

Self-perception of mental illness, and subjective and objective cognitive functioning in people with schizophrenia

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Background: People with schizophrenia may have a negative self-perception of mental illness. However, the relationship between the self-perception of illness and subjective and objective cognitive functioning remains unclear.

Method: Thirty-seven people with schizophrenia were enrolled in the study group. All subjects completed self-reported self-perception of mental illness questionnaires (Birchwood Insight Scale [BIS], Internalized Stigma of Mental Illness [ISMI]), subjective cognitive functioning (Scale to Investigate Cognition in Schizophrenia [SSTICS]) and objective cognitive functioning (Luria Nebraska Neuropsychological Battery [LNNB]).

Results: Spearman's rank analysis showed that awareness of illness (domain of insight) was positively associated with most domains of SSTICS and ISMI. Total insight was positively correlated with alienation (domain of ISMI). Need for treatment (domain of insight) was negatively correlated with stigma resistance (domain of ISMI). Awareness of symptoms (domain of insight) and total insight were negatively associated with receptive speech and arithmetic (LNNB subtest), respectively. ISMI was positively correlated with most domains of SSTICS, but not with LNNB. The group with good insight had higher scores in attention (domain of SSTICS) and total SSTICS and alienation, stereotype endorsement, social withdrawal (domains of ISMI) and total ISMI than the group with poor insight. The group with mild to moderate internalized stigma had higher scores in explicit memory, attention, language, praxia (domains of SSTICS) and total SSTICS than the group with no internalized stigma.

Conclusion: We identified that awareness of illness (domain of insight), internalized stigma were significantly associated with most domains of SSTICS, but not with LNNB. Total insight and awareness of symptoms (domain of insight) were significantly associated with receptive speech and arithmetic (LNNB subtest), respectively. Schizophrenia with higher insight or more internalized stigma reported more subjective cognitive impairment. Future studies with larger samples involving follow up are necessary to verify our findings and extend the applicability.

Keywords: self perception, insight, internalized stigma, Luria Nebraska neuropsychological battery, schizophrenia

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Introduction

The extent to which individuals are aware of their mental disorder and how they perceive their illness may affect how they experience their illness and develop negative attitudes toward mental illness. Having a high level of insight has been shown related to better treatment adherence in people with schizophrenia,¹ but also implies a greater chance of adopting the label of mental illness and internalizing the stigma. The concept of self-

stigmatization refers to a person's internalized feelings of stigma by accepting the negative attitudes and stigmatizing it towards oneself.^{2,3} Lack of insight has been attributed to brain dysfunction but also to psychological defense mechanism of denial.⁴ The neuropsychological model has generated extensive research in recent years. Studies investigating insight, self-stigma and objective cognition have obtained inconsistent findings. To date, no research has studied the relationship between insight, internalized stigma and subjective cognition; thus, it is important to examine the possible impact on the self-perception of illness. The simultaneous use of subjective and objective cognitive measures may provide a more complete picture of individual rehabilitation targets in people with schizophrenia.

Insight is referred to as one having awareness of an illness that requires treatment.⁵ David⁶ addressed three components of insight: recognition that one has an illness, the ability to recognize the symptoms of the illness and the compliance with treatment. Studies investigating lack of insight and objective cognition have obtained inconsistent findings. Poor insight has been found to have a small but significant association with executive functioning, complex motor sequencing, memory and global cognition in acute and non-acute phases of schizophrenia.⁷⁻⁹ Other studies observed a non-significant relationship between insight and neurocognition among patients in varying phases of illness.¹⁰⁻¹³ Inconclusive findings may be the result of examining patients at different stages of the illness. Applying neurocognitive measures that target specific neurocognitive function may be a necessary condition to examine clinical insight.¹⁴

People with mental illness may have internalized stigma, also referred to as self-stigma, toward the self-perception of mental illness. Having more internalized stigma has been associated with a wide range of adverse psychosocial outcomes in people with mental illness, including poor quality of life and life satisfaction, lower self-esteem and self-efficacy, recovery orientation, more psychiatric symptoms, marginalization, rejection, shame and isolation.¹⁵⁻¹⁷ Thus, internalized stigma is considered to be a risk factor for mental health prognosis and rehabilitation. The results by Chan et al¹⁸ showed that neurocognition (assessed with a modified Wisconsin card sorting test, digit span and digit symbol) was negatively associated with internalized stigma (stereotype endorsement and discrimination experience) in people with schizophrenia-spectrum disorders. Limit in research and yielding inconsistent results, more studies are warranted to explore the association between internalized

stigma and objective cognitive function in people with schizophrenia.

