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Characteristics of motivation and their impacts on the functional outcomes in patients with schizophrenia

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Abstract

Background: Deficits of motivation have been considered to be a core feature of schizophrenia, and recent studies have begun to reveal the biological and psychological characteristics and mechanisms underlying the deficits in motivation in schizophrenia patients. The aims of the present study were to investigate the characteristics of motivation in schizophrenia patients using the General Causality Orientations Scale (GCOS), and the impacts of motivational orientations on the functional outcomes in schizophrenia patients.
Methods: A total of 53 outpatients with schizophrenia and 38 healthy controls were recruited for this study. The GCOS was used to assess individual tendencies in respect of three different motivational orientations: the autonomy, controlled, and impersonal orientations, corresponding to intrinsic motivation, extrinsic motivation, and amotivation, respectively. The cognitive functioning, psychiatric symptoms, social functioning, and quality of life of the subjects were also assessed.
Results: The score for autonomy orientation was significantly lower in the patient group than that in the control group, while no significant differences were found between the two groups in respect of the scores for the other two orientations. The autonomy orientation was associated with various clinical variables, and regression analysis identified as one of the variables with the highest predictive accuracy for social functioning.
Conclusions: Intrinsic motivation measured by the GCOS in schizophrenia patients was significantly lower than that in healthy controls. The deficits of intrinsic motivation were broadly associated with the clinical features and were a determinant of social functioning. Development of treatments for enhancing intrinsic motivation would be essential for functional recovery in schizophrenia patients.

1. Introduction

Deficits of motivation have been considered as a central feature of schizophrenia since early times. They are frequently considered as a part of the negative symptom clusters. Recent studies have begun to reveal the biological and psychological characteristics and mechanisms underlying the deficits in motivation in schizophrenia patients [1–7]. The Self-Determination Theory (SDT) provides a broad framework to examine human motivation and personality. In theory, it is hypothesized that motivated behavior in humans is affected by environmental factors and personality tendencies, and comprises three components: intrinsic motivation, extrinsic motivation, and amotivation (disconnection-disengagement) [8,9]. Intrinsic motivation, which drives individuals to set goals and engage in behaviors with inherent interest, has recently drawn much attention in the field of psychiatry, although the framework for intrinsic motivation was first developed in other fields such as education, sports, and healthcare. As compared with healthy controls, patients with schizophrenia exhibit lower levels of intrinsically motivated behavior [10,11]. It has also been demonstrated using a quality-of-life scale that intrinsic motivation is associated with cognitive and psychosocial functioning in schizophrenic patients [12,13]. Therefore, under the present circumstances where medications may improve only the psychotic symptoms and have no effect on the functioning of the individuals, intrinsic motivation is also regarded as an important target for successful rehabilitation to

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improve the functional outcomes in schizophrenia patients [14]. In addition, several studies revealed that intrinsic motivation would play a vital role in predicting functional outcome [15,16]. On the other hand, extrinsic motivation refers to behaviors driven by external forces, such as rewards and punishment, and the implications of extrinsically motivated behavior are still controversial in schizophrenia [17].

The General Causality Orientations Scale (GCOS) was developed on the basis of the Causality Orientation Theory, which was one component of the SDT, in order to assess the profile of motivation [18]. The GCOS is used to measure three personality tendencies: the autonomy orientation, the control orientation, and the impersonal orientation, which correspond to intrinsic motivation, extrinsic motivation, and amotivation, respectively. The GCOS is useful for practical evaluation one's general motivational orientations. A recent study used the GCOS to assess motivation in patients with first-episode psychosis, and revealed that all the orientations were significantly different in the patients as compared to the control subjects, although one of the limitations of the study was that it was unclear whether the demographic data had been matched between the two groups [19]. Another recent study on schizophrenia adopted a modified version of the GCOS and revealed that schizophrenic patients had lower autonomy orientation and higher impersonal/amotivated orientation as compared to healthy controls, and the motivational orientations were partially correlated with psychosocial functioning, but not with the psychiatric symptoms in schizophrenia patients [20].

