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Intrinsic motivation predicts cognitive and functional gains during coordinated specialty care for first-episode schizophrenia

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Abstract

Coordinated Specialty Care (CSC) and embedded group therapeutic interventions have been effective in improving outcomes for individuals experiencing recent first-episode schizophrenia, including cognitive performance and functioning. Treatment response varies substantially, with some patients experiencing limited or no improvement. Motivation has emerged as a key determinant of treatment engagement and efficacy. However, the impact of intrinsic and extrinsic aspects of motivation has not been directly examined with treatment outcomes in first-episode schizophrenia. This study investigated whether baseline levels of intrinsic and extrinsic motivation predicted cognitive and functional gains over 6 and 12 months in CSC. Forty participants with first-episode schizophrenia completed a 12-month CSC treatment period. Baseline measures of intrinsic and extrinsic motivation were obtained for group therapeutic interventions and work/school, as well as measures of cognition and functioning (role and social) at baseline, 6 months, and 12 months. Results revealed that higher baseline scores of intrinsic motivation for group therapeutic interventions were significantly predictive of greater cognitive gains at 12 months, and a similar tendency was observed at 6 months. Additionally, baseline scores of intrinsic motivation for work/school predicted role gains at 6 months, with a similar tendency observed at 12 months. Extrinsic motivation did not consistently impact treatment outcomes, except for work/school-related extrinsic motivation, which was linked to greater social functioning gains at 12 months. These findings provide insight into the factors influencing treatment outcomes for individuals with first-episode schizophrenia and highlight the importance of intrinsic motivation as a modifiable personal variable that can enhance response to CSC.

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Declaration of competing interest

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CRedit authorship contribution statement

Thanh P. Le: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Joseph Ventura:** Funding acquisition, Investigation, Project administration, Supervision, Writing – review & editing. **Kenneth L. Subotnik:** Funding acquisition, Investigation, Project administration, Supervision, Writing – review & editing. **Keith H. Nuechterlein:** Conceptualization, Funding acquisition, Investigation, Project administration, Resources, Supervision.

Keywords

Extrinsic motivation; Self-determination theory; First episode psychosis; Cognitive remediation; Treatment outcomes

1. Introduction

Coordinated specialty care (CSC), which provides comprehensive early intervention encompassing psychotherapeutic, medication, and supportive components in the early course of psychosis, can reduce the short-term and potentially long-term dysfunction associated with schizophrenia-spectrum psychotic disorders (Heinssen et al., 2014). The CSC model, a term used in the United States to characterize Early Intervention Services for individuals experiencing their first episode of psychoses, is effective in enhancing various outcomes, including cognitive performance and functioning. However, there is considerable variability in treatment response (Kane et al., 2016; Nuechterlein et al., 2023; Rosenheck et al., 2017). Therefore, a critical research focus is the identification of modifiable personal factors that can be targeted to enhance the likelihood of successful treatment outcomes. Motivation, which is a broad, multi-faceted construct encompassing both intrinsic and extrinsic motivation, has emerged as a key determinant of treatment engagement and efficacy (Choi and Medalia, 2010; Le et al., 2023). Surprisingly, relatively little research has investigated the roles of these separate aspects of motivation in treatment outcomes in first-episode schizophrenia. This study investigated intrinsic and extrinsic motivation as predictors of cognitive and functional gains within CSC.

In a recently reported 12-month randomized controlled trial (RCT) for first-episode schizophrenia, we observed a specific synergistic effect, whereby cognitive remediation led to faster gains in cognition and functioning compared to a comparison group (receiving healthy behavior training) in the long-acting injectable risperidone (LAI) medication condition, but not in the oral medication condition (Nuechterlein et al., 2022). This interaction highlights the wide variability in treatment response across patients, which has also been observed in other controlled trials conducted by our group (Nuechterlein et al., 2020, 2023), as well as in other studies. A meta-analysis showed that patients with long-term schizophrenia who participated in cognitive remediation exhibited moderate improvements in cognition (Cohen's $d = 0.41$ – 0.47 ; McGurk et al., 2007; Wykes et al., 2011). However, another meta-analysis (Revell et al., 2015) revealed that cognitive remediation in first-episode schizophrenia had smaller standardized mean effect sizes for cognition (0.19) and everyday functioning (0.18). Therefore, although group therapeutic interventions such as group-based cognitive remediation have the potential to significantly improve cognitive outcomes, as well as vocational and social functioning in CSC, there is significant variability in individual-level response as some participants show little or no benefit (Griffiths et al., 2022; Wykes et al., 2011). Thus, there is a need to identify variables that predict response to CSC and embedded group therapeutic interventions given the heterogeneous outcomes, as interventions targeting these variables may improve outcomes for those who otherwise show limited effects.

