Schizophrenia Research: Cognition 19 (2020) 100140

Contents lists available at ScienceDirect

Schizophrenia Research: Cognition

journal homepage: www.elsevier.com/locate/scog

Metacognition moderates the relationship between self-reported and clinician-rated motivation in schizophrenia

Lauren Luther[a,b,*], Kelsey A. Bonfils[c,d], Melanie W. Fischer[a], Annalee V. Johnson-Kwochka[a], Michelle P. Salyers[a]

[a] Indiana University-Purdue University Indianapolis, Department of Psychology, 402 N. Blackford St., LD 124, Indianapolis, IN 46202, United States of America
[b] University of Illinois at Chicago, Department of Psychiatry, 1747 West Roosevelt Road, 279, Chicago, IL 60608, United States of America
[c] VISN 4 Mental Illness Research, Education, & Clinical Center (MIRECC), VA Pittsburgh Healthcare System, 4100 Allequippa St., Pittsburgh, PA 15219, United States of America
[d] University of Pittsburgh, Department of Psychiatry, 3811 O'Hara Street, Pittsburgh, PA 15213, United States of America

ARTICLE INFO

Keywords:
Motivation
Measurement
Metacognition
Moderation
Schizophrenia

ABSTRACT

Introduction: Prior work has found varied relationships between self-reported and clinician-rated motivation measures in schizophrenia, suggesting that moderators might impact the strength of this relationship. This current study sought to identify whether metacognition – the ability to form complex representations about oneself, others, and the world – moderates the relationship between self-reported and clinician-rated motivation measures. We also explored whether clinical insight and neurocognition moderated this relationship.
Methods: Fifty-six participants with a schizophrenia-spectrum disorder completed the Motivation and Pleasure Self-Report Scale and the clinician-rated motivation index from the Heinrichs-Carpenter Quality of Life Scale.
Results: Metacognition significantly moderated the relationship; self-reported and clinician-rated motivation were positively and significantly correlated only when metacognition was relatively high. Neither clinical insight nor neurocognition moderated the relationship.
Discussion: Metacognition appears to be a key variable impacting the strength of the relationship between self-reported and clinician-rated motivation measures and may help to partly explain the varied relationships observed in prior work. Using a metacognitive framework to guide assessment interviews and targeting metacognition in psychosocial treatments may help to improve the synchrony between self-perceptions and clinician ratings of motivation.

1. Introduction

Motivation–an internal state that initiates and guides goal-directed behavior (Kleinginna and Kleinginna, 1981)–is often impaired among people with schizophrenia (Cooper et al., 2015; Faerden et al., 2009). Although these reductions have long been observed in schizophrenia (Bleuler, 1911/1950; Kraepelin et al., 1913/1919), motivation has only recently become a major focus in schizophrenia research. This increased interest is partly due to the key role that motivation plays in social and occupational functioning and quality of life (Evensen et al., 2012; Najas-Garcia et al., 2018; Saperstein et al., 2011).

The functional importance of motivation has led to an increased focus on the development and validation of measures to assess motivation in schizophrenia. Among the most commonly used motivation measures are clinician-rated and self-reported measures. For example, the clinician-rated motivation index from the Heinrichs-Carpenter Quality of Life Scale (QLS; Heinrichs et al., 1984), which was originally put forth by Nakagami et al. (2008), has been central to schizophrenia motivation research. The index assesses participants' sense of purpose, curiosity, and degree of motivation. Others have used negative symptom motivation items or subscales from clinician-rated measures like the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) or the Clinical Assessment Interview for Negative Symptoms (CAINS; Kring et al., 2013). More recently, several self-report motivation measures have been created, including the Motivation and Pleasure Scale-Self Report (MAP-SR; Llerena et al., 2013), which contains items that assess participants' motivation and effort to engage in social, school, work, hobbies, and recreational activities.

Notably, existing work suggests that the convergent validity or strength of the relationship between self-reported and clinician-rated

* Corresponding author at: IUPUI School of Science, Department of Psychology, 402 N. Blackford St., LD 124, Indianapolis, IN 46202, United States of America.
E-mail address: lutherl@iupui.edu (L. Luther).

https://doi.org/10.1016/j.scog.2019.100140
Received 28 December 2018; Received in revised form 19 March 2019; Accepted 25 March 2019
Available online 17 April 2019

motivation measures is variable (Engel and Lincoln, 2017; Luther et al., 2018). For example, Richter et al. (2019) found small, non-significant relationships between the MAP-SR motivation items and the CAINS motivation and pleasure items and PANSS negative symptom subscale. On the other hand, Jang et al. (2016) found medium, significant correlations between the MAP-SR motivation items and the PANSS amotivation subscale and PANSS negative symptom subscale (Luther et al., 2018). Further, a recent meta-analysis identified 33 studies that examined the relationship between self-reported and clinician-rated motivation measures, finding that study-level correlations ranged from −0.11 to 0.75 and that there was a medium to high amount of heterogeneity among the study-level effect sizes (Luther et al., 2018).