To the best of our knowledge, there are no studies that have investigated the relationships of these motivational orientations with the broad clinical features, including those related to cognitive function, psychiatric symptoms, and social functioning in patients with schizophrenia. The aims of the present study were to investigate (1) the characteristics of motivation in schizophrenic patients as compared with those in healthy controls using the GCOS; (2) the relationships between the motivational orientations and the clinical features, and (3) the contribution of motivational orientations to the functional outcomes in schizophrenia patients.

2. Methods

2.1. Participants

A total of 53 outpatients with schizophrenia were recruited from the Toho University Omori Medical Center, Tokyo; in addition, 38 healthy controls were volunteers recruited from the community around Tokyo. The patients were diagnosed by trained psychiatrists based on the DSM-IV criteria [21]. The mean age of the patients was 30.6 years, and the mean number of years of formal education was 14.8 years. The mean duration of illness was 95.7 months, and the mean age at onset was 22.0 years old. The mean duration of untreated psychosis (DUP) was 10.5 months. No significant differences in the gender, age, or years of education were observed between the two groups. The demographic and clinical characteristics of both groups are shown in Table 1. None of the subjects had a history of alcoholism, drug abuse or serious neurological illness. The institutional review board approved the protocol for the study. The study was carried out in accordance with the latest version of the Declaration of Helsinki. After providing the subjects with a complete description of the study, written informed consent was obtained from every subject.

2.2. Measures

2.2.1. Motivation

The GCOS was used to assess individuals' tendencies in respect of three different motivation orientations: autonomy, controlled, and impersonal orientations, and these three orientations are conceptualized as intrinsic motivation, extrinsic motivation, and amotivation, respectively. An individual who is highly autonomously oriented is referred to as having a strong tendency to be intrinsically motivated. The 12-vignette version of the GCOS in Japanese [18,22] was used in the present study. For each vignette, three statements corresponding to the three orientations were presented. For example, "You have been invited to a large party where you know very few people. As you look forward to the evening, you would likely expect that: a) you will try to fit in with whatever is happening in order to have a good time and not look bad; b) you will find some people with whom you can relate; c) you will probably feel somewhat isolated and unnoticed." Subjects were asked to rate their likelihood of approval for the statements on a Likert scale from 1 to 7. The highest score for each orientation was 84 and the lowest was 12; higher scores indicated a higher propensity to be oriented in each of the orientations. The validity and reliability of the Japanese version of the GCOS have been established elsewhere [22]. Three orientations of the Japanese version showed acceptable internal consistency: the autonomy orientation ($\alpha = 0.76$), the controlled orientation ($\alpha = 0.65$), and the impersonal orientation ($\alpha = 0.65$). These orientations also showed good test–retest reliability: the autonomy orientation ($\alpha = 0.73$), the controlled orientation ($\alpha = 0.72$), and the impersonal orientation ($\alpha =$

Table 1
Demographic and clinical characteristics of the subjects with schizophrenia and healthy controls.

	Schizophrenia	Controls
N (male/female)	53 (29/24)	38 (20/18)
Age (years)	31.1 (5.1)	30.6 (6.6)
Years of education	14.8 (1.5)	15.1 (1.7)
Age at onset (years)	22.0 (6.4)	
Duration of illness (months)	97.0 (73.4)	
Duration of untreated psychosis (months)	10.5 (16.4)	
Antipsychotic medication dose (CPZ equiv.)	408.9 (330.8)	

Values are numbers or means (standard deviation in parenthesis).
CPZ: chlorpromazine.

0.71) [22]. The validity of the Japanese version of the GCOS was verified using five psychological concepts used in the original version: self-esteem, locus of control, type-A behavior pattern, self-consciousness, and depression. The autonomy orientation had a positive correlation with the locus of control ($r = 0.33$, $p < 0.01$). The controlled orientation had positive correlations with the type-A behavior pattern ($r = 0.27$, $p < 0.05$) and the self-consciousness ($r = 0.25$, $p < 0.05$), and a negative correlation with the locus of control ($r = -0.29$, $p < 0.05$). The impersonal orientation had a positive correlation with the depression ($r = 0.31$, $p < 0.01$), and negative correlations with the self-esteem ($r = -0.25$, $p < 0.05$), the locus of control ($r = -0.28$, $p < 0.05$), and the type-A behavior pattern ($r = -0.27$, $p < 0.05$) [22]. These correlations were almost consistent with the original version.