A number of neurophysiological and neuroimaging studies showed that people with schizophrenia have abnormal functional connections in their distinct brain process. The dysfunctional connectivity may include exaggerated connections or weakened pathways between cortical and subcortical areas and result in altered functional integration.¹⁹⁻²³ The three functional blocks addressed by Luria²⁴ involved the simultaneous operation of the three functional units. In Luria's interpretation, a particular region of the brain usually represents a single factor, which supported and subserved different systems and various psychological functions. A given behavior is integrated by different interacting factors.²⁵ Cognitive deficits impact the functional outcomes in people with schizophrenia and may cause them to have several cognitive dysfunctions when compared to the healthy population.²⁶⁻²⁹ Most studies have focused on the relationship between self-perception of illness and objective cognitive functioning; few studies investigated the association between self-perception of illness and subjective cognitive functioning. Therefore, to gain a full picture of self-perception of illness in chronic patients with schizophrenia, subjective and objective cognitive functioning need to be assessed concurrently to understand their treatment outcomes and adjustment in recovery.

Few studies have investigated the association between insight and internalized stigma. The results by Lu and Wang³⁰ showed that lack of insight was not correlated with self-stigma in people with schizophrenia. Another study found that psychiatric patients with insight have a high level of self-stigma compared to those without insight.³¹ The inconclusive results may be due to a lack of recruiting stable schizophrenia outpatients, and the inconsistent use of assessments to test insight.

Therefore, this study aimed to investigate (1) the association between insight and subjective cognitive complaints and objective Luria-Nebraska Neuropsychological Battery (LNNB) in stable outpatients with schizophrenia; (2) the association between internalized stigma, and subjective cognitive complaints and objective LNNB; (3) the relationship between insight and internalized stigma. We hypothesized that patients with schizophrenia that have good insight and more internalized stigma would display more subjective cognitive complaints. We expect that insight and internalized stigma would be independent of current cognitive performance. We hypothesized that

patients with good insight would have more internalized stigma compared to those with poor insight.

Method

Ethics

The study protocol was reviewed and approved by the Kaohsiung Armed Forces General Hospital institutional review board. Prior to receiving assessments, written informed consent was obtained from all participants. This study was conducted in accordance with the ethical standards set forth in the Declaration of Helsinki (1964).

Participants and procedures

The criteria for patient recruitment were as follows: (1) a diagnosis of schizophrenia was made using the Structured Clinical Interview for DSM-IV Diagnoses³² by professionals in the department of psychiatry, Zuoying Branch of Kaohsiung Armed Forces General Hospital. (2) All patients were stably adhered on medical treatment without changes in the dosage of medications in the previous month of recruitment into the study, and had no acute hospitalizations. We approached 55 patients by telephone to request their participation in the study. Patients were excluded if they: (a) met the diagnostic criteria for substance abuse, acute psychotic symptoms, intellectual disabilities and other psychiatric disorders; (b) had a history of head trauma with loss of consciousness; (c) had neurological disorders in the preceding 6 months. Thirty-seven outpatients with schizophrenia (16 males, 21 females) were enrolled in the study. All participants were on stable doses of atypical antipsychotic medication.

Measures

The Birchwood Insight Scale (BIS) is an 8-item scale and includes three domains: awareness of symptoms (ie, attribution of one's symptoms as part of one's disorder), awareness of illness (ie, awareness of having a mental disorder) and need for treatment. Participants were asked to answer each item rated on a 3-point Likert scale (0 = disagree, 1 = unsure, 2 = agree). Subscale items were summed, and the score for the need for treatment subscale was divided by 2 with equal weight to the other two subscales, allowing total scores for BIS to be calculated which ranged from 0–12. Higher scores indicated a higher level of insight. Scores above 9 points were categorized as the group with good insight. This scale has adequate internal consistency, validity, and sensitivity to change.³³

The Internalized Stigma of Mental Illness (ISMI) scale is a self-reported 29-item questionnaire which includes five aspects of self-stigma including alienation, stereotype endorsement, discrimination experience, social withdrawal, and stigma resistance. Participants were asked to answer each item rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Higher scores are indicative of a greater perception of internalized stigma, but not including stigma resistance. Higher scores on this domain indicated more resistance to stigma and therefore less internalized stigma.³⁴ The cut-off point of no, mild, moderate and severe internalized stigma was based on the method used by Lysaker et al.³⁵ We used the Taiwan-version of ISMI-29 in this study.³⁶