Given these mixed associations, it may be that participant or sample characteristics influence the strength of (i.e., moderate) the association between self-reported and clinician-rated motivation measures. One potential factor that may impact this association is metacognition, the capacity to identify and then integrate mental experiences such as thoughts and emotions into complex representations of oneself and others (Lysaker et al., 2015). Metacognition may be a prime potential moderator for several reasons. Without awareness of internal states, it may be difficult to identify and report one's motivation level, related intentions, and emotions (e.g., pleasure). It may also be challenging to identify the frequency of a motivational state over the past week or level of interest or desire for an activity, as is often required by self-report motivation measures. Further, without an integrated and nuanced representation of oneself, it may be difficult to reflect on times when one felt motivated generally or was motivated for a specific task or domain (e.g., school), especially without the help of guided interviewer questions. Thus, people with higher levels of metacognition may be better able to identify and report motivational states, particularly on self-report measures. In turn, greater metacognitive capacities may make it easier for an interviewer and participant to develop greater shared agreement and understanding of the participant's motivation, leading to improved concordance between self-reported and clinician-rated measures. Indeed, this aligns with a theoretical model put forth by Hasson-Ohayon et al. (2017), which suggests that a metacognitive framework or therapeutic approach may enhance shared client-clinician agreement and help to align the client's and clinician's narratives of symptoms such as reduced motivation. Taken together, greater metacognitive capacity may lead to greater agreement between self-reported and clinician-rated motivation, such that those with higher metacognition have a stronger association between self-reported and clinician-rated measures than those with relatively lower metacognition.

Although no one has directly tested whether metacognition moderates the relationship between self-reported and clinician-rated motivation, several related lines of work provide support for this hypothesis. First, within schizophrenia, metacognition is often impaired (Hasson-Ohayon et al., 2015; Lysaker et al., 2014b), and these impairments have been linked to reduced clinical insight and social cognition (Hamm et al., 2012; Lysaker et al., 2011). Second, metacognition plays a role in both self-reported (Tas et al., 2012) and clinician-rated motivation measures (Luther et al., 2016; Vohs and Lysaker, 2014), such that those with higher metacognition report greater motivation. Metacognition also moderates the association between self-reported negative appraisals about oneself and the future and clinician-rated social functioning, so that lower negative appraisals were related to greater social functioning only when participants had higher metacognition (James et al., 2016). Similarly, reduced metacognition and lower clinical insight have been linked to greater disagreement between self-reported and clinician-rated measures of work quality, quality of life, and empathy (Hasson-Ohayon et al., 2011; Luedtke et al., 2012; Lysaker et al., 2013). Thus, with lower metacognition, there may be more discordance or a weaker association between self-reported and clinician-rated measures. Identifying whether metacognition also helps to explain the variability often observed between self-reported and clinician-rated motivation measures could clarify whether and how metacognition may impact these relationships. Similarly, it also could help identify when motivation measures may require additional supporting information (e.g., when metacognition is low) or when it might be important to intervene on metacognitive capacities in order to improve a person's identification and consideration of motivational states and to promote a greater shared agreement and understanding between the client and clinician.

The main aim of this study was to test whether metacognition moderates the association between self-reported and clinician-rated motivation measures in a sample of 56 people with schizophrenia-spectrum disorders. We hypothesized that participants' metacognition would significantly moderate the association, such that there would only be a significant, positive relationship between the motivation measures when metacognition was higher; at relatively lower metacognition levels, we hypothesized that the relationship between the motivation measures would be non-significant. As a secondary aim, because prior work has linked insight to client-clinician agreement (Hasson-Ohayon et al., 2011; Hasson-Ohayon et al., 2017; Lysaker et al., 2013) and neurocognition may impact one's ability to discuss and report motivational states, we also examined whether participants' clinical insight and neurocognition moderate the self-reported and clinician-rated motivation relationship.

2. Methods

2.1. Participants

Participants were enrolled in a randomized pilot trial of a text-message intervention targeting motivation. Diagnoses of schizophrenia (n = 23) or schizoaffective disorder (n = 33) were confirmed with the Structured Clinical Interview for DSM-5 (SCID-5; First et al., 2015). Additional eligibility included receiving services from a community mental health center, having a text-message enabled cell-phone, no past month medication changes or hospitalizations, ≥ a fourth grade reading level on the Graded Word List (La Pray and Ross, 1969), and moderate motivation deficits according to the CAINS (i.e., score ≥ 2 on at least one item: motivation for family, close friends and romantic relationships, work and school, and/or recreational activities). Most participants were male (n = 29, 51.8%) and identified as Black (n = 39, 70%) or White (n = 14, 25%). The mean age was 46.1 (SD = 8.8), and the mean education was 11.8 years (SD = 2.4).

2.2. Measures

2.2.1. Metacognition

Metacognition was assessed with the Metacognition Assessment Scale—Abbreviated (MAS-A; Lysaker et al., 2005, adapted from Semerari et al., 2003). The MAS-A was based on participants' responses to the Indiana Psychiatric Illness Interview (IPII; Lysaker et al., 2002), a semi-structured interview that asks how participants view themselves, others, and their mental illness and life. IPII responses were rated on four metacognitive domains: self-reflectivity, awareness of others' minds, decentration, and mastery (see Lysaker et al., 2014a for more information). For this study, we used the MAS-A total score, which has good validity (Hamm et al., 2012; Lysaker et al., 2005) and demonstrated good inter-rater reliability in our sample (Intra-class coefficient (ICC) = 0.89).

