Journal of Young Pharmacists, 2026; 18(2):386-391.
https://www.jyoungpharm.org

Original Article

Development and Validation of the MBQ-20: A Metacognitive Belief Questionnaire for Delusions in Schizophrenia-A Pilot Study

Varadharajan Sivaraman[1], Natarajan Shanmugasundaram[2,*], Kannan Lakshminarayanan[3], Thamilselvan Palanichamy[4], Harshitha Muthu Sundaram[1], Karthik Sankarbabu[5]

[1]Department of Clinical Psychology, Sri Ramachandra Faculty of Behavioral and Social Sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, INDIA.
[2]Department of Psychiatry, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, INDIA.
[3]Department of Community Medicine, Sri Ramachandra Institute of Higher Education and Research, Chennai, Tamil Nadu, INDIA.
[4]Department of Psychology (Aided), PSG College of Arts and Science, Coimbatore, Tamil Nadu, INDIA.
[5]Department of Clinical Pharmacy, Apollo Speciality Hospital, Chennai, Tamil Nadu, INDIA.

ABSTRACT

Background: Delusions in schizophrenia are characterized by rigidity and resistance to change; processes potentially linked to metacognitive deficits. However, there is a lack of specific tools to assess metacognitive beliefs related to delusions. Hence, this pilot study details the development and initial psychometric validation of the Metacognitive Belief Questionnaire for Delusions in Schizophrenia (MBQ-20). **Materials and Methods:** Employing a cross-sectional design, 64 outpatients with schizophrenia from a tertiary care hospital in South India were assessed using the MBQ-20 and the Positive and Negative Syndrome Scale (PANSS). Internal consistency was evaluated with Cronbach's alpha, and validity through Pearson's correlations and group comparisons (ANOVA). **Results:** The initial results from the MBQ-20 suggest strong reliability (α=0.92) and validity, as indicated by significant negative correlations between scores on the MBQ-20 and PANSS delusion severity (ranging from -0.78 - -0.87, $p<0.001$). Additionally, significant differences in MBQ-20 scores were found between mild, moderate, and severe groups of delusions (F (2, 61)=105.6, $p<0.001$, $\eta^2=0.78$), and item analysis indicated adequate levels of item discrimination. **Conclusion:** Overall, results indicate that the MBQ-20 could be a reliable and valid measure of metacognitive beliefs related to delusions amongst individuals with schizophrenia; however, this measure will need to be validated on a larger scale.

Keywords: Assessment, Delusions, Metacognition, Psychometric validation, Questionnaire development, Schizophrenia.

Correspondence:
Dr. Natarajan Shanmugasundaram
Department of Psychiatry, Sri Ramachandra Institute of Higher Education and Research, No-01 Sri Ramachandra Nagar, Porur-600116, Chennai, Tamil Nadu, INDIA.
Email: natarajans@sriramachandra.edu.in

Received: 23-01-2026;
Revised: 06-03-2026;
Accepted: 15-05-2026.

INTRODUCTION

People who suffer from schizophrenia spectrum disorders can experience great amounts of distress, have a significant loss of their ability to think, perceive, feel, behave, and suffer from delusions and misbeliefs which are at the core of these disorders and which can create overwhelming levels of conviction while providing no evidence or rational basis for their occurrence (American Psychiatric Association, 2013; National Institute of Mental Health, 2018). When an individual holds onto belief systems like this, it creates an instant decline in functional ability, hinders social interaction and negatively impacts their overall quality of life (Garety *et al*., 2007). To create better therapeutic methods to help alleviate these symptoms and better themselves, it is critical to fully understand how individuals adopt and maintain their delusional beliefs.

Psychosis has always been known to be of cognitive origin, including the cognitive bias known as "jumping to conclusions" (Freeman *et al*., 2002; Garety and Freeman, 1999). However, these cognitive theories did not provide a clear understanding of the subjective phenomenon of delusions being held onto with a very high level of resistance to change. A newer way of looking at cognition is metacognition, which is defined as "thinking about thinking" (Wells, 2000).

Metacognition involves monitoring and controlling mental states-thoughts, beliefs, feelings, and intentions—as well as reflecting on them (Flavell 1979; Wells 2000). In schizophrenia, metacognition implies the ability to create complex mental

DOI: 10.5530/jyp.20260085

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representations about oneself and others, affecting functioning and understanding of experiences.