Previous research has generally focused on largely immutable characteristics of treatment response such as demographic variables, forensic and substance use history, history of hospitalizations, socioeconomic status, and site characteristics (Barlatti et al., 2018; Bowie et al., 2014; Lindenmayer et al., 2017; Saperstein et al., 2021a). However, investigation of person-level and modifiable factors that significantly impact treatment outcomes is likely more suitable for the delivery of personalized interventions that maximize the opportunity for cognitive and functional gains.

Lack of motivation is a frequent symptom of schizophrenia (Kirkpatrick et al., 2006), present in the early course of the disease (Piskulic et al., 2012), and contributes to severe functional impairments in independent living, work, and relationships (Pogue-Geile and Harrow, 1985; Ventura et al., 2015). Motivation consists of two types: intrinsic and extrinsic (Kremen et al., 2016; Ryan and Deci, 2000). Intrinsic motivation refers to the willingness to exert effort because a task is inherently enjoyable or meaningful, while extrinsic motivation refers to externally regulated behavior that is motivated by rewards or punishments and compelled by feelings of the need to comply. Both are key concepts within Self-Determination Theory (SDT; Ryan and Deci, 1985), which is a leading framework of motivation that has accumulated a considerable amount of evidence in recent years as a viable approach to improving motivation toward treatment engagement and efficacy in clinical and non-clinical populations (Ryan et al., 2008; Teixeira et al., 2012). However, there is limited information on how intrinsic and extrinsic motivation contributes to treatment outcomes in first-episode schizophrenia. For example, external incentives (i.e., monetary payment) are often used for initial engagement in interventions but little is known about whether these extrinsic rewards promote successful treatment outcomes in schizophrenia (Silverstein, 2010). Moreover, intrinsically motivated behaviors that are experienced as internally valuable, enjoyable, and autonomous have been linked in some studies with continued engagement and cognitive gains during cognitive remediation in long-term schizophrenia (Bryce et al., 2018; Choi and Medalia, 2010), but not in others (Best et al., 2020; Saperstein et al., 2021a).

There has been limited research into how these different motivational components predict functional gains in schizophrenia, and to our knowledge, no studies have investigated this relationship in first-episode schizophrenia. Saperstein et al. (2011), among others (Reddy et al., 2016), observed that greater baseline intrinsic motivation was associated with better work functioning among patients with long-term schizophrenia who participated in a 6-month vocational rehabilitation trial, while Choi et al. (2013) found that changes in motivation were significantly linked to work outcomes over time. Participation in early intervention services for first-episode schizophrenia may improve intrinsic motivation (Breitborde et al., 2021). These findings underscore the importance of understanding the relationship between intrinsic and extrinsic motivation and treatment outcomes in first-episode schizophrenia, especially given the significant expansion of CSC programs in the United States since 2014 (George et al., 2022).

This study investigated the longitudinal relationships between baseline intrinsic motivation and extrinsic motivation with treatment outcomes in participants with first-episode schizophrenia who completed a 12-month CSC treatment period (Nuechterlein et al.,

2020b). This study took place in the context of a RCT, with overall cognitive performance level as one of the primary treatment outcomes, at the UCLA Aftercare Research Program, an outpatient research program for first-episode schizophrenia (see Section 2.1. below). Cognitive remediation was a central component of this RCT. While cognitive functioning is not an outcome of primary interest for most CSCs in the United States, there have been increasing efforts made to address cognitive health and disseminate cognitive remediation in early intervention clinical services as part of the standard of care (Best and Bowie, 2017; Lewandowski, 2021; Saperstein et al., 2021b; Vinogradov, 2019). We build on prior literature (Saperstein and Medalia, 2016) by examining these associations in the context of a rigorous and systematic clinical trial protocol in a CSC program at 6 and 12 months, and by examining multiple aspects of motivation and treatment responsiveness (i.e., cognitive and functional gains) in first-episode schizophrenia. Our primary hypothesis was that greater baseline levels of intrinsic motivation for group therapeutic interventions and for work/school would be associated with greater cognitive and functional gains, respectively, within a comprehensive early intervention program.