2.2.2. Clinician-rated motivation

Following Nakagami et al. (2008), clinician-rated motivation was assessed using the sum of the general sense of purpose, degree of motivation, and curiosity items from the QLS. Based on Choi et al. (2014), we refer to this as an index of general trait-like motivation. Items are rated based on the past four-weeks on a variable scale from 0 to 6. This index exhibits good construct validity and inter-rater reliability (ICC = 0.86 in our sample) (Luther et al., 2015; Nakagami et al., 2008).

Of note, we focused on the QLS motivation index because the CAINS motivation items had a restricted range based on study inclusion criteria.

2.2.3. Self-reported motivation

The sum of the MAP-SR six motivation and effort items was used to assess self-reported motivation. Items assess perceived motivation and effort over the past week for social, work/school, and hobbies/recreational activities and are rated on a variable scale from 0 to 4. The MAP-SR has demonstrated reliability and validity (Engel and Lincoln, 2016; Llerena et al., 2013), and these six items demonstrated good internal consistency in our sample ($\alpha = 0.82$).

2.2.4. Neurocognition

Neurocognition was measured using the updated brief neurocognitive assessment (BNA; Fervaha et al., 2015), which assesses working memory with the letter-number sequencing test (Gold et al., 1997) and processing speed with the symbol coding subtest from the Brief Assessment of Cognition in Schizophrenia (BACS; Keefe et al., 2004); these constructs were chosen because they explained the greatest variance in global neurocognition in a large schizophrenia sample (Fervaha et al., 2014). A composite standardized z-score was created from guidelines by Fervaha et al. (2015). The BNA has demonstrated prior construct validity and test-retest reliability (Fervaha et al., 2014, 2015).

2.2.5. Clinical insight

Global clinical insight was measured using the clinician-rated PANSS insight and judgement item. This item is rated from 1 to 7, with greater scores reflecting reduced awareness of illness/symptoms, treatment need, and illness consequences. This item has been previously used to measure insight in schizophrenia and has strong convergent validity with more comprehensive clinical insight measures (Drake and Lewis, 2003; Marks et al., 2000); PANSS inter-rater reliability in our sample was good (ICC = 0.84).

2.3. Procedure

After informed consent, participants completed assessments with trained research assistants. MAS-A raters were blind to other testing. Only baseline (i.e., pre-intervention) assessments were used in the current investigation. Participants were compensated for completing study procedures, which were approved by the university's institutional review board.

2.4. Analyses

Analyses were conducted in several steps. First, we conducted descriptive statistics to examine demographics and ensure study measures met statistical assumptions. We then conducted Pearson's correlations between study measures. For moderation analyses, we used the PROCESS macro (Hayes, 2013) in SPSS to conduct three moderation models. Self-reported motivation, the moderator of interest (i.e., metacognition, clinical insight, or neurocognition), and the interaction term between these variables were entered into a regression model predicting clinician-rated motivation. Moderation was deemed present if the interaction term was significant ($p < .05$) and significantly improved the regression model. For significant moderators, we re-ran the model controlling for demographic variables (age, sex, race, education) as a more stringent test. We then used the Johnson-Newman technique (Bauer and Curran, 2005) to identify the level of the moderator where the relationship between motivation measures changed significance. We also visualized significant interactions by using the pick-a-point approach (Rogosa, 1980); we used plus and minus one standard deviation of the moderator.

Table 1
Descriptive statistics and correlations for study measures.

	1.	2.	3.	4.	5.	Mean	SD
1. MAP-SR – motivation and effort	–					9.46	5.43
2. QLS – Motivation	0.46**	–				7.73	2.62
3. MAS-A – Total	0.10	0.19	–			9.27	2.44
4. PANSS – Insight	−0.24	−0.15	−0.47**	–		2.82	1.18
5. BNA – Composite	−0.05	−0.01	0.08	−0.03	–	−1.78	1.14

Note. BNA = Brief Neurocognitive Assessment; MAP-SR = Motivation and Pleasure Self-Report; MAS-A = Metacognition Assessment Scale—Abbreviated; PANSS = Positive and Negative Syndrome Scale. Higher scores on the MAP-SR, QLS-motivation, MAS-A, and BNA = greater levels of each construct. Higher scores on the PANSS-Insight = lower insight.

** Correlation is significant at the 0.01 level (2-tailed).

3. Results

3.1. Descriptive and correlation analyses

Table 1 contains measure descriptive statistics and correlations. Self-reported and clinician-rated motivation were significantly and moderately correlated ($p < .01$). Neither motivation measure was significantly associated with metacognition, clinical insight, or neurocognition.

3.2. Moderation analyses

Moderation results are in Table 2. Consistent with our hypothesis, after accounting for the independent effects of metacognition and self-reported motivation, the interaction term between self-reported motivation and metacognition was significant and accounted for a significant proportion of additional variance in clinician-rated motivation (F change (1,52 = 6.01, $p = .02$, R^2 change = 0.08). Of note, these results were highly similar when demographics were controlled. The Johnson-Newman technique indicated that at metacognition levels at or above 7.54, the relationship between motivation measures was positive and significant; at metacognition levels below this score (28.6% of our sample), there was a non-significant relationship between the measures. See Fig. 1 for a graph of this interaction (results of the pick-a-point approach).