We also used the sum of 3 items (QLS-3) from the Quality of Life Scale [23] to evaluate intrinsic motivation, based on previous studies [12,13]. The included items were: sense of purpose, motivation, and curiosity.

2.2.2. Cognitive functioning

Cognitive functioning in the patients was assessed by the Brief Assessment of Cognition in Schizophrenia (BACS), Japanese version [24,25]. This scale includes brief assessments of reasoning and problem solving, verbal fluency, attention, verbal memory, working memory, and motor speed. The composite score on BACS was used for the analyses in this study.

2.2.3. Psychiatric symptoms

The Positive and Negative Syndrome Scale (PANSS) [26] was used to determine the scores for the positive symptoms, negative symptoms, and general psychopathology subscales. The Scale for the Assessment of Negative Symptoms (SANS) [27] was used to evaluate the patients' negative symptoms in detail, and the total score was used for this study.

2.2.4. Functional outcomes

Four measures were used to assess the functional outcomes of the patients. The Global Assessment of Functioning (GAF) [21] was used as the scale to measure global functioning (symptoms and social functioning composite). The Social Functioning Scale (SFS) [28,29] was used to assess the abilities and performance of patients with schizophrenia in seven functional domains. The World Health Organization Quality of Life (WHOQOL-26) [30,31] was used to measure the patients' subjective sense of well-being in a comprehensive manner; it is composed of 26 items classified into four domains: physical health, psychological health, social relationships, and environment. The Subjective Well-being under Neuroleptic drug treatment Short form (SWNS) Japanese version [32,33] was also used to assess the patients' subjective well-being. The SWNS consists of 5 subscales: emotional regulation, self-control, mental functioning, social integration, and physical functioning. The total scores for the functional measures were used in this study.

2.3. Statistical analysis

All statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version 21.0J for Windows. Initially, unpaired t-tests were used to examine the differences in the scores on the GCOS subscales between the patient and control groups. A correlation matrix was created to establish the directionality of each individual association between the functional outcomes, motivational deficit, cognitive functioning, and the demographic/clinical variables in the patient group. Then, stepwise multiple regressions were used to examine the contribution of the motivational deficits, cognitive functions, and demographic/clinical variables to each of the four functional outcome measures described above. The demographic/clinical variables entered into the equations as independent variables were: age, years of education, duration of illness, DUP, antipsychotic medication dose, the three orientation scores on the GCOS, the sum of QLS-3, the composite score of BACS, the three subscale scores of PANSS, and the total score of SANS. For each analysis, p-value <0.05 was considered to be statistically significant without any consideration for multiple comparisons.

3. Results

3.1. Differences in motivational orientations between the patient and control groups

The mean GCOS scores in the schizophrenia patient group were as follows: autonomy orientation, 49.9 (SD = 11.4); controlled orientation, 40.8 (SD = 8.1); impersonal orientation, 46.2 (SD = 10.6); those in the control group were as follows: autonomy orientation, 54.8 (SD = 8.0); controlled orientation, 40.6 (SD = 7.6); impersonal orientation, 43.5 (SD = 10.6). Thus, the score for the autonomy orientation of the patient group was significantly lower than that in the control group ($t = 2.441$, $p = 0.017$). Although the mean score for impersonal orientation in the patient group appeared higher than that in the control group, the orientation scores, except for the autonomy orientation, were not significantly different between the two groups (Fig. 1).

3.2. Correlations of the motivational orientation with demographic/clinical variables

The results of motivation, cognitive functioning, psychiatric symptoms, and functional outcomes in the patient group are shown in Table 2. Correlation coefficients of the three orientation scales of the GCOS with the demographic/clinical variables in the patient group are presented in Table 3. The autonomy orientation was significantly correlated with the duration of illness, and the scores on the QLS-3, BACS, PANSS, SANS, GAF, SFS, WHOQOL-26, and SWNS. The controlled orientation was significantly correlated with the PANSS score for negative symptoms and