2. Methods

2.1. Participants

Please see Nuechterlein, et al. (2020b) for information about the parent study, including full sample demographics, assessments, primary outcomes, and a description of the experimental and control conditions. Briefly, data for the current study were drawn from a 12-month, 2×2 fully crossed RCT with the assignment to Cognitive Remediation (CR) v. Healthy Behavior Training (HBT) and oral v. long-acting injectable (LAI) risperidone. The primary treatment outcomes were overall cognitive performance level, role (work/school) functioning, and medication adherence ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT00333177) Identifier: [NCT00333177](https://clinicaltrials.gov/ct2/show/study/NCT00333177)).

Participants were first-episode patients ($N = 40$) recently diagnosed with schizophrenia-spectrum disorders and received outpatient psychiatric treatment at the UCLA Aftercare Research Program. Participants were in the fourth phase of the Developmental Processes in Schizophrenic Disorders Project (Nuechterlein et al., 2014a; Subotnik et al., 2015). The inclusion and exclusion criteria were (1) a first-episode of a psychotic illness that began within the past two years, based on a clinical interview (SCID; First et al., 1997), medical records, treatment providers, and family members; (2) a diagnosis by DSM-IV of schizophrenia, schizoaffective disorder, mainly depressed type, or schizophreniform disorder; (3) 18 to 45 years old; (4) no evidence of significant head injury or neurological disorder or; (5) no evidence of significant and alcohol or substance dependence within the six months before the first-episode, (6) premorbid IQ not <70 ; (7) sufficient fluency in the English language to avoid invalidating measures of verbal cognitive abilities; (8) residing within commuting distance to the Aftercare Research Program; and (9) treatment with risperidone was not contraindicated.

2.2. Procedures

All patients were enrolled in outpatient coordinated specialty care including the RCT protocol, antipsychotic medication by a psychiatrist, weekly case management and skills-

focused therapy provided by a psychologist, psychoeducation, and family education. All patients also worked with an Individual Placement and Support (IPS) specialist (Nuechterlein et al., 2008b, 2020). IPS, adapted for a first-episode schizophrenia population, incorporated the following principles: (1) competitive employment or schooling in typical community settings, (2) IPS services integrated into the mental health treatment team, (3) rapid search for schooling or employment, (4) eligibility based on participant choice, (5) attention to the individual's job/school preferences, (6) continuous individualized support, (7) community outreach, and (8) disability benefits counseling.

The major assessment battery, including clinical symptoms (Brief Psychiatric Rating Scale; (Kopelowicz et al., 2008; Ventura et al., 1993), functioning (Global Functioning Scale; Cornblatt et al., 2007), and cognition (MATRICS Consensus Cognitive Battery; Nuechterlein and Green, 2006), was conducted at baseline, 6 months, and the end of the 12-month randomized treatment period.

2.2.1. Cognitive remediation—The group-based Cognitive Remediation Program (Bell et al., 2001; Medalia et al., 2017) included computerized cognitive training and a Bridging Group to facilitate generalization between the abilities learned in cognitive training and functional performance such as work or school and applying cognitive skills in daily life. The computerized group sessions involved 2 h/week of in-clinic cognitive training for 6 months, followed by 1 h/week of cognitive training during months 7–9, and 1 h/week every other week during months 10–12. The program, using bottom-up and top-down approaches with continuously adapted difficulty levels, was administered at the clinic's computer lab in groups (of 4–5 patients plus a cognitive coach; Nuechterlein et al., 2014b).

2.2.2. Healthy behavior training—The group-based HBT program served as an active control condition and focused on increasing positive lifestyle habits and overall well-being. The HBT program used a manual-driven didactic program to cover three topic areas: 1) nutrition and health, 2) stress management, and 3) physical exercise. Each module in the topic areas included a group activity that promoted positive lifestyle mastery-building experiences. HBT was provided in an equal amount of group facilitator intervention time as compared to the cognitive remediation program (Gretchen-Doorly et al., 2009).