For clinical insight, the interaction term between clinical insight

Table 2
Moderation results.

Variable	Coefficient	SE	t	p
Model 1 (Metacognition)				
$R^2 = 0.31$, $F = 7.89$, $p < .001$				
Constant	9.13	2.36	3.87	< 0.001
MAS-A – Total	−0.39	0.26	−1.52	0.13
MAP-SR – Motivation and effort	−0.28	0.21	−1.33	0.19
MAS-A X MAP-SR	0.05	0.02	2.45	0.02
Model 2 (Clinical insight)				
$R^2 = 0.21$, $F = 4.73$, $p = .005$				
Constant	5.48	1.87	2.93	0.01
PANSS – Clinical insight	0.06	0.58	0.11	0.91
MAP-SR – Motivation and effort	0.26	0.15	1.73	0.09
PANSS X MAP-SR	−0.01	0.05	−0.30	0.77
Model 3 (Neurocognition)				
$R^2 = 0.22$, $F = 4.85$, $p = .005$				
Constant	5.06	1.23	4.12	< 0.001
BNA – Composite	−0.35	0.62	−0.55	0.58
MAP-SR – Motivation and effort	0.28	0.11	2.57	0.01
BNA X MAP-SR	0.04	0.06	0.67	0.51

Note. BNA = Brief Neurocognitive Assessment; MAP-SR = Motivation and Pleasure Self-Report; MAS-A = Metacognition Assessment Scale—Abbreviated; PANSS = Positive and Negative Syndrome Scale.

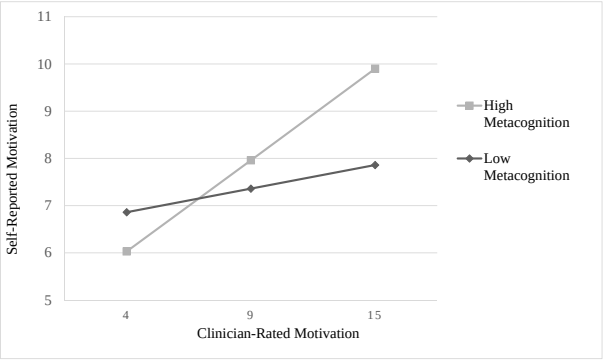

Fig. 1. Graph showing the relationship between self-reported and clinician-rated motivation at different levels of metacognition.

and self-reported motivation was non-significant and did not explain a significant amount of additional variance in clinician-rated motivation after accounting for the effects of self-reported motivation and clinical insight (F change $(1,52 = 0.09$, $p = .77$, R^2 change $= 0.001)$). Similarly, the interaction term between neurocognition and self-reported motivation was non-significant (F change $(1,52 = 0.45, p = .51$, R^2 change $= 0.01)$).

4. Discussion

The main aim of this study was to identify whether participants' metacognitive capacities help to explain the mixed relationships observed in the literature between self-reported and clinician-rated motivation measures in people with schizophrenia-spectrum disorders. Consistent with our hypothesis, results suggest that metacognition moderated the relationship between self-reported and clinician-rated motivation. Specifically, we found that at low metacognition levels, self-reported and clinician-rated motivation were unrelated. However, as metacognition increased and at least essential metacognitive abilities were present (i.e., ≥7.54 MAS-A score), the relationship between the motivation measures became significant and stronger. Further, a similar moderating relationship did not exist when clinical insight or neurocognition were examined as moderators.

With replication, these results suggest that links between self-perceived motivation and clinician-rated motivation break down when metacognition is low. Specifically, we found that without a minimum of essential metacognitive capacities, the relationship between motivation measures was non-significant. It may be that when a person has a reduced ability to reflect on and identify their intentions, thoughts, and feelings and then integrate them into a complex representation of themselves and others that they may have a more difficult time reflecting on and reporting their goals and motivational states, which in turn could lead to disagreement between self-reported and clinician-rated motivation. Further, since the self-report MAP-SR focuses on motivation for specific domains and the clinician-rated QLS motivation index focuses on motivation more broadly, it may be that those with lower metacognition have more difficulty identifying and forming a general representation of their motivation than when identifying their motivation for more specific domains; this could also lead to a reduced association between the measures. Thus, for those with metacognitive capacities below an essential level (i.e., 7.54 MAS-A score), it may be that self-report motivation measures may be less useful as standalone tools or that more time or attention from the interviewer (i.e., exploration and synthesis of client's experiences, awareness of potential clashes between client-clinician narratives, including awareness that the clinician's narrative is not necessary true; Hasson-Ohayon et al., 2017) may be needed to develop a greater shared agreement and understanding of the participant's motivation.

This work aligns with prior studies showing that metacognition plays a key role in the level of agreement between self-reported and clinician-rated work quality measures (Luedtke et al., 2012) and moderates the relationships between perceived stress and anxiety symptoms and self-appraisals and clinician-rated social functioning (James et al., 2016; Ramos-Cejudo and Salguero, 2017). Our findings extend this work to motivation measures and identify the specific metacognition level associated with greater agreement between self-reported and clinician-rated measures. Further, these findings align with Hasson-Ohayon et al.'s (2017) theoretical model positing that metacognition may be a source of shared meaning and understanding between clients and clinicians. Indeed, our findings in conjunction with this prior work suggest that using a metacognitive framework to guide the interview process and targeting metacognition with psychosocial interventions could lead to greater concordance between self-reported and clinician-rated measures. This may be particularly helpful for motivation measures and when intervening on motivation, as greater client-clinician agreement and awareness of the client's motivation could facilitate more collaborative, authentic, and meaningful goal-setting as well as improve a client's identification and use of person-congruent strategies that could bolster their motivation and overcome barriers to their goals.