The Scale to Investigate Cognition in Schizophrenia (SSTICS) is a self-rating scale and consists of 21 items that incorporate the areas of memory, attention, executive function, language, and praxia. Participants were asked to rate the frequency of their cognitive deficits with a 5-point Likert-scale ranging from 0 (never) to 4 (very often). Total scores ranged from 0 to 84 and higher scores indicated that the participants complained more about their cognitive impairment.³⁷

The LNNB Form-I is a standardized and multidimensional battery designed to identify a broad range of neuropsychological deficiencies. The LNNB Form-I consists of 269 items, 11 clinical scales, five summary scales, eight localization scales and twenty-eight factor scales. Higher scores on the LNNB indicated more cognitive deficits in that area.³⁸ (1) C1 (Motor Functions): The C1 scale includes a variety of motor skills to reflect both right and left hemisphere performance. (2) C2 (Rhythm): The C2 scale assesses the auditory perception of rhythmic patterns. (3) C3 (Tactile Functions): The C3 scale involves different levels of cutaneous sensation. (4) C4 (Visual Functions): The C4 scale evaluates a range of visual functions, including naming and visual-spatial perception. (5) C5 (Receptive Speech): The C5 scale evaluates the ability of participants to understand receptive speech, from simple phonemic analysis to complex sentences. (6) C6 (Expressive Speech): The C6 scale assesses the participants' ability to repeat simple phonemes and words and to generate automatic as well as more complex speech form. (7) C7 (Writing): The C7 scale evaluates the ability of participants to analyze words phonetically and to copy and write items of increasing difficulty. (8) C8 (Reading): The C8 scale measures the ability of participants to generate sounds from words that the examiner reads aloud. (9) C9 (Arithmetic): The C9 scale includes basic arithmetic skills, spatial function and ability to comprehend

number structure and relative numerical values. (10) C10 (Memory): The scale involves short-term and intermediate memory, including non-verbal and verbal memory. (11) C11 (Intellectual Processes): The C11 scale is differentiated from a standard intelligence test and it tends to assess a functional intellectual level, including complex reasoning and problem-solving skills. The cutoff of LNNB higher than 60 T scores is categorized as brain damaged. The Taiwan version of the LNNB Form-I has good validity and reliability.³⁹

Statistical analyses

All statistical analyses were performed using SPSS 22.0 software (SPSS Inc., Chicago, IL, USA). Mean standard deviation and percentages were calculated. The significance level for all statistical analyses was set at $P < 0.05$ (2-tailed test). The Mann–Whitney U test was used to examine group differences in non-parametric variables. To examine the potential relationships between variables, we performed Spearman's rank correlations.

Results

Sample description

Demographic characteristics and clinical measures of 37 patients are summarized in Table 1. The mean age of the participants was 42.8 years ($SD=8.9$). Most participants were single (78.4%), unemployed (91.8%) and had an education level of senior high school ($M=12.7$, $SD=3.9$). The onset of illness and duration of illness were at the age of 25.5 ($SD=9.5$) and 17.3 years ($SD=7.7$), respectively. Only three of the participants were currently employed and worked as blue-collar workers. Description of the LNNB is shown in Table 2. The T score in memory scale is higher than 60 T scores. Demographic variables (age, education, sex and duration of illness) were not significantly associated with any clinical measures in this study (data not shown). Subdomains and total scores of SSTICS were not correlated with any LNNB subtests (data not shown).

Correlation of insight and subjective, objective cognitive functioning and internalized stigma

Awareness of illness was positively correlated with working memory ($r=0.39$), explicit memory ($r=0.47$), attention ($r=0.52$), executive function ($r=0.49$) and

Table 1 Demographic characteristics and clinical measures of participants ($n=37$)