Metacognition is garnering attention due to its potential to explain the rigidity characteristic of delusional beliefs. In schizophrenia, patients' ability to accurately identify and reflect upon their mental states, understand the mental states of others, and change beliefs when facing disconfirming evidence is reduced (Brüne 2005; Lysaker *et al*., 2011). Such deficits pave the way for the development of belief systems, as the person finds it hard to assess their thoughts or take in opposing evidence.

Despite growing acknowledgement of metacognition's significance, there is no metacognitive assessment tool designed specifically for delusions. Existing methods assess metacognition broadly. The need for a psychometrically valid metacognitive measure is essential with regards to delusional thoughts and experiences. The present pilot project studies the creation of a new self-report measure called the MBQ-20, which captures four metacognitive domains: Self-Reflectivity, Metacognitive Monitoring, Decentration/Perspective-Taking, and Temporal Reflection/Belief Revision. This study aims to describe initial development of the MBQ-20 and its psychometric characteristics.

MATERIALS AND METHODS

Study Design

The instrument development and validation utilized a cross-sectional research design. The findings of this pilot study involving persons with the diagnosis along the schizophrenia spectrum will be presented in this report.

Participants

A total of (64) outpatients with a diagnosed case of Schizophrenia agreed to participate in this study. Participants were recruited from the Department of Psychiatry in a tertiary hospital in South India, and were recruited from September 2023 to February 2024 (inclusive). Participants were included in the study if they: (1) had been diagnosed as having either Schizophrenia or Schizoaffective Disorder according to the ICD-I0 criteria; (2) were between I8 and 50 years old on the day of assessment; (3) had attained a higher secondary level of education; and (4) scored greater than or equal to 3 on the Positive and Negative Syndrome Scale (PANSS) items P1 (Delusions) and P6 (Suspiciousness/Persecution). Participants were excluded based on the following criteria: (1) had a neurological disorder; (2) had an intellectual disability; (3) were currently abusing drugs (with the exception of nicotine); and (4) had undergone ECT (electroconvulsive therapy) within the past 12 months. Of the total sample, there were (47) male participants (73.4%) and (17) female participants (26.6%) with a mean age of (35.8) years (SD=9.4) and a mean duration of treatment of (8.8) years (SD=4.9).

Measures

Socio-demographic Data Sheet

A patient demographics sheet provided standardized information about participants' age, sex, education level, profession, marital status, and previous treatment experiences. The Positive and Negative Syndrome Scale PANSS (Kay *et al*., 1987) consisted of 30 items rated by the investigator using a clinician-based scoring system. The Delusion Composite Score (DCS) was computed as the sum of the P1 and P6 items (possible range: 2 to 14). Based on the DCS scores, participants were classified into three groups based on the severity of delusions: mild (DCS 2 to 8), moderate (DCS 9 to 11), or severe (DCS 12 to 14).

Metacognitive beliefs about delusions in schizophrenia were measured using the new Metacognitive Belief Questionnaire for Delusions in Schizophrenia (MBQ-20), which is 20 self-report items rated on a 4-point Likert scale from 1 (Strongly Disagree) to 4 (Strongly Agree). Higher total scores are indicative of more adaptive metacognitive functioning. The MBQ-20 includes 4 five-item subscales: Self-Reflectivity (SR), Metacognitive Monitoring (MM), Decentration and Perspective Taking (DPT), and Temporal Reflection and Belief Revision (TR).

Procedure

The study protocol was reviewed and approved by the Institutional Ethics Committee. Written informed consent was obtained. A trained clinical psychologist administered the PANSS to assess symptom severity. Subsequently, participants completed the MBQ-20 in a private, quiet area. The psychologist read all items aloud while participants followed along, offering non-directive clarification. The assessment session lasted approximately 30-40 min.