We also found that neither clinical insight nor neurocognition were significant moderators of the self-reported and clinician-rated motivation relationship. This aligns with prior work suggesting that metacognition overlaps with but is separate from both clinical insight and neurocognition (Lysaker et al., 2011; Nicolò et al., 2012) and that neurocognition may be a building block for the more complex process of metacognition (Lysaker et al., 2014a; Minor and Lysaker, 2014). Indeed, basic levels of memory and processing speed are needed to complete both self-report and clinician-rated motivation measures, but these motivation measures go beyond the ability to accurately identify the corresponding symbols and numbers or the ability to remember specific numbers and letters. Similarly, these motivation measures require more than acceptance of one's illness and need for treatment. Indeed, these motivation measures require not only awareness of one's past intentions, desires, and emotions but also the ability to make sense of these experiences and integrate them into a coherent representation that the participant then needs to translate into a Likert scale option, frequency, and/or verbal response. Thus, neurocognition and some level of clinical insight may be necessary to complete these measures, but greater agreement between self-perceptions and clinician motivation ratings may only arise when a person has a more integrated representation of themselves and others. However, it may also be that our measures of clinical insight and neurocognition were not precise enough or that other forms of insight or neurocognition not measured here might moderate the self- clinician-rated motivation association; future replications are needed with more comprehensive insight and neurocognition measures such as the Scale for the Unawareness of Illness (SUMD; Amador et al., 1994) or the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS; Nuechterlein et al., 2008) Consensus Cognitive Battery.

This study has limitations. First, our sample was small, and our findings may have been impacted by our inclusion criteria; additional work should explore whether these findings generalize to those in a more acute illness phase or those with a wider range of motivation as measured by the CAINS. Further, given the cross-sectional data, we were not able to investigate the direction or specific mechanism through which relatively lower metacognition leads to a reduced relationship between motivation measures. It may be that metacognition reductions impact a person's ability to report motivation, impact the rater's ability to assess motivation, or some combination of these factors. Finally, we examined the relationship between only two motivation measures; future work could examine whether metacognition also moderates the relationship between additional motivation measures, including performance-based measures.

In sum, our results suggest that participants' metacognition level may be a key factor influencing the strength of the relationship between

self-reported and clinician-rated motivation measures. Specifically, we found that without at least essential metacognitive abilities, the relationship between self-reported and clinician-rated motivation was non-significant. However, as metacognition reached or surpassed this level, the self-reported and clinician-rated motivation relationship became significant and relatively stronger. Neither clinical insight nor neurocognition significantly moderated the relationship between these motivation measures, suggesting that metacognition plays a unique role in the strength of this relationship. With replication, our results suggest that using a metacognitive framework to guide assessment interviews (Hasson-Ohayon et al., 2017) and directly targeting participants' metacognition with interventions such as Metacognitive Reflection and Insight Therapy (MERIT; Lysaker and Klion, 2017) may help to improve the synchrony between self-perceptions and clinician motivation ratings.

Acknowledgements

Conflicts of interest

All authors declare no conflicts of interest.

Funding sources

This work was supported by the William and Dorothy Bevan Scholarship from the American Psychological Foundation as well as a Predoctoral Award to L.L. from the Indiana Clinical and Translational Sciences Institute (ICTSI) and the ICTSI Clinical Research Center, which are both funded in part by a National Institutes of Health (NIH), National Center for Advancing Translational Sciences, Clinical and Translational Sciences Award (# UL1TR001108). Support for K. Bonfils was provided in part by the VISN 4 Mental Illness Research, Education, & Clinical Center (MIRECC; Director: D. Oslin; Associate Director: G. Haas), VA Pittsburgh Healthcare System. The contents of this article do not represent the views of the U.S. Department of Veterans Affairs or the United States Government. These funding sources had no further role in the study design, data collection, analysis, and interpretation or in the writing of the manuscript and the decision to submit the article.

References

Amador, X.F., Flaum, M., Andreasen, N.C., Strauss, D.H., Yale, S.A., Clark, S.C., Gorman, J.M., 1994. Awareness of illness in schizophrenia and schizoaffective and mood disorders. Arch. Gen. Psychiatry 51, 826–836. https://doi.org/10.1001/archpsyc.1994.03950100074007.

Bauer, D.J., Curran, P.J., 2005. Probing interactions in fixed and multilevel regression: inferential and graphical techniques. Multivar. Behav. Res. 40, 373–400. https://doi.org/10.1207/s15327906mbr4003_5.

Bleuler, E., 1950. Dementia praecox or the group of schizophrenia, Zinkin, J. Trans., International Universities Press, New York. (Original work published 1911).

