since self-esteem requires individuals to reflect upon their self-worth. They found that better awareness of cognitive deficits predicted lower self-esteem. On controlling for other variables, low self-esteem was, in fact, found to be the strongest predictor of higher NI. Based on this, they hypothesized that high self-esteem persisted only in the context of denial of cognitive deficits. Similarly, it is possible that even in our participants, self-awareness about deficits in cognitive functioning such as episodic memory and executive functions could have affected their self-esteem and perceived ability to perform the task at hand and further affect occupational functioning.

The domain of “other social roles” includes relationship with family members not living in the same house, friends, neighbors, and colleagues at workplace participation in social activity groups. Self-perception of gaps in episodic memory pertaining to close relatives and friends could lead to impaired social interaction by itself or secondary to social avoidance. This is particularly important in the light of the finding that up to 86% participants had moderate impairment in explicit memory. It also brings to mind the observations described earlier, where the patients claimed to avoid social interaction secondary to knowledge of cognitive deficits, such as difficulty in recognizing past acquaintances and remembering previous interactions. However, it is also possible that the presence of metacognitive deficits in social cognition could have caused an alteration in social behavior and thus impairment in their social relations with others.

**CONCLUSIONS**

Patients with schizophrenia have complaints about their cognitive functioning. However, these do not correlate with their objective performance on neuropsychological tests, implying poor self-awareness of cognitive deficits or poor NI. This entity of NI is independent of the severity of psychotic symptoms or even the clinical insight into illness. However, depressive symptoms should be investigated into when a patient of schizophrenia presents with SCC.
Finally, NI can affect social functioning, especially work and relationship with relatives and friends.

The study has its limitations. There was no nonclinical comparison group. In addition, apart from the four cognitive domains assessed for NI, other domains implicated in schizophrenia were not assessed. The effect of medications on cognition was also not taken into account. Finally, the study sample was not community based, and hence, the results are not generalizable.