Data Analysis

Data were analyzed using SPSS version 28.0. Descriptive statistics were calculated. Internal consistency was evaluated using Cronbach's alpha, with $\alpha \geq 0.70$ considered acceptable (Nunnally and Bernstein, 1994). Convergent validity was assessed using Pearson's correlations between MBQ-20 scores and PANSS Delusion Composite Score. Group validity was tested using one-way ANOVA with Tukey's HSD *post-hoc* tests. Effect sizes were calculated using eta-squared (η^2) (Cohen, 1988). Item analysis included corrected item-total correlations (≥ 0.30 acceptable) and assessment of floor and ceiling effects (>15% at extremes) (Streiner *et al*., 2015; McHorney and Tarlov, 1995).

RESULTS

Demographic and Clinical Characteristics

Table 1 summarizes demographic and clinical characteristics. The overall sample (*N*=64) was predominantly male (73.4%), with mean age 35.8 years (SD=9.4). Based on PANSS Delusion

Composite Scores, 22 patients (34.4%) were in the mild delusion group, 24 (37.5%) in moderate, and 18 (28.1%) in severe. No significant differences were found across groups for age, gender, education, or treatment duration (all $p>0.05$).

Descriptive Statistics and Internal Consistency

Table 2 outlines internal consistency and descriptive statistics. The MBQ-20 total score had very strong internal consistency (α=0.92). All subscales displayed reliability from good to excellent; SR (α=0.81), MM (α=0.84), DPT (α=0.87), and TR (α=0.83). Observed score ranges suggest that there are no floor or ceiling effects.

Convergent Validity

Table 3 presents correlations between MBQ-20 scores and PANSS Delusion Composite. There is a very strong negative correlation of MBQ-20 total score and delusion severity ($r=-0.87$, $p< 0.001$) and all subscales displayed significant negative correlations; SR ($r=-0.80$), MM ($r=-0.85$), DPT ($r=-0.83$), and TR ($r=-0.78$) (all $p<0.001$).

Validity Outgroup

Group validity was established in Table 4 with analytical results from the one-way analysis of variance. The one-way analysis revealed there were significant differences in MBQ-20 total scores by delusion severity ($F(2, 61)=105.6$, $p<0.001$, $\eta^2=0.78$), confirming through Tukey's HSD that all groups ($p<0.001$) are significantly different from each other. Participants in the mild delusion group had the highest mean total score (mean=53.2, SD=6.1), followed by the moderate (mean=39.8, SD=3.5) and severe (mean=29.1, SD=3.9) delusion groups. For the three subscales, significant differences were also found ($p<0.001$).

Item Analysis

It provides an analysis of item characteristics. Corrected item-total correlations were between 0.64 and 0.74, all larger than the established 0.30 cut-off. The item means on 13 MBQ items ranged from 1.95 to 2.45 and item difficulty indices ranged from 0.49 to 0.61. No items showed a ceiling or floor effect.

DISCUSSION

This research project presents an important first step in constructing the MBQ-20, a self-report instrument designed to measure some aspects of metacognition related to persistent delusion. While the data obtained are preliminary in nature, they provide initial evidence for the psychometric properties of the instrument related to internal consistency, convergent validity, and construct validity in a clinical population (people diagnosed with schizophrenia-spectrum disorders).

The four metacognitive domains of the MBQ-20 (i.e., self-reflectivity; metacognitive monitoring; decentration and perspective-taking; temporal reflection and belief revision) are based on current theoretical frameworks regarding the nature of metacognition when an individual has a psychotic disorder, e.g., (Flavell, 1979; Wells, 2000; Lysaker and Klion, 2017). Each of these four domains represents important ways in which individuals deal with themselves and others regarding their way of thinking. These four domains also correspond to the fixedness of belief associated with persistent delusions (Brüne, 2005; Lysaker *et al*., 2011).

The results of this pilot study suggest that the MBQ-20 demonstrates excellent internal consistency (α=0.92) and good to excellent reliability coefficients for each subscale of the instrument (α=0.81 to 0.87), thus providing some initial evidence

Table 1: Summarizes demographic and clinical characteristics.