2.3. Measures

2.3.1. Cognition—The MATRICS Consensus Cognitive Battery (MCCB; Nuechterlein et al., 2008a, 2008b) was administered at baseline, 6 months, and 12 months. The Overall Composite Score summarizes performance across 10 tests of Speed of Processing, Attention/Vigilance, Working Memory, Verbal Learning, Visual Learning, Reasoning and Problem Solving, and Social Cognition, scaled as a T score based on community norms (Kern et al., 2008).

2.3.2. Functioning—The Global Functioning Scale: Role (GFS; Cornblatt et al., 2007), is a 10-point scale measuring a combination of quantity and quality of work/school functioning based on their ongoing interactions with the patients, family members, and employers or teachers. Ratings are based on age appropriateness, demands of the role,

level of independence or support provided to the individual, and the individual's overall performance in the role given the level of support. Higher scores indicate better functioning.

The Global Functioning Scale: Social, is also a 10-point scale that assesses the quantity and quality of peer relationships, level of peer conflict, age-appropriate intimate relationships, and involvement with family members. Emphasis is placed on age-appropriate social contacts and interactions outside of the family, with a particular focus on social withdrawal and isolation.

2.3.3. Motivation for group therapeutic interventions—The Situational Motivation Scale (SIMS; Guay et al., 2000) assesses a continuum of self-determination for a given task/activity. The 16-item SIMS assesses four domains pertinent to motivation: intrinsic motivation (e.g., “Because I think this activity is interesting”), identified regulation (e.g., “Because I am doing it for my own good”; valuable), external regulation/extrinsic motivation (e.g., “Because I am supposed to do it”), and amotivation (“I do this activity but I am not sure it is worth it”). Individual items are rated on a Likert-type scale from 1 (Not at all) to 7 (Exactly). Higher scores indicate greater motivation, except for the amotivation subscale. The SIMS has previously shown good psychometric properties (Guay et al., 2000) with internally consistent values (Cronbach's α) for each factor: intrinsic motivation = 0.95, identified regulation = 0.80, external regulation = 0.86, and amotivation = 0.77. The four domain scores were used for analyses. The SIMS was administered to all participants, in both randomized conditions of CR vs. HBT, and at the end of the second session for CR or HBT. The *non-specific* group intervention prompt was: “...circle the number that best describes the reason why you are currently engaged in your group therapy exercises.”

2.3.4. Motivation for work and school—The Work Preference Inventory (WPI; Amabile et al., 1994) was used for individual differences in intrinsic and extrinsic motivational orientations. The 30-item WPI is scored on two primary scales (intrinsic and extrinsic motivation) with each scale further subdivided into two secondary scales. The intrinsic motivation secondary domains include enjoyment (“What matters most to me is enjoying what I do”) and challenge (“I enjoy trying to solve complex problems”). The extrinsic motivation secondary scale includes outward (“I am strongly motivated by the recognition I can earn from other people.”) and compensation (“I am strongly motivated by the [grades] [money] I can earn.”). The WPI was originally designed with individual items rated on a Likert-type scale from 1 (Never or almost never true of me) to 4 (Always or almost always true of me). However, this study adapted the WPI to a True/False format to reduce respondent burden and ease item interpretation. The WPI exhibits meaningful factor structures, adequate internal consistency, short-term test-retest reliability, and long-term stability (Cronbach's α = 0.70–0.76; Amabile et al., 1994; Loo, 2001). Additionally, WPI scores are associated with other motivation questionnaires, behavioral measures, personality traits, attitudes, and behaviors (Loo, 2001; Stuhlfaut, 2010). Higher scores indicate greater motivation (summing true responses per participant). The WPI was administered to all participants before the randomization to group interventions. The prompt was: “The following statements describe different attitudes towards work [school]. Please

read each statement carefully and circle either TRUE if the statement is true or mostly true for you or FALSE if the statement is false or mostly false for you.”