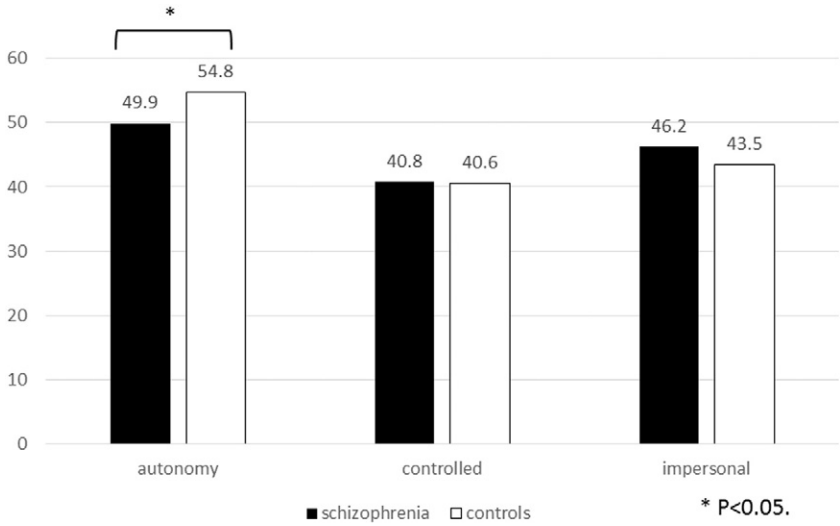

Fig. 1. Comparison between the subscales of the General Causality Orientations Scale (GCOS) in subjects with schizophrenia and healthy controls.

the SFS score. The impersonal orientation was significantly correlated with the PANSS score for positive symptoms.

3.3. Contribution of motivational deficits to functioning

A stepwise multiple regression model using motivational and demographic/clinical variables as predictors was generated for each variable of functioning to identify the predictors most closely associated with the patients' functional outcomes (Table 4).

The model for the GAF was significant ($F = 8.862$, $df = 3,49$, $p < 0.001$; adjusted $R^2 = 0.312$), and identified the PANSS score for negative symptoms, the QLS-3, and the DUP as significant predictors. The model for the SFS was also significant ($F = 20.810$, $df = 2,50$, $p < 0.001$; adjusted $R^2 = 0.432$), and identified the PANSS score for negative symptoms and the GCOS score for autonomy orientation as significant predictors. The WHOQOL-26, a significant model ($F = 13.372$, $df = 1,51$, $p = 0.001$; adjusted $R^2 = 0.192$), identified the PANSS score for general psychopathology as a significant predictor, and the SWNS, also a significant model ($F = 10.608$, $df = 2,50$, $p < 0.001$; adjusted $R^2 = 0.270$), identified the QLS-3 and the duration of illness as significant predictors.

Table 2
Scores for clinical variables in subjects with schizophrenia.

	Mean	SD
GCOS Autonomy	49.9	11.4
GCOS Controlled	40.8	8.1
GCOS Impersonal	46.2	10.6
QLS-3	7.5	3.2
BACS	−2.6	1.9
PANSS Positive	17.8	5.3
PANSS Negative	21.3	5.7
PANSS General	42.0	8.9
SANS Total	82.1	20.9
GAF	48.7	12.5
SFS	115.8	26.1
WHOQOL-26	3.0	0.5
SWNS	68.9	16.9

GCOS: General Causality Orientations Scale; QLS-3: 3 items from the Quality of Life Scale; BACS: Brief Assessment of Cognition in Schizophrenia; PANSS: Positive and Negative Syndrome Scale; SANS: Scale for the Assessment of Negative Symptoms; GAF: Global Assessment of Functioning; SFS: Social Functioning Scale; WHOQOL-26: World Health Organization Quality of Life; SWNS: Subjective Well-being under Neuroleptic drug treatment Short form.

Table 3
Pearson's correlation coefficients between the subscales of the GCOS and the demographic/clinical variables in subjects with schizophrenia (n = 53).