Characteristics	Total Sample	Mild Delusions	Moderate Delusions	Severe Delusions	*p*-value
	(*N*=64)	(*n*=22)	(*n*=24)	(*n*=18)	
Age in years (M, SD)	35.8 (9.4)	36.2 (8.9)	35.5 (10.1)	35.7 (9.8)	0.98
Gender, n (%)					0.87
Male	47 (73.4)	17 (77.3)	17 (70.8)	13 (72.2)	
Female	17 (26.6)	5 (22.7)	7 (29.2)	5 (27.8)	
Education, years (M, SD)	13.2 (2.8)	13.5 (2.6)	13.1 (3.0)	12.9 (2.9)	0.79
Treatment Duration, in years (M, SD)	8.8 (4.9)	8.5 (4.7)	9.0 (5.2)	8.9 (5.0)	0.94
PANSS Delusion Composite (P1+P6 items) (M, SD)	9.4 (2.1)	6.8 (1.2)	9.9 (0.8)	12.7 (0.8)	<0.001

Note: PANSS = Positive and Negative Syndrome Scale. The *p*-values are based on ANOVA for the continuous variables and the Chi-square for the categorical variables.

Table 2: Descriptive Statistics and Internal Consistency of the MBQ-20 (*N*=64).

Scale	Number of Items	Mean	SD	Possible Range	Observed Range	Cronbach's α	Average Item-Total Correlation
MBQ-20 Total score	20	41.8	11.5	20-80	22-73	0.92	0.69
Self-Reflectivity	5	10.5	2.8	5-20	5-16	0.81	0.56
Metacognitive Monitoring	5	10.3	3.1	5-20	5-18	0.84	0.61
Decentration & Perspective Taking	5	11.1	3.4	5-20	5-20	0.87	0.66
Temporal Reflection	5	9.9	3.2	5-20	5-19	0.83	0.58

Table 3: Correlations between MBQ-20 scores and PANSS Delusion Composite (*N*=64).

MBQ-20 Scale	PANSS Delusion Composite
Total Score	-0.87*
Self-Reflectivity	-0.80*
Metacognitive Monitoring	-0.85*
Decentration and Perspective-Taking	-0.83*
Temporal Reflection	-0.78*

*p<.001.

of the quality of the instrument (Nunnally and Bernstein, 1994). Evidence of the quality of individual items on the MBQ-20 was established via correct item-total correlation coefficients, which ranged from 0.30 to 1.00 (Streiner, 2015), with no floor or ceiling effects identified within the instrument as well as appropriate item difficulty having been observed via item calibration to ensure that the MBQ-20 was an appropriate tool for assessing metacognition among individuals with schizophrenia-spectrum disorders (McHorney and Tarlov, 1995).

The MBQ-20 and PANSS measures show high levels of convergent validity through the high negative correlations between them, especially between their total scores, which produced a correlation of −0.87, supporting the prediction that individuals with a high level of adaptive metacognitive beliefs will show lower levels of delusion severity (Beck *et al.*, 2004; Moritz *et al.*, 2014). The finding supports previous studies that link metacognitive impairment with the level and persistence of psychotic symptoms (Lysaker *et al.*, 2007; Lysaker *et al.*, 2010).

The demonstration of between-groups validity is significant, in that the MBQ-20 was found to differentiate the three levels of delusion severity (i.e., mild, moderate, and severe) with an exceptionally large effect size (η^2=0.78) (Cohen, 1988). The overall decreasing pattern (i.e., the mild group always had the highest level of metacognitive functioning) demonstrates strong evidence of discriminant validity and supports the theory that metacognitive deficits exist on a continuum that is directly related to the level of clinical severity of the condition (Lysaker *et al.*, 2005; Barbato *et al.*, 2015).

Also consistent with the discriminant validity of the MBQ-20 is the evaluation of specific metacognitive domains by the MBQ-20; this provides meaningful information about the underlying processes associated with the experience of delusions (Semerari *et al.*, 2003). Self-Reflectivity deficits contribute to a lack of insight into one's own thinking processes (Lysaker and Klion, 2017). Deficits in Metacognitive Monitoring establish the conditions for developing erroneous beliefs by limiting the ability to check the veracity of new ideas (Beck *et al.*, 2004). Finally, difficulties in Decentration and Perspective-Taking negatively influence the social aspect of delusions, particularly for delusions involving persecutions or referentiality (Brüne, 2005; Corcoran *et al.*, 2006). The absence of Temporal Reflection and Belief Revision skills is a major reason for the rigid character of delusions (Garety *et al.*, 2007; Moritz *et al.*, 2014).