2.4. Statistical analyses

This study investigated the degree to which the three treatment outcome indices (e.g., cognitive gains, role gains, social gains) were related to baseline scores of motivation using correlational analyses. Gain scores were calculated using the following equations: (1) 6 months – baseline, and (2) 12 months – baseline. Of note, cognitive gain scores were collapsed between the two treatment conditions (CR, HBT) to maximize statistical power due to the study’s low sample size. There were no significant differences in the strength of associations between motivation measures and cognitive and functional gains between the two treatments conditions (z 's < 1.18, p 's > 0.11). Partial Spearman correlations were used to account for the group therapeutic intervention arms and the non-normal distribution for treatment gain indices. In the first set of analyses, this study examined the predictive associations between baseline motivation for group therapeutic intervention (via the SIMS) and cognitive gains. In the second set of analyses, predictive associations between baseline motivation for work/school (via the primary scales of the WPI) and later role and social functioning gains were examined. In exploratory analyses, this study examined links between the secondary scales (enjoyment, challenge, outward, compensation) of the WPI and functioning gain indices only if significant associations were observed between the primary scales of the WPI and functioning gain indices. All tests were two-tailed. The various motivation summary scores were normally distributed (skew <1.0, kurtosis <1.0). All available treatment gain scores were examined to increase statistical power and to be consistent with the parent study’s intent-to-treat analyses.

3. Results

3.1. Descriptive and demographic data

Table 1 presents descriptive statistics. As reported by Nuechterlein et al. (2022), demographic and clinical characteristics did not significantly differ between treatment conditions (CR vs. HBT). Demographic characteristics (e.g., gender, race, ethnicity, education) were generally unrelated to the three treatment gain indices and baseline motivation measures. As seen in Table 1, there was wide variability in gains for all three treatment outcome indices.

3.2. Associations between motivation for group therapeutic intervention and cognitive gains

Table 2 presents the results of the primary analyses. The prediction of 6-month cognitive gain from baseline scores of motivation for group therapeutic interventions did not reach significance. However, associations between baseline external regulation and identified regulation for group therapeutic interventions and cognitive gains were approaching statistical significance at 6 months (r s = 0.33, p 's < 0.10).

Baseline scores of identified regulation (r s = 0.37, p < .05) and intrinsic motivation (r s = 0.49, p < .01) for group therapeutic intervention were significantly predictive of cognitive

gains at 12 months. Other aspects of motivation for group intervention did not predict cognitive gains at 12 months.

3.3. Associations between motivation for work/school and functioning gains

Baseline intrinsic motivation for work/school on the WPI was predictive of greater role gains at 6 months ($r_s = 0.36, p < .05$; see Table 3), and showed a similar but nonsignificant directional tendency at 12 months ($r_s = 0.26, p = .15$). Baseline scores of extrinsic motivation for work/school were not significantly linked with role gains at 6 or 12 months (r_s 's $< 0.13, p > .50$).

Similar to role gains, baseline scores of intrinsic motivation for work/school were significantly predictive of social gains at 6 months ($r_s = 0.37, p < .05$), and approached statistical significance for social gains at 12 months ($r_s = 0.32, p < .10$). Interestingly, extrinsic motivation for work/school significantly predicted social gains at 12 months ($r_s = 0.35, p < .05$).

The significant relationships between baseline motivation measures and treatment gain indices did not substantially change even when covarying for baseline cognitive and functional scores.

3.4. Exploratory analyses

Using the secondary scales from the WPI, baseline intrinsic motivation: challenge for work/school was predictive of greater role improvements at 6 months ($r_s = 0.42, p < .05$; see Table 4), while baseline scores of intrinsic motivation: enjoyment for work/school were predictive of greater social gains at 6 months ($r_s = 0.45, p < .01$). Extrinsic motivation: outward for work/school was significantly associated with social gains at 12 months ($r_s = 0.42, p < .05$), and approached significance at 6 months ($r_s = 0.31, p < .10$). The WPI secondary scales were not significantly predictive of role gains at 12 months ($|r_s$'s $< 0.27, p > .13$).

4. Discussion

This study investigated the predictive relationships between baseline intrinsic and extrinsic motivation and treatment outcomes in individuals with a recent first episode of schizophrenia. Higher baseline scores of intrinsic motivation for group therapeutic interventions predicted significantly greater cognitive gains at 12 months and approached significance at 6 months. Additionally, baseline scores of intrinsic motivation for work/school predicted role and social gains at 6 months, with similar directional tendencies observed at 12 months. Extrinsic motivation, on the other hand, showed no consistent association with treatment outcomes, except for extrinsic motivation for work/school, which was linked to greater social functioning gains at 12 months. These findings have clear treatment implications, considering the substantial variability in treatment response within CSC programs for first-episode schizophrenia. Overall, these findings provide insight into reasons for suboptimal treatment outcomes for first-episode schizophrenia and indicate modifiable personal variables that can improve response in CSC.