	Autonomy		Controlled		Impersonal	
	r	*p*	*r*	*p*	*r*	*p*
Age	−.17	.236	−.13	.349	−.24	.087
Years of education	−.04	.349	−.01	.951	−.15	.297
Duration of illness	−.35	.010	−.16	.263	.07	.621
Duration of untreated psychosis	.11	.433	.07	.596	.21	.121
Antipsychotic medication dose	−.10	.463	.10	.448	.09	.530
QLS−3	.49	<.001	.10	.472	−.01	.970
BACS	.38	.005	.02	.869	.08	.578
PANSS Positive	−.38	.005	.08	.561	.32	.021
PANSS Negative	−.36	.008	−.28	.040	−.13	.336
PANSS General	−.41	.002	−.16	.254	.14	.336
SANS Total	−.31	.023	.07	.624	.17	.231
GAF	.38	.004	.18	.195	−.07	.641
SFS	.44	.001	.39	.004	−.05	.751
WHOQOL-26	.33	.015	.20	.155	−.09	.522
SWNS	.38	.009	.18	.191	−.20	.156

GCOS: General Causality Orientations Scale; QLS-3: 3 items from the Quality of Life Scale; BACS: Brief Assessment of Cognition in Schizophrenia; PANSS: Positive and Negative Syndrome Scale; SANS: Scale for the Assessment of Negative Symptoms; GAF: Global Assessment of Functioning; SFS: Social Functioning Scale; WHOQOL-26: World Health Organization Quality of Life; SWNS: Subjective Well-being under Neuroleptic drug treatment Short form.

Table 4
Stepwise multiple regression analysis to identify the predictive ability of the demographic/clinical variables for the functional outcomes in subjects with schizophrenia.

Dependent variables	Independent variables	Beta	*p*
GAF	PANSS Negative	−.307	.019
	QLS-3	.347	.009
	Duration of untreated psychosis	−.250	.037
SFS	PANSS Negative	−.549	<.001
	GCOS Autonomy	.240	.037
WHOQOL-26	PANSS General	−.456	.001
SWNS	QLS-3	.374	.003
	Duration of illness	−.352	.005

GAF: Global Assessment of Functioning; SFS: Social Functioning Scale; WHOQOL-26: World Health Organization Quality of Life; SWNS: Subjective Well-being under Neuroleptic drug treatment Short form; PANSS: Positive and Negative Syndrome Scale; QLS-3: 3 items from the Quality of Life Scale; GCOS: General Causality Orientations Scale.

4. Discussion

4.1. Motivation in schizophrenia patients and healthy control subjects

Comparison of the scores on the GCOS between the control and schizophrenia groups in this study showed that the autonomy orientation in the patients was significantly lower than that in the controls. This result is consistent with previous reports [19,34]. Studies of intrinsic motivation analyzed by other measures also demonstrated decreased intrinsic motivation in schizophrenia patients as compared with that in healthy control subjects [10,34]. Motivational profiles measured by the GCOS represent trait factors that are quite well related to the personality, whereas an intrinsic motivation inventory for schizophrenia patients in which motivational structures for specific tasks or treatments rather than for the general situation are addressed measures state factors [10,35]. Therefore, the deficits of intrinsic motivation revealed in this study may be connected with core impairments in schizophrenia.

On the other hand, there were no significant differences of the control and impersonal orientations between the schizophrenia patients and control subjects, a finding that was not necessarily in line with previous reports [19,20]. A previous study demonstrated that the way of presenting rewarding stimuli affects the behavior in schizophrenia patients [36], and the results of studies on the extrinsic motivation of schizophrenia patients are varied [37]. In regard to the difference in the results for impersonal orientation, a previous study used the additional or modified version of GCOS, whereas we used the original GCOS [20].

The patterns of the scores for the three categories of motivation were similar between the patient and control groups, with the autonomy orientation being greater than the impersonal orientation, and the impersonal orientation being greater than the controlled orientation. The greater autonomy orientation than the other orientations was consistent with previous reports [19,20]. An approach to improve intrinsic motivation seems more promising than that to improve extrinsic motivation to drive one's behavior, both in control individuals and patients with schizophrenia.