	Mean \pm SD/n/%
Age (years)	42.8 \pm 8.9
Education (years)	12.7 \pm 3.9
Onset of illness	25.5 \pm 9.5
Illness of duration	17.3 \pm 7.7
Gender	
Male	16 (56.8%)
Female	21 (43.2%)
Occupation	
Currently unemployed	34 (91.8%)
Currently employed	3 (8.2%)
Marital status	
Single	29 (78.4%)
Married	3 (8.1%)
Widowed/divorced	5 (13.5%)
	Median/range
The Birchwood Insight Scale	7.0 (2–11)
Awareness of symptoms	2.0 (0–4)
Awareness of illness	2.0 (0–4)
Need for treatment	3.5 (0–4)
Internalized Stigma of Mental Illness scale	2.3 (1.5–3.6)
Alienation	2.3 (1–4)
Stereotype endorsement	2.0 (0.8–3.4)
Discrimination experience	2.4 (1.2–3.6)
Social withdrawal	2.3 (1–4)
Stigma resistance	2.2 (1.6–2.8)
Scale to Investigate Cognition in Schizophrenia	29 (8–57)
Working memory	3 (0–7)
Explicit memory	13 (0–26)
Attention	7 (0–19)
Executive function	4 (0–10)
Language	1 (0–4)
Praxia	0 (0–4)

total SSTICS ($r=0.52$) (Table 3). Awareness of symptoms and total insight were negatively associated with receptive speech ($r=-0.33$, $r=-0.35$) and arithmetic ($r=-0.46$, $r=-0.32$), respectively (LNNB subtest). Total insight was positively correlated with alienation ($r=0.36$); awareness of illness was positively correlated with alienation ($r=0.54$), stereotype endorsement ($r=0.41$), social withdrawal ($r=0.44$) and total ISMI ($r=0.52$). Need for treatment was negatively associated with stigma resistance ($r=-0.41$) (Table 3).

Table 2 Description of Luria-Nebraska neuropsychological battery of participants (n=37)

Variables	Raw scores		Tscore	
	Median	Range	Median	Range
C1 (Motor functions)	4.0	(0–21)	33.0	(30–52)
C2 (Rhythm)	5.0	(0–13)	47.0	(30–78)
C3 (Tactile functions)	4.0	(0–17)	41.0	(33–67)
C4 (Visual functions)	11.0	(0–18)	55.0	(30–73)
C5 (Receptive speech)	8.0	(0–20)	47.0	(31–71)
C6 (Expressive speech)	7.0	(1–28)	38.0	(30–68)
C7 (Writing)	2.0	(0–14)	43.0	(38–72)
C8 (Reading)	0.0	(0–8)	38.0	(38–55)
C9 (Arithmetic)	4.0	(0–22)	50.0	(40–97)
C10 (Memory)	13.0	(2–24)	62.0	(36–89)
C11 (Intellectual processes)	27.0	(8–63)	60.0	(37–105)

Correlation of internalized stigma and subjective and objective cognitive functioning

Total ISMI, alienation, stereotype endorsement, discrimination experience and social withdrawal were positively

correlated with most domains of SSTICS, but not with any LNNB subtest (Table 4).

The differences in subjective cognitive functioning and internalized stigma between the good insight group and poor insight group

The good insight group had higher scores in attention and total SSTICS than the poor insight group ($P<0.05$). The good insight group had higher scores in alienation, stereotype endorsement, social withdrawal and total ISMI than the poor insight group ($P<0.01$, $P<0.05$) (Table 5).

The differences in subjective cognitive functioning between the no internalized stigma group and mild to moderate internalized stigma group

The no internalized stigma group had lower scores in explicit memory, attention, language, praxia and total SSTICS than the mild to moderate internalized stigma group ($P<0.01$, $P<0.05$) (Table 6).

Table 3 Correlations of insight and SSTICS, LNNB and ISMI scale of participants (n=37)

Variables	Total insight	Awareness of symptoms	Awareness of illness	Need for treatment
Working memory	0.20	0.03	0.39**	0.06
Explicit memory	0.25	0.14	0.47**	0.10
Attention	0.22	0.02	0.52**	0.07
Executive function	0.19	0.03	0.49**	0.12
Language	0.14	0.05	0.22	0.03
Praxia	0.00	0.02	0.23	0.24
Total SSTICS	0.24	0.09	0.52**	-0.11
C1 (Motor functions)	0.16	-0.17	0.07	-0.11
C2 (Rhythm)	-0.08	-0.10	-0.06	0.06
C3 (Tactile functions)	-0.17	-0.10	0.08	-0.30
C4 (Visual functions)	-0.06	-0.09	0.10	0.05
C5 (Receptive speech)	-0.35*	-0.33*	-0.10	-0.08
C6 (Expressive speech)	-0.23	-0.24	-0.01	-0.08
C7 (Writing)	-0.29	-0.22	-0.01	-0.00
C8 (Reading)	-0.12	-0.23	-0.29	-0.04
C9 (Arithmetic)	-0.32*	-0.46**	0.08	-0.20
C10 (Memory)	0.01	0.02	0.12	0.16
C11 (Intellectual processes)	-0.28	-0.17	-0.01	-0.25
Alienation	0.36*	0.25	0.54**	-0.10
Stereotype endorsement	0.26	0.22	0.41**	-0.06
Discrimination experience	0.10	0.16	0.24	-0.22
Social withdrawal	0.29	0.26	0.44**	-0.11
Stigma resistance	-0.03	0.07	0.26	-0.41*
Total ISMI	0.31	0.26	0.52**	-0.16