Consistent with prior literature (Bryce et al., 2018; Choi and Medalia, 2010), our findings suggest that greater intrinsic motivation, specifically as related to enjoyment and usefulness for group therapeutic interventions, can predict and likely contribute to cognitive gains. These results make intuitive sense for participants who received group-based cognitive remediation as part of the RCT from the parent study. However, participants randomized to the healthy behavior training group therapeutic arm experienced cognitive gains as well and these were predicted by baseline intrinsic motivation (Nuechterlein et al., 2022). Initial intrinsic motivation, characterized by a strong sense of treatment's worth and pleasure, may lead to sustained engagement in treatment and attendance of a meaningful number of sessions, especially for a clinical trial protocol as intensive and extended as the one in the current study. Research suggests the value of targeting intrinsic motivation to improve treatment outcomes. Choi and Medalia (2010) demonstrated that systematically enhancing intrinsic motivation for cognitive interventions resulted in greater cognitive gains compared to a control condition in adults with schizophrenia. Moreover, 2–3 sessions of motivational interviewing (MI), which is a person-centered therapeutic approach that strengthens intrinsic motivation for positive behavior change before cognitive remediation have been found to increase motivations attributed to cognitive learning and subsequent session attendance (Fiszdon et al., 2016, 2022). MI can enhance intrinsic motivation by exploring the participant's views about their cognitive abilities, providing individualized feedback about cognitive function (based on baseline cognitive performance), and providing information on how cognition can be improved through cognitive remediation. MI can also enhance identified regulation by having open-ended discussions about the participant's cognitive problems and related life impacts and conducting a decisional balance activity regarding pursuing a goal. Boosting attendance via motivation enhancement techniques is particularly relevant, given our previous reports indicating that successful outcomes from an intensive cognitive remediation plus exercise protocol were associated with higher attendance and homework completion rates (Le et al., 2023; Nuechterlein et al., 2023). Providing in-session opportunities for interaction with a "cognitive coach" during cognitive training, as well as interactions with peers during bridging discussions, may also enhance competence, autonomy, and relatedness that underlie intrinsic motivation based on Self-Determination Theory (Medalia and Bowie, 2016; Medalia and Freilich, 2008; Teixeira et al., 2012). It is worth noting that associations between baseline external regulation (i.e., extrinsic motivation) for group intervention and cognitive gains approached statistical significance at 6 months. While this association should be interpreted with caution, externally regulated behaviors (motivated by rewards or the need to comply) might have a role in facilitating early engagement that could lead to cognitive improvement.

The other primary finding was that baseline intrinsic motivation for work/school predicted greater role and social functional gains at 6 months, with similar directional tendencies observed at 12 months. Thus, intrinsic motivation plays a predictive role in both cognitive gains and everyday functioning. Our findings expand upon prior literature such that, which found that greater baseline intrinsic motivation was associated with better employment outcomes among patients with long-term schizophrenia who participated in multi-month vocational rehabilitation programs (Reddy et al., 2016; Saperstein et al., 2011). In exploratory analyses, intrinsic motivation related to challenge-seeking for work/school

was strongly associated with greater role functioning gains at 6 months. It may be that individuals who prefer complex tasks to demonstrate competence and mastery are more likely to seek employment or pursue further education. Interestingly, intrinsic motivation related to enjoyment uniquely predicted social gains at 6 months. This may indicate that part of the enjoyment derived from work and school stems from social aspects, such as social networking and a sense of community. Further research is needed to examine how baseline motivation for work/school influences outcomes in supported employment programs within CSC, which are known to boost work/school outcomes (Killackey et al., 2019; Nuechterlein et al., 2020). Moreover, emerging digital interventions such as Moderated Online Social Therapy (Alvarez-Jimenez et al., 2021) might be utilized to enhance motivation and improve outcomes in both role and social functioning.