4.2. Association of motivation with the clinical features of schizophrenia

Intrinsic motivation, as measured by the autonomy orientation of the GCOS, was correlated with the cognitive functioning, psychiatric symptoms, and social functioning, which are the central damaged domains in schizophrenic patients. These results indicate that deficits in intrinsic motivation are broadly associated with the clinical features in schizophrenia patients. The autonomy orientation was correlated with the QLS-3, which indicates a certain association between self-assessment and interview-based scales of intrinsic motivation. In regard to the association with negative symptoms, the autonomy orientation of the GCOS was correlated with the PANSS score for negative symptoms and the SANS score although a previous study using the modified GCOS revealed the absence of any correlation between the autonomy orientation and the negative symptoms score measured by the PANSS [20], and the controlled orientation of the GCOS was also correlated with the PANSS score for negative symptoms. Recent studies have shown that negative symptoms comprise two distinct domains; diminished motivation and pleasure, that is, avolition and apathy, and decreased verbal, non-verbal, and communicative outputs, that is, diminished emotional expression [38]. Under the current circumstances, where the influence of negative symptoms is being reconsidered [17,39], it would be essential to make further investigation of the relationships between negative symptoms and self-reported/observed motivation.

4.3. Contribution of motivation to functioning

Social functioning is one of the most crucial goals of treatment of schizophrenia, and it has been reported that social cognition acts as an intermediary between basic cognition and the functional outcomes [40–42]. In recent years, intrinsic motivation has also attracted attention as a key intermediary between the two regions [12,43] and as a predictor of functional outcome [15]. Saperstein et al. revealed that greater intrinsic motivation and lower negative symptoms were linked up with better work functioning and intrinsic motivation might be an important target of rehabilitation interventions [16]. The importance of addressing intrinsic motivation in cognitive remediation has also been pointed out [14]. Treatments for motivational deficits may lead to greater improvements especially in the early stage of illness [44]. In the current study, the autonomy orientation was correlated with the cognitive functioning, psychiatric symptoms, and social functioning. Furthermore, the results of a regression analysis revealed that it was one of the variables that showed the highest predictive accuracy for

social functioning. In addition, the QLS-3 was one of the predictors of global functioning and the patients' subjective well-being. These results suggest that the deficits of intrinsic motivation are broadly associated with the clinical features of schizophrenia, and improvement of intrinsic motivation is a key to improve the functioning of schizophrenia patients in real-world settings.

4.4. Treatment implications

A stronger focus on intrinsic motivation may be expected to lead to a more personalized approach to psychosocial treatment in patients with schizophrenia, because intrinsic motivation relies on identifying what is inherently interesting and enjoyable to each person. These findings suggest that it may be beneficial to also assess and consider the autonomy orientation, which is related to the personality tendency connected to intrinsic motivation. In actual fact, provision of support for autonomy is central to motivational interviewing, which is a person-centered guidance method to elicit and strengthen personal motivation, although the method is commonly used only to treat addictions at present [45,46]. To improve intrinsic motivation, enhancement of the ability for divergent thinking also seems promising [47,48]. Divergent thinking is associated with intrinsic motivation and spontaneity, and we previously demonstrated that cognitive training for enhancing divergent thinking improved the social functioning in schizophrenia patients [49]. Further development of methods to enhance intrinsic motivation is essential for improving the functional outcomes in patients with schizophrenia.

5. Conclusions

Intrinsic motivation measured by the GCOS in schizophrenia patients was significantly lower than that in healthy controls. The deficits of intrinsic motivation were broadly associated with the clinical features and were a determinant of social functioning. Development of treatments for enhancing intrinsic motivation would be essential for functional recovery in patients with schizophrenia.