Choi, J., Choi, K.-H., Felice Reddy, L., Fiszdon, J.M., 2014. Measuring motivation in schizophrenia: is a general state of motivation necessary for task-specific motivation? Schizophr. Res. 153, 209–213. https://doi.org/10.1016/j.schres.2014.01.027.

Cooper, S., Lavaysse, L.M., Gard, D.E., 2015. Assessing motivation orientations in schizophrenia: scale development and validation. Psychiatry Res. 225, 70–78. https://doi.org/10.1016/j.psychres.2014.10.013.

Drake, R.J., Lewis, S.W., 2003. Insight and neurocognition in schizophrenia. Schizophr. Res. 62, 165–173. https://doi.org/10.1016/S0920-9964(02)00382-1.

Engel, M., Lincoln, T.M., 2016. Motivation and pleasure scale-self-report (MAP-SR): validation of the German version of a self-report measure for screening negative symptoms in schizophrenia. Compr. Psychiatry 65, 110–115. https://doi.org/10.1016/j.comppsych.2015.11.001.

Engel, M., Lincoln, T.M., 2017. Concordance of self-and observer-rated motivation and pleasure in patients with negative symptoms and healthy controls. Psychiatry Res. 247, 1–5. https://doi.org/10.1016/j.psychres.2016.11.013.

Evensen, J., Røssberg, J.I., Barder, H., Haahr, U., ten Velden Hegelstad, W., Joa, I., ... Rund, B.R., 2012. Apathy in first episode psychosis patients: a ten year longitudinal follow-up study. Schizophr. Res. 136 (1–3), 19–24.

Faerden, A., Friis, S., Agartz, I., Barrett, E.A., Nesvåg, R., Finset, A., Melle, I., 2009. Apathy and functioning in First-episode psychosis. Psychiatr. Serv. 60, 1495–1503. https://doi.org/10.1176/ps.2009.60.11.1495.

Fervaha, G., Agid, O., Foussias, G., Remington, G., 2014. Toward a more parsimonious assessment of neurocognition in schizophrenia: a 10-minute assessment tool. J. Psychiatr. Res. 52, 50–56. https://doi.org/10.1016/j.jpsychires.2014.01.009.

Fervaha, G., Hill, C., Agid, O., Takeuchi, H., Foussias, G., Siddiqui, I., Kern, R.S., Remington, G., 2015. Examination of the validity of the brief neurocognitive assessment (BNA) for schizophrenia. Schizophr. Res. 166, 304–309. https://doi.org/10.1016/j.schres.2015.05.015.

First, M.B., Williams, J.B.W., Karg, R.S., Spitzer, R.L., 2015. Structured Clinical Interview for DSM-5 Disorders. American Psychiatric Publishing, Arlington, VA.

Gold, J.M., Carpenter, C., Randolph, C., Goldberg, T.E., Weinberger, D.R., 1997. Auditory working memory and Wisconsin card sorting test performance in schizophrenia. Arch. Gen. Psychiatry 54, 159–165. https://doi.org/10.1001/archpsyc.1997.01830140071013.

Hamm, J.A., Renard, S.B., Fogley, R.L., Leonhardt, B.L., Dimaggio, G., Buck, K.D., Lysaker, P.H., 2012. Metacognition and social cognition in schizophrenia: stability and relationship to concurrent and prospective symptom assessments. J. Clin. Psychol. 68, 1303–1312. https://doi.org/10.1002/jclp.21906.

Hasson-Ohayon, I., Roe, D., Kravetz, S., Levy-Frank, I., Meir, T., 2011. The relationship between consumer insight and provider-consumer agreement regarding Consumer's quality of life. Community Ment. Health J. 47, 607–612. https://doi.org/10.1007/s10597-011-9380-2.

Hasson-Ohayon, I., Avidan-Msika, M., Mashiach-Eizenberg, M., Kravetz, S., Rozencwaig, S., Shalev, H., Lysaker, P.H., 2015. Metacognitive and social cognition approaches to understanding the impact of schizophrenia on social quality of life. Schizophr. Res. 161, 386–391. https://doi.org/10.1016/j.schres.2014.11.008.

Hasson-Ohayon, I., Kravetz, S., Lysaker, P.H., 2017. The special challenges of psychotherapy with persons with psychosis: intersubjective metacognitive model of agreement and shared meaning. Clin. Psychol. Psychother. 24, 428–440.

Hayes, A.F., 2013. Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach. Guilford Publications, New York.

Heinrichs, D.W., Hanlon, T.E., Carpenter, W.T., 1984. The quality of life scale: an instrument for rating the schizophrenic deficit syndrome. Schizophr. Bull. 10, 388–398. https://doi.org/10.1093/schbul/10.3.388.

James, A.V., Hasson-Ohayon, I., Vohs, J., Minor, K.S., Leonhardt, B.L., Buck, K.D., George, S., Lysaker, P.H., 2016. Metacognition moderates the relationship between dysfunctional self-appraisal and social functioning in prolonged schizophrenia independent of psychopathology. Compr. Psychiatry 69, 62–70. https://doi.org/10.1016/j.comppsych.2016.05.008.

Jang, S.-K., Choi, H.-I., Park, S., Jaekal, E., Lee, G.-Y., Cho, Y.I., Choi, K.-H., 2016. A two-factor model better explains heterogeneity in negative symptoms: evidence from the positive and negative syndrome scale. Front. Psychol. 7. https://doi.org/10.3389/fpsyg.2016.00707.