Note: * $P<0.05$; ** $P<0.01$.

Abbreviations: SSTICS, Scale to Investigate Cognition in Schizophrenia; LNNB, Luria-Nebraska Neuropsychological Battery; ISMI, Internalized Stigma of Mental Illness.

Table 4 Correlations of ISMI scale and SSTICS, and LNNB of participants (n=37)

Variables	Total ISMI	Alienation	Stereotype endorsement	Discrimination experience	Social withdrawal	Stigma resistance
Working memory	0.55**	0.58 **	0.38*	0.46**	0.41*	0.24
Explicit memory	0.64**	0.69**	0.60**	0.45**	0.56**	0.25
Attention	0.68**	0.68**	0.53**	0.39*	0.74**	0.09
Executive function	0.49**	0.49**	0.44**	0.29	0.43**	0.04
Language	0.34*	0.40*	0.35*	0.12	0.30	0.10
Praxia	0.21	0.25	0.22	0.18	0.06	0.28
Total SSTICS	0.73**	0.76**	0.64**	0.48**	0.66**	0.22
C1 (Motor functions)	0.31	0.18	0.19	0.29	0.27	0.29
C2 (Rhythm)	0.05	0.01	0.17	0.20	-0.08	-0.15
C3 (Tactile functions)	0.12	0.03	0.03	0.02	0.22	-0.01
C4 (Visual functions)	0.19	0.08	0.26	0.23	0.19	0.13
C5 (Receptive speech)	-0.06	-0.14	0.10	-0.01	-0.13	0.13
C6 (Expressive speech)	0.08	-0.02	0.18	0.05	0.06	0.29
C7 (Writing)	-0.04	-0.17	-0.02	0.14	0.02	0.04
C8 (Reading)	0.09	-0.01	0.06	-0.03	0.15	-0.03
C9 (Arithmetic)	0.09	0.04	0.07	0.06	0.05	0.18
C10 (Memory)	0.21	0.18	0.32	0.10	0.13	0.05
C11 (Intellectual processes)	0.32	-0.09	0.17	0.02	-0.06	0.32

Note: * $P < 0.05$; ** $P < 0.01$.

Abbreviations: ISMI, Internalized Stigma of Mental Illness; SSTICS, Scale to Investigate Cognition in Schizophrenia; LNNB, Luria-Nebraska Neuropsychological Battery.

Discussion

The current study is among the few to explore the link between self-perception of mental illness, subjective cognitive functioning and objective LNNB in people with schizophrenia. When used to explore the relationship between self-perception of illness, subjective and objective cognition measures, the Spearman's rank correlation analysis found that the total insight and awareness of symptoms were negatively associated with receptive speech and arithmetic, but not with other LNNB subtest. A majority of our results were in agreement with previous findings indicating that insight lacked an association with objective cognitive measures, including attention, working memory, visual/verbal memory, executive function, speed of processing, error-processing, digit span and trail-making.¹⁰⁻¹³ In this study, total insight and awareness of symptoms were negatively associated with receptive speech and arithmetic, indicating that schizophrenia patients with high awareness of symptoms and total insight had better performances in receptive speech and arithmetic. Some researchers proposed that good neurocognitive ability leads to good insight, although it is

not a sufficient condition.¹⁴ They argued that some aspects of insight, particularly in terms of awareness of symptoms, seem to require a certain level of neurocognitive functioning (neurocognitive model). The awareness of symptoms and total insight were significantly associated with receptive speech and arithmetic (LNNB subtest) of this study. Receptive speech required the processing of syntactic structure or/and susceptibility to demands placed on temporal auditory processing (sentential clauses and relative sentences). Arithmetic needed basic arithmetic skills, spatial function and ability to comprehend number structure and relative numerical values. Other studies reported that awareness of having a mental disorder, the need to take medication and the consequences of mental illness may result from metacognitive abilities or metalizing (the capacity to attribute mental states of one's self and others).^{7,40,41}