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References

[1] Barch DM. The relationships among cognition, motivation, and emotion in schizophrenia: how much and how little we know. Schizophr Bull 2005;31:875-81.
[2] Barch DM. Emotion, motivation, and reward processing in schizophrenia spectrum disorders: what we know and where we need to go. Schizophr Bull 2008;34:816-8.
[3] Gold JM, Waltz JA, Prentice KJ, Morris SE, Heerey EA. Reward processing in schizophrenia: a deficit in the representation of value. Schizophr Bull 2008;34:835-47.
[4] Heerey EA, Gold JM. Patients with schizophrenia demonstrate dissociation between affective experience and motivated behavior. J Abnorm Psychol 2007;116:268-78.
[5] Strauss GP, Waltz JA, Gold JM. A review of reward processing and motivational impairment in schizophrenia. Schizophr Bull 2014;40(Suppl 2):S107-16.
[6] Salamone JD, Koychev I, Correa M, McGuire P. Neurobiological basis of motivational deficits in psychopathology. Eur Neuropsychopharmacol 2015;25:1225-38.
[7] Felice Reddy L, Green MF, Rizzo S, Sugar CA, Blanchard JJ, Gur RE, et al. Behavioral approach and avoidance in schizophrenia: an evaluation of motivational profiles. Schizophr Res 2014;159:164-70.
[8] Deci E, Ryan R. Intrinsic motivation and self-regulation in human behavior. New York: Plenum Press; 1985.
[9] Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol 2000;55:68.
[10] Choi J, Mogami T, Medalia A. Intrinsic motivation inventory: an adapted measure for schizophrenia research. Schizophr Bull 2010;36:966-76.
[11] Medalia A, Brekke J. In search of a theoretical structure for understanding motivation in schizophrenia. Schizophr Bull 2010;36:912-8.
[12] Nakagami E, Xie B, Hoe M, Brekke JS. Intrinsic motivation, neurocognition and psychosocial functioning in schizophrenia: testing mediator and moderator effects. Schizophr Res 2008;105:95-104.
[13] Nakagami E, Hoe M, Brekke JS. The prospective relationships among intrinsic motivation, neurocognition, and psychosocial functioning in schizophrenia. Schizophr Bull 2010;36:935-48.
[14] Medalia A, Saperstein A. The role of motivation for treatment success. Schizophr Bull 2011;37(Suppl 2):S122-8.
[15] Fervaha G, Siddiqui I, Foussias G, Agid O, Remington G. Motivation and social cognition in patients with schizophrenia. J Int Neuropsychol Soc 2015:1-8.
[16] Saperstein AM, Fiszdon JM, Bell MD. Intrinsic motivation as a predictor of work outcome after vocational rehabilitation in schizophrenia. J Nerv Ment Dis 2011;199:672-7.
[17] Kane JM. Tools to assess negative symptoms in schizophrenia. J Clin Psychiatry 2013;74:e12.
[18] Deci EL, Ryan RM. The general causality orientations scale: self-determination in personality. J Res Pers 1985;19:109-34.
[19] Breitborde NJ, Kleinlein P, Srihari VH. Causality orientations among individuals with first-episode psychosis. Psychosis 2014;6:177-80.
[20] Cooper S, Lavaysse LM, Gard DE. Assessing motivation orientations in schizophrenia: scale development and validation. Psychiatry Res 2015;225:70-8.
[21] American Psychiatric Association. Diagnosis and Statistical Manual of Mental Disorders. 4th ed. Washington: American Psychiatric Association; 1994.
[22] Tanaka H, Sakurai S. Construction of the Japanese version of the General Causality Orientations Scale. Bulletin of Institute for Educational Research of Nara University of Education, 31; 1995. p. 177-84.
[23] Heinrichs DW, Hanlon TE, Carpenter Jr WT. The Quality of Life Scale: an instrument for rating the schizophrenic deficit syndrome. Schizophr Bull 1984;10:388-98.
[24] Keefe RS, Goldberg TE, Harvey PD, Gold JM, Poe MP, Coughenour L. The Brief Assessment of Cognition in Schizophrenia: reliability, sensitivity, and comparison with a standard neurocognitive battery. Schizophr Res 2004;68:283-97.