Kay, S.R., Fiszbein, A., Opler, L.A., 1987. The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophr. Bull. 13, 261–276. https://doi.org/10.1093/schbul/13.2.261.

Keefe, R.S.E., Goldberg, T.E., Harvey, P.D., Gold, J.M., Poe, M.P., Coughenour, L., 2004. The brief assessment of cognition in schizophrenia: reliability, sensitivity, and comparison with a standard neurocognitive battery. Schizophr. Res. 68, 283–297. https://doi.org/10.1016/j.schres.2003.09.011.

Kleinginna, P.R., Kleinginna, A.M., 1981. A categorized list of motivation definitions, with a suggestion for a consensual definition. Motiv. Emot. 5, 263–291. https://doi.org/10.1007/BF00993889.

Kraepelin, E., 1919. Dementia Praecox and Paraphrenia, M. Barclay Trans, Chicago Medical Book Company, Chicago, IL. (Original work published 1913).

Kring, A.M., Gur, R.E., Blanchard, J.J., Horan, W.P., Reise, S.P., 2013. The clinical assessment interview for negative symptoms (CAINS): final development and validation. Am. J. Psychiatry 170, 165–172. https://doi.org/10.1176/appi.ajp.2012.12010109.

La Pray, M., Ross, R., 1969. The graded word list: quick gauge of Reading ability. J. Read. 12, 305–307.

Llerena, K., Park, S.G., McCarthy, J.M., Couture, S.M., Bennett, M.E., Blanchard, J.J., 2013. The motivation and pleasure scale–self-report (MAP-SR): reliability and validity of a self-report measure of negative symptoms. Compr. Psychiatry 54, 568–574. https://doi.org/10.1016/j.comppsych.2012.12.001.

Luedtke, B.L., Kukla, M., Renard, S., Dimaggio, G., Buck, K.D., Lysaker, P.H., 2012. Metacognitive functioning and social cognition as predictors of accuracy of self-appraisals of vocational function in schizophrenia. Schizophr. Res. 137, 260–261. https://doi.org/10.1016/j.schres.2012.02.006.

Luther, L., Lysaker, P.H., Firmin, R.L., Breier, A., Vohs, J.L., 2015. Intrinsic motivation and amotivation in first episode and prolonged psychosis. Schizophr. Res. 169, 418–422. https://doi.org/10.1016/j.schres.2015.08.040.

Luther, L., Firmin, R.L., Vohs, J.L., Buck, K.D., Rand, K.L., Lysaker, P.H., 2016. Intrinsic motivation as a mediator between metacognition deficits and impaired functioning in psychosis. Br. J. Clin. Psychol. 55, 332–347. https://doi.org/10.1111/bjc.12104.

Luther, L., Firmin, R.L., Lysaker, P.H., Minor, K.S., Salyers, M.P., 2018. A meta-analytic review of self-reported, clinician-rated, and performance-based motivation measures in schizophrenia: are we measuring the same “stuff”? Clin. Psychol. Rev. 61, 24–37. https://doi.org/10.1016/j.cpr.2018.04.001.

Lysaker, P.H., Klion, R.E., 2017. Recovery, Meaning-Making, and Severe Mental Illness. Routledge, New York.

Lysaker, P.H., Clements, C.A., Plascak-Hallberg, C.D., Knipscheer, S.J., Wright, D.E., 2002. Insight and personal narratives of illness in schizophrenia. Psychiatry 65, 197–206. https://doi.org/10.1521/psyc.65.3.197.20174.

Lysaker, P.H., Carcione, A., Dimaggio, G., Johannesen, J.K., Nicolò, G., Procacci, M., Semerari, A., 2005. Metacognition amidst narratives of self and illness in schizophrenia: associations with neurocognition, symptoms, insight and quality of life. Acta Psychiatr. Scand. 112, 64–71. https://doi.org/10.1111/j.1600-0447.2005.00514.x.

Lysaker, P.H., Dimaggio, G., Buck, K.D., Callaway, S.S., Salvatore, G., Carcione, A.,

Nicolò, G., Stanghellini, G., 2011. Poor insight in schizophrenia: links between different forms of metacognition with awareness of symptoms, treatment need, and consequences of illness. Compr. Psychiatry 52, 253–260. https://doi.org/10.1016/j.comppsych.2010.07.007.

Lysaker, P.H., Hasson-Ohayon, I., Kravetz, S., Kent, J.S., Roe, D., 2013. Self perception of empathy in schizophrenia: emotion recognition, insight, and symptoms predict degree of self and interviewer agreement. Psychiatry Res. 206, 146–150. https://doi.org/10.1016/j.psychres.2012.10.021.

Lysaker, P.H., Leonhardt, B.L., Pijnenborg, M., van Donkersgoed, R., de Jong, S., Dimaggio, G., 2014a. Metacognition in schizophrenia spectrum disorders: methods of assessment and associations with neurocognition, symptoms, cognitive style and function. Isr. J. Psychiatry Relat. Sci. 51, 54–62.