LIMITATIONS AND FUTURE DIRECTIONS

There were some limitations with the pilot study. The sample size of 64 participants was sufficient for validating the pilot study, but would be considered a small sample size for the full psychometric evaluation (including confirmatory factor analysis) (Streiner *et al.*, 2015). Because the study design was cross-sectional rather than longitudinal, conclusions could not be drawn regarding cause and effect or the consistency of scores over time. Since the sample was limited to a single site and had a homogenous culture, the results cannot be generalized to other locations

Table 4: Group validity: MBQ-20 scores by Delusion Severity.

MBQ-20 Scale Mild Delusions	Moderate Delusions	Severe Delusions	F (2,61)	*p*	η^2
(*n*=22) M (SD)	(*n*=24) M (SD)	(*n*=18) M (SD)			
Total Score 53.2 (6.1) [a]	39.8 (3.5) [b]	29.1 (3.9) [c]	105.6	<0.001	0.78
Self-Reflectivity 13.2 (1.8) [a]	10.0 (1.2) [b]	7.2 (1.5) [c]	78.3	<0.001	0.72
Metacognitive 13.5 (2.0) [a]	9.8 (1.4) [b]	6.5 (1.7) [c]	92.1	<0.001	0.75
Monitoring Decentration and 14.5 (2.2) [a]	10.5 (1.5) [b]	7.2 (1.8) [c]	88.5	<0.001	0.74
Perspective-Taking Temporal 12.0 (1.9) [a]	9.5 (1.4) [b]	7.2 (1.6) [c]	45.2	<0.001	0.60
Reflection					

Note: Different superscript letters within rows indicate significant difference between the group based on the Tukey's HSD test ($p<0.001$).

or cultures (Agerbo *et al*., 2004). As well, because the data collected were self-reported, the results could be biased by the participants' responses. Future research could be improved by obtaining a larger, more diverse sample size; using a longitudinal design; assessing the cross-cultural validity of the tool (Aker, 2003); and comparing the results of this tool with the results of clinician-rated metacognition tools (Semerari *et al*., 2003). Additionally, given the domain-wise evaluation of MBQ-20, it can be used to integrate into clinical practice for tailored intervention planning. By identification of specific metacognitive deficits across domains such as Self-reflectivity, metacognitive monitoring, decentration and temporal reflection, the MBQ-20 can help clinicians tailor metacognitive interventions suited to the patient's unique cognitive vulnerabilities.

CONCLUSION

This first trial of the MBQ-20 was a success and included evaluating its reliability and validity. The data showed MBQ-20 had very good internal reliability, matched well with existing measures of severity and was able to reliably distinguish between groups based on degree of severity of delusions. The findings affirm that the MBQ-20 can be considered a reliable and valid tool for self-report assessment of metacognitive beliefs in relation to delusions in schizophrenia spectrum disorders (Lysaker *et al*., 2005; Lysaker *et al*., 2011). Further validation work in larger and more diverse samples is warranted to confirm its factor structure and test-retest reliability (Hu and Bentler, 1999).

ACKNOWLEDGEMENT

The authors thank the study participants for their time and cooperation. The authors also acknowledge the staff of the Department of Psychiatry for their support in participant recruitment. No external funding was received for this work.

ABBREVIATIONS

APA: American Psychiatric Association; **ANOVA:** Analysis of Variance; **DCS:** Delusion Composite Score; **DPT:** Decentration and Perspective-Taking; **ECT:** Electroconvulsive Therapy; **ICD-10:** International Classification of Diseases, 10th Revision; **MBQ-20:** Metacognitive Belief Questionnaire-20; **MM:** Metacognitive Monitoring; **PANSS:** Positive and Negative Syndrome Scale; **SD:** Standard Deviation; **SPSS:** Statistical Package for the Social Sciences; **SR:** Self-Reflectivity; **TR:** Temporal Reflection and Belief Revision.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Cite this article: Sivaraman V, Shanmugasundaram N, Lakshminarayanan K, Palanichamy T, Sundaram HM, Sankarbabu K. Development and Validation of the MBQ-20: A Metacognitive Belief Questionnaire for Delusions in Schizophrenia-A Pilot Study. J Young Pharm. 2026;18(2):386-91.