Self-stigma was not correlated with any subtests of LNNB. The results were not consistent with previous studies.¹⁸ Other factors may influence the inconsistency, including course and phase of illness and the presence of long-term patients. When a patient's condition improves or

Table 5 Description of SSTICS and ISMI scale scores of good insight group and poor insight group

	Good insight group n=27	Poor insight group n=10	P-value
	Median/ range	Median/ range	
Working memory	3.5 (0–7)	2.5 (1–6)	0.228
Explicit memory	13.6 (0–26)	9.3 (2–22)	0.064
Attention	7.5 (0–19)	5.4 (3–9)	0.025*
Executive function	4.7 (0–10)	3.2 (1–7)	0.079
Language	1.6 (0–4)	1.0 (0–3)	0.104
Praxia	0.5 (0–4)	0.5 (0–2)	1.00
Total SSTICS	31 (8–57)	21.5 (12–40)	0.035*
Alienation	2.4 (1–4)	2.0 (1.5–2.6)	0.009**
Stereotype endorsement	2.0 (1.5–3.4)	1.7 (0.8–2.4)	0.010*
Discrimination experience	2.4 (1.2–3.6)	2.3 (1.8–3.0)	0.743
Social withdrawal	2.5 (1.5–4.0)	2.1 (1–2.8)	0.013*
Stigma resistance	2.2 (1.6–2.8)	2.3 (1.6–2.6)	0.726
Total ISMI	2.3 (1.5–3.6)	2.12 (1.5–2.5)	0.014*

Note: *P<0.05; **P<0.01.

Abbreviations: SSTICS, Scale to Investigate Cognition in Schizophrenia; ISMI, Internalized Stigma of Mental Illness.

Table 6 Description of SSTICS scores of no internalized stigma group and mild to moderate internalized stigma group

	No internalized stigma n=6	Mild to moderate internalized stigma n=31	P-value
	Median/ range	Median/ range	
Working memory	2.0 (0–5)	3.4 (1–7)	0.053
Explicit memory	4.5 (0–13)	13.4 (3–26)	0.007**
Attention	3.6 (0–8)	6.9 (1–19)	0.024*
Executive function	3.0 (0–8)	4.4 (1–10)	0.127
Language	0.4 (0–3)	1.5 (0–4)	0.018*
Praxia	0.0 (0–0)	0.6 (0–4)	0.027*
Total SSTICS	12.5 (8–28)	31.0 (8–57)	0.004**

Notes: *P<0.05; **P<0.01.

Abbreviation: SSTICS, Scale to Investigate Cognition in Schizophrenia.

gets worse, insight can change rapidly. Since stigma is typically experienced over longer periods of time, longitudinal studies are recommended to examine levels of insight and stigma over time and gain a more sensitive evaluation of the relationship of these variables.

The awareness of illness and total insight were positively associated with most domains of SSTICS (except for language and praxia). The good insight group had higher scores in attention and total SSTICS than the poor insight group. Total ISMI, alienation, stereotype endorsement, discrimination experience and social withdrawal (domains of ISMI) were positively correlated with most domains of SSTICS. The mild to moderate internalized stigma group had higher scores in explicit memory, attention, language, praxia and total SSTICS than the no internalized stigma group. Results indicated that schizophrenia patients with good insight or higher self-stigma were more likely to have reduced subjective cognitive functioning. Our results also showed that subtests or total scores of SSTICS were not correlated with LNNB. In reality, the impaired subjective cognitive complaints (SSTICS) may not accurately reflect the impairments in objective cognitive abilities (LNNB) of this study. Other studies examining the correlation between subjective scales and objective cognition in schizophrenia had inconclusive results.^{42–46} The inconsistent findings may include different subjective and objective cognition measures, phase of illness, and the heterogeneity of participants. The argument of ecological validity of objective cognitive tests could be considered because the laboratory settings and tests are very different from the everyday environments that participants experience.⁴⁷ Thus, subjective cognitive complaints should be taken into account to evaluate patient wellbeing and rehabilitation, but not as a substitute for objective cognitive functioning. The responses of self-reported subjective cognition in medical populations may be biased by patient's mood and can be affected by their choice of strategic judgments to influence their perception of functioning that happened to be recallable at the time of assessment.⁴⁸ Future studies are needed to examine if there is a mediating effect between awareness of illness (domain of insight) and ISMI and SSTICS.