[25] Kaneda Y, Sumiyoshi T, Keefe R, Ishimoto Y, Numata S, Ohmori T. Brief assessment of cognition in schizophrenia: validation of the Japanese version. Psychiatry Clin Neurosci 2007;61:602-9.
[26] Kay SR, Flszbein A, Opfer LA. The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophr Bull 1987;13:261.
[27] Andreasen NC. The Scale for the Assessment of Negative Symptoms (SANS): conceptual and theoretical foundations. Br J Psychiatry Suppl 1989;7:49-58.
[28] Birchwood M, Smith J, Cochrane R, Wetton S, Copestake S. The Social Functioning Scale. The development and validation of a new scale of social adjustment for use in family intervention programmes with schizophrenic patients. Br J Psychiatry 1990;157:853-9.
[29] Nemoto T, Fujii C, Miura Y, Chino B, Kobayashi H, Yamazawa R, et al. Reliability and validity of the Social Functioning Scale Japanese version (SFS-J). Jpn Bull Soc Psychiatry 2008;17:188-95.
[30] WHOQOL Group. Measuring quality of life: the development of the World Health Organization Quality of Life Instrument (WHOQOL). Geneva: World Health Organization; 1993.
[31] Tazaki M, Nakane Y. WHO QOL 26 Japanese version (in Japanese). Tokyo: Kaneko Shobo; 1997.
[32] Naber D, Moritz S, Lambert M, Rajonk F, Holzbach R, Mass R, et al. Improvement of schizophrenic patients' subjective well-being under atypical antipsychotic drugs. Schizophr Res 2001;50:79-88.
[33] Watanabe M, Matsumura H. Reliability and validity of subjective well-being under neuroleptic drug treatment short form, Japanese version (SWNS-J). Jpn J Clin Psychopharmacol 2003;6:905-12.
[34] Gard DE, Sanchez AH, Starr J, Cooper S, Fisher M, Rowlands A, et al. Using self-determination theory to understand motivation deficits in schizophrenia: the 'why' of motivated behavior. Schizophr Res 2014;156:217-22.
[35] Choi J, Choi KH, Felice Reddy L, Fiszdon JM. Measuring motivation in schizophrenia: is a general state of motivation necessary for task-specific motivation? Schizophr Res 2014;153:209-13.
[36] Gard DE, Kring AM, Gard MG, Horan WP, Green MF. Anhedonia in schizophrenia: distinctions between anticipatory and consummatory pleasure. Schizophr Res 2007;93:253-60.
[37] Silverstein SM. Bridging the gap between extrinsic and intrinsic motivation in the cognitive remediation of schizophrenia. Schizophr Bull 2010;36:949-56.
[38] Kring AM, Barch DM. The motivation and pleasure dimension of negative symptoms: neural substrates and behavioral outputs. Eur Neuropsychopharmacol 2014;24:725-36.
[39] Kring AM, Gur RE, Blanchard JJ, Horan WP, Reise SP. The Clinical Assessment Interview for Negative Symptoms (CAINS): final development and validation. Am J Psychiatry 2013;170:165-72.
[40] Schmidt SJ, Mueller DR, Roder V. Social cognition as a mediator variable between neurocognition and functional outcome in schizophrenia: empirical review and new results by structural equation modeling. Schizophr Bull 2011;37(Suppl 2):S41-54.
[41] Lam BY, Raine A, Lee TM. The relationship between neurocognition and symptomatology in people with schizophrenia: social cognition as the mediator. BMC Psychiatry 2014;14:138 [244X-14-138].
[42] Pinkham AE, Penn DL. Neurocognitive and social cognitive predictors of interpersonal skill in schizophrenia. Psychiatry Res 2006;143:167-78.
[43] Gard DE, Fisher M, Garrett C, Genevsky A, Vinogradov S. Motivation and its relationship to neurocognition, social cognition, and functional outcome in schizophrenia. Schizophr Res 2009;115:74-81.
[44] Fervaha G, Foussias G, Agid O, Remington G. Motivational deficits in early schizophrenia: prevalent, persistent, and key determinants of functional outcome. Schizophr Res 2015;166:9-16.
[45] Resnicow K, McMaster F. Motivational interviewing: moving from why to how with autonomy support. Int J Behav Nutr Phys Act 2012;9:19 [5868-9-19].
[46] Miller WR, Rollnick S. Ten things that motivational interviewing is not. Behav Cogn Psychother 2009;37:129-40.
[47] Nemoto T, Mizuno M, Kashima H. Qualitative evaluation of divergent thinking in patients with schizophrenia. Behav Neurol 2005;16:217-24.
[48] Nemoto T, Kashima H, Mizuno M. Contribution of divergent thinking to community functioning in schizophrenia. Prog Neuropsychopharmacol Biol Psychiatry 2007;31:517-24.
[49] Nemoto T, Yamazawa R, Kobayashi H, Fujita N, Chino B, Fujii C, et al. Cognitive training for divergent thinking in schizophrenia: a pilot study. Prog Neuropsychopharmacol Biol Psychiatry 2009;33:1533-6.