Lysaker, P.H., Vohs, J., Hamm, J.A., Kukla, M., Minor, K.S., de Jong, S., van Donkersgoed, R., Pijnenborg, M.H.M., Kent, J.S., Matthews, S.C., Ringer, J.M., Leonhardt, B.L., Francis, M.M., Buck, K.D., Dimaggio, G., 2014b. Deficits in metacognitive capacity distinguish patients with schizophrenia from those with prolonged medical adversity. J. Psychiatr. Res. 55, 126–132. https://doi.org/10.1016/j.jpsychires.2014.04.011.

Lysaker, P.H., Vohs, J., Minor, K.S., Irarrázaval, L., Leonhardt, B., Hamm, J.A., Kukla, M., Popolo, R., Luther, L., Buck, K.D., Wasmuth, S., Dimaggio, G., 2015. Metacognitive deficits in schizophrenia: presence and associations with psychosocial outcomes. J. Nerv. Ment. Dis. 203, 530–536. https://doi.org/10.1097/NMD.0000000000000323.

Marks, K.A., Fastenau, P.S., Lysaker, P.H., Bond, G.R., 2000. Self-appraisal of illness questionnaire (SAIQ): relationship to researcher-rated insight and neuropsychological function in schizophrenia. Schizophr. Res. 45, 203–211. https://doi.org/10.1016/S0920-9964(99)00208-X.

Minor, K.S., Lysaker, P.H., 2014. Necessary, but not sufficient: links between neurocognition, social cognition, and metacognition in schizophrenia are moderated by disorganized symptoms. Schizophr. Res. 159, 198–204. https://doi.org/10.1016/j.schres.2014.08.005.

Najas-Garcia, A., Gómez-Benito, J., Huedo-Medina, T.B., 2018. The relationship of motivation and Neurocognition with functionality in schizophrenia: a meta-analytic review. Community Ment. Health J. 54, 1019–1049.

Nakagami, E., Xie, B., Hoe, M., Brekke, J.S., 2008. Intrinsic motivation, neurocognition and psychosocial functioning in schizophrenia: testing mediator and moderator effects. Schizophr. Res. 105, 95–104. https://doi.org/10.1016/j.schres.2008.06.015.

Nicolò, G., Dimaggio, G., Popolo, R., Carcione, A., Procacci, M., Hamm, J., Buck, K.D., Pompili, E., Buccione, I., Lagrotteria, B., Lysaker, P.H., 2012. Associations of metacognition with symptoms, insight, and neurocognition in clinically stable outpatients with schizophrenia. J. Nerv. Ment. Dis. 200, 644–647. https://doi.org/10.1097/NMD.0b013e31825bfb10.

Nuechterlein, K.H., Green, M.F., Kern, R.S., Baade, L.E., Barch, D.M., Cohen, J.D., Essock, S., Fenton, W.S., Frese, F.J., Gold, J.M., Goldberg, T., Heaton, R.K., Keefe, R.S.E., Kraemer, H., Mesholam-Gately, R., Seidman, L.J., Stover, E., Weinberger, D.R., Young, A.S., Zalcman, S., Marder, S.R., 2008. The MATRICS consensus cognitive battery, part 1: test selection, reliability, and validity. Am. J. Psychiatry 165, 203–213. https://doi.org/10.1176/appi.ajp.2007.07010042.

Ramos-Cejudo, J., Salguero, J.M., 2017. Negative metacognitive beliefs moderate the influence of perceived stress and anxiety in long-term anxiety. Psychiatry Res. 250, 25–29. https://doi.org/10.1016/j.psychres.2017.01.056.

Richter, J., Hesse, K., Eberle, M.-C., Eckstein, K.N., Zimmermann, L., Schreiber, L., Burmeister, C.P., Wildgruber, D., Klingberg, S., 2019. Self-assessment of negative symptoms – critical appraisal of the motivation and pleasure – self-report's (MAP-SR) validity and reliability. Compr. Psychiatry 88, 22–28. https://doi.org/10.1016/j.comppsych.2018.10.007.

Rogosa, D., 1980. Comparing nonparallel regression lines. Psychol. Bull. 88, 307–321.

Saperstein, A.M., Fiszdon, J.M., Bell, M.D., 2011. Intrinsic motivation as a predictor of work outcome after vocational rehabilitation in schizophrenia. J. Nerv. Ment. Dis. 199, 672–677. https://doi.org/10.1097/NMD.0b013e318229d0eb.

Semerari, A., Carcione, A., Dimaggio, G., Falcone, M., Nicolò, G., Procacci, M., Alleva, G., 2003. How to evaluate metacognitive functioning in psychotherapy? The metacognition assessment scale and its applications. Clin. Psychol. Psychother. 10, 238–261. https://doi.org/10.1002/cpp.362.

Tas, C., Brown, E.C., Esen-Danaci, A., Lysaker, P.H., Brüne, M., 2012. Intrinsic motivation and metacognition as predictors of learning potential in patients with remitted schizophrenia. J. Psychiatr. Res. 46, 1086–1092. https://doi.org/10.1016/j.jpsychires.2012.04.027.

Vohs, J., Lysaker, P.H., 2014. Metacognitive mastery and intrinsic motivation in schizophrenia. J. Nerv. Ment. Dis. 202, 74–77. https://doi.org/10.1097/NMD.0000000000000063.