Total insight was positively correlated with alienation. Awareness of illness was positively associated with alienation, stereotype endorsement, social withdrawal and total ISMI. Need for treatment was negatively associated with stigma resistance. The good insight group had higher scores in alienation, stereotype endorsement, social withdrawal and total ISMI than the poor insight group. Schizophrenia patients with a better insight of illness, measured as clinical insight in the present study, were more likely to have higher internalized stigma. This is consistent with the previous model of insight and self-stigma.³¹ The results by Lu and Wang³⁰ showed that

lack of insight was not correlated with self-stigma in people with schizophrenia (most were inpatients). Another study found that psychiatric inpatients and outpatients (including bipolar affective disorder, substance dependence, schizophrenia, and obsessive-compulsive disorder) with insight had a high level of self-stigma compared to those without insight.³¹ The inconclusive results may be due to the lack of recruiting stable schizophrenia outpatients, and the inconsistent use of assessments to test insight. Clinical insight could be rapidly worsened when patients have acute symptoms and can also fluctuate during the exacerbation of the illness.⁴⁹ Another type of insight, cognitive insight, has been examined to evaluate psychotic patients' capacity for distancing themselves and reflects their psychotic experiences.^{50,51} Future studies are needed to include cognitive insight to investigate the relationship of these variables in this study.

People with higher insight of mental illness were more likely to have treatment adherence,¹ but may develop internalized stigma toward themselves. It has also been suggested that patients with high insight or/accompanied by stigmatizing beliefs were at high risk of experiencing social isolation, low self-esteem, lower level of hope, depressed mood and low quality of life.^{35,52}

These complementary results suggest that alleviating self-stigma experiences should provide a major benefit for treatment and rehabilitation among people with schizophrenia. Stigma reduction programs have been found to be an effective way of psychosocial intervention for patients with schizophrenia.^{53,54}

Awareness of illness (domain of insight) was not correlated with language, praxia (domains of SSTICS). Some domains and all domains of ISMI were not correlated with language, praxia, respectively. The domain of language asked respondents if they had difficulty finding their words, forming sentences, pronouncing words, understanding the meaning of words, or naming objects. The domain of praxia asked respondents if they had difficulty getting dressed or eating. These two cognitive domains of SSTICS assessed basic cognitive skills in participants, in which there might be a floor effect related with other measures.

Limitations

Several potential limitations should be considered when interpreting the current study results. First, the cross-sectional nature of our study did not allow us to test the causal effect of these variables. Longitudinal studies and a larger sample size of participants are needed to investigate the relationship of these factors, including the

differences between insight (good insight group and poor insight group), self-stigma (no internalized stigma group and mild to moderate internalized stigma group) and subjective cognitive functioning and differences between insight (good insight group and poor insight group) and internalized stigma. Furthermore, the BIS was rated on self-report measures; thus, further research is needed to include objective measures of insight. When interpreting the results of this study, the effect size should be considered. The effect size is the magnitude of the difference between groups. The effect size for two group comparisons and Spearman correlation ranged from 2.5 to 3.2 (small effect size) and from 0.32 to 0.76 (small effect size to medium effect size), respectively. Statistical power depends on the sample size and effect size. If the effect size of the intervention is large, it is possible to detect such an effect in smaller sample numbers, whereas a smaller effect size would require larger sample sizes.

Our samples tended to include outpatients with relatively stable and chronic, less severe symptoms; therefore, the results may not be generalized and representative of the entire population of individuals with schizophrenia.

Conclusion

We found that awareness of illness and self-stigma were associated with most domains of subjective cognitive functioning. Only awareness of symptoms and total insight were associated with receptive speech and arithmetic (LNNB subtest), and self-stigma was not correlated with any subtest of LNNB. Schizophrenia patients with good insight or higher self-stigma were more likely to report reduced subjective cognition and when they have good insight, they also have higher scores of self-stigma toward themselves. Future studies are necessary to examine the relationship between self-perception of illness, subjective cognitive functioning and LNNB battery on a diverse, larger group of patients.

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Disclosure

The authors report no conflicts of interest in this work.

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