Clinical implications and future directions

Insight building regarding neurocognitive dysfunction should become a part of general insight building in patients of schizophrenia. Patients should be routinely assessed for their subjective awareness of cognitive deficits, just as their insight into mental illness is evaluated. In addition, when planning cognitive interventions, the patients should also be assessed objectively for cognitive deficits using neuropsychological tests as their self-report may not be accurate. Finally, patients who do not have clinical insight into their illness may or may not have awareness of their neurocognitive functioning; hence, it should still be actively enquired into as it can by itself have an effect on social functioning. In the future, studies using larger community-based samples and using a comparison group could help in getting more generalizable results. Longitudinal studies could also be done to evaluate the course of NI in patients of schizophrenia. Interventional studies assessing the effect of working memory exercises on NI could help in getting a better understanding of NI in schizophrenia.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Elvevåg B, Goldberg TE. Cognitive impairment in schizophrenia is the core of the disorder. Crit Rev Neurobiol 2000;14:1-21.
2. Fioravanti M, Bianchi V, Cinti ME. Cognitive deficits in schizophrenia: An updated metanalysis of the scientific evidence. BMC Psychiatry 2012;12:64.
3. Nuechterlein KH, Barch DM, Gold JM, Goldberg TE, Green MF, Heaton RK. Identification of separable cognitive factors in schizophrenia. Schizophr Res 2004;72:29-39.
4. Green MF. Cognitive impairment and functional outcome in schizophrenia and bipolar disorder. J Clin Psychiatry 2006;67 Suppl 9:3-8.
5. Gold JM, Goldberg RW, McNary SW, Dixon LB, Lehman AF. Cognitive correlates of job tenure among patients with severe mental illness. Am J Psychiatry 2002;159:1395-402.
6. Green MF. What are the functional consequences of neurocognitive deficits in schizophrenia? Am J Psychiatry 1996;153:321-30.
7. Stip E, Caron J, Renaud S, Pampoulova T, Lecomte Y. Exploring cognitive complaints in schizophrenia: The subjective scale to investigate cognition in schizophrenia. Compr Psychiatry 2003;44:331-40.
8. Medalia A, Thysen J. Insight into neurocognitive dysfunction in schizophrenia. Schizophr Bull 2008;34:1221-30.
9. Potvin S, Aubin G, Stip E. Subjective cognition in schizophrenia. Encephale 2017;43:15-20.
10. Harvey PD, Serper MR, White L, Parrella MJ, McGurk SR, Moriarty PJ, et al. The convergence of neuropsychological testing and clinical ratings of cognitive impairment in patients with schizophrenia. Compr Psychiatry 2001;42:306-13.
11. Medalia A, Lim RW. Self-awareness of cognitive functioning in schizophrenia. Schizophr Res 2004;71:331-8.
12. Sellwood W, Morrison AP, Beck R, Heffernan S, Law H, Bentall RP. Subjective cognitive complaints in schizophrenia: Relation to antipsychotic medication dose, actual cognitive performance, insight and symptoms. PLoS One 2013;8:e63774.
13. Frith CD. The Cognitive Neuropsychology of Schizophrenia. New York, NY: Psychology Press; 1992.
14. Frith CD. Schizophrenia and theory of mind. Psychol Med 2004;34:385-9.
15. Huddy V, Reeder C, Kontis D, Wykes T, Stahl D. The effect of working alliance on adherence and outcome in cognitive remediation therapy. J Nerv Ment Dis 2012;200:614-9.
16. Kay SR, Fiszbein A, Opler LA. The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophr Bull 1987;13:261-76.
17. Wechsler D. Manual for the Wechsler Adult Intelligence Scale-III. San Antonio, TX: The Psychological Corporation; 1997.
18. Rao SL, Subbakkadru DK, Gopukumar K. NIMHANS Neuropsychology Battery-2004. Bangalore: NIMHANS Publication; 2004.
19. Hegde S, Rao SL, Raguram A, Gangadhar BN. Addition of home-based cognitive retraining to treatment as usual in first episode schizophrenia patients: A randomized controlled study. Indian J Psychiatry 2012;54:15-22.
20. Michel P, Baumstarck K, Auquier P, Madou D, Dumas R, Fernandez J, et al. Psychometric properties of the abbreviated version of the Scale to Assess Unawareness in Mental Disorder in schizophrenia. BMC Psychiatry 2013;13:229.
21. Padmavathi R, Thara R, Sinivasan L, Kumar S. SCARF social functioning index. Indian J Psychiatry 1995;37:161-4.
22. Lecardeur L, Briand C, Prouteau A, Lalone P, Nicole L, Lesage A, et al. Preserved awareness of their cognitive deficits in patients with schizophrenia: Convergent validity of the SSTICS. Schizophr Res 2009;107:303-6.
23. Chan RC, Wang Y, Ma Z, Hong X, Yuan Y, Yu X, et al. Objective measures of prospective memory do not correlate with subjective complaints in schizophrenia. Schizophr Res 2008;103:229-39.
24. Johnson I, Tabbane K, Dellagi L, Kebir O. Self-perceived cognitive functioning does not correlate with objective measures of cognition in schizophrenia. Compr Psychiatry 2011;52:688-92.
25. Silver H, Feldman P, Bilker W, Gur RC. Working memory deficit as a core neuropsychological dysfunction in schizophrenia. Am J Psychiatry 2003;160:1809-16.
26. Snitz BE, Macdonald AW 3rd, Carter CS. Cognitive deficits in unaffected first-degree relatives of schizophrenia patients: A meta-analytic review of putative endophenotypes. Schizophr Bull 2006;32:179-94.
27. Lawlor-Savage L, Gogari VM. Working memory training in schizophrenic and healthy populations. Behav Sci (Basel) 2014;4:301-19.
28. Burton CZ, Harvey PD, Patterson TL, Twamley EW. Neurocognitive insight and objective cognitive functioning in schizophrenia. Schizophr Res 2016;171:131-6.
29. Harvey PD, Pinkham A. Impaired self-assessment in schizophrenia: Why patients misjudge their cognition and functioning. Curr Psychiatry 2015;14:53-9.
30. Bayard S, Capdevielle D, Boulenger JP, Raffard S. Dissociating self-reported cognitive complaint from clinical insight in schizophrenia. Eur Psychiatry 2009;24:251-8.
31. Bengoecha Seco R, Gil Sanz D, Fernández Modamo M, Arrieta Rodríguez M, Sánchez Calleja R, Prat Solís R, et al. Cognitive complaints in schizophrenia: Relationship with insight and other cognitive measures. Rev Psiquiatr Salud Ment 2010;3:55-60.
32. Zhornitsky S, Potvin S, Aubin G, Stip E. Relationship between insight into cognition, extrapyramidal symptoms and mental illness in schizophrenia. Aust N Z J Psychiatry 2011;45:604-5.
33. Cella M, Swan S, Medin E, Reeder C, Wykes T. Metacognitive awareness of cognitive problems in schizophrenia: Exploring the role of symptoms and self-esteem. Psychol Med 2014;44:469-76.