This investigation has several limitations. First, our sample size was relatively small, which limited the statistical power and generalizability of the findings. Additionally, the limited sample size prevented us from assessing the specificity of predictors for cognitive and functional gains in the CR vs. HBT group interventions. Second, the study did not assess other potential predictors that could also influence treatment response in schizophrenia, such as internalized/externalized stigma, economic disincentives, substance use history, dysfunctional beliefs, self-esteem, or social support (Barlati et al., 2018; Dixon et al., 2016; Granholm et al., 2017; Mahmood et al., 2022; Rabinovitch et al., 2009). Third, the study employed motivational measures (e.g., SIMS, WPI) that have not been previously used in treatment outcomes research for schizophrenia. Measures such as the Intrinsic Motivational Inventory (IMI-SR; Choi et al., 2010) have mainly been utilized within the context of cognitive training and provide increased specificity by separating task-specific intrinsic motivation into three domains: value/utility, perceived choice, and interest/enjoyment. However, the SIMS and WPI have similar subscales that are based on Self-Determination Theory. Fourth, this study included participants who consented to receive treatment in a research-based clinic. In theory, the Aftercare Research Program might have attracted participants who had a relatively high baseline level of motivation for treatment compared to those receiving care at community-based psychiatric clinics that accept patients regardless of their level of interest in participating in research. Lastly, as previously mentioned, the Aftercare Research Program is relatively unique in that it assesses and targets cognitive functioning. Future research is needed to examine how initial motivation for other common intervention components of CSC (i.e., pharmacotherapy, individual psychotherapy, family support, peer recovery services, vocational/education support, and substance use support) predict work, school, and social outcomes.

The findings of this study suggest that evaluating and addressing motivational deficits may be beneficial for improving treatment outcomes in CSC for first-episode schizophrenia. Specifically, individuals with low intrinsic motivation for group therapeutic interventions and work/school may benefit from structured motivational enhancement strategies initially in CSC programs that seek to improve cognitive deficits and promote psychosocial recovery. These results need to be replicated in future trials with larger samples, across diverse clinical settings, and consideration of other person-level, program, and socioeconomic variables may provide a broader context for these results. A deeper understanding of the role of baseline intrinsic motivation for group interventions and work/school may aid in

developing additional methods to optimize the benefits of early intervention services and in comprehending the heterogeneity in treatment outcomes during this period.

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Table 1Descriptive and demographic data ($N = 40$)

Variable	<i>M (SD) or % or Range</i>
Demographics	
Age	22.5 (4.3)
Gender (% identified male)	77 %
Race	
White	25 %
Black	25 %
Asian American	15 %
Other	38 %
Ethnicity	
Hispanic	30 %
Education	12.5 (1.6)
Time since Psychosis Onset (in months)	6.6 (5.2)
Schizophrenia diagnosis	59 %
BPRS symptoms ^a	
Positive Symptoms	1.7 (0.6)
Negative Symptoms	1.8 (0.9)
Depression/Anxiety	1.6 (0.5)
Agitation	1.1 (0.2)
Situational Motivation Scale ^a	
Amotivation	12.0 (5.3)
External Regulation	17.6 (6.7)
Identified Regulation	19.8 (5.1)
Intrinsic Motivation	16.8 (5.6)
Work Preference Inventory ^a	
Extrinsic Motivation	9.1 (2.3)
Intrinsic Motivation	10.2 (2.7)
Treatment Outcomes ^a	
MCCB Overall Composite T-score	29.4 (12.7)
GFS: Role	4.1 (2.1)
GFS: Social	6.0 (1.9)
Range of Treatment Gain Scores ^b	
Cognitive Gains: 6 months	- 11-22
Cognitive Gains: 12 months	- 19-17
Role Gains: 6 months	- 6-7
Role Gains: 12 months	- 4-6
Social Gains: 6 months	- 2-4
Social Gains: 12 months	- 1-4

^aBaseline scores.

^bTreatment gain scores measured by increases in score/rating relative to baseline score/rating; BPRS = Brief Psychiatric Rating Scale; MCCB = MATRICS Consensus Cognitive Battery

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Table 2

Correlations between baseline domains of motivation for group therapeutic intervention (SIMS) and later cognitive gains

	Cognitive Gains 6 months	Cognitive Gains 12 months
Baseline Amotivation	– 0.08	– 0.07
Baseline External Regulation	.33 ^t	0.15
Baseline Identified Regulation	.30 ^t	0.37 [*]
Baseline Intrinsic Motivation	0.25	0.49 ^{**}

Note. SIMS = Situational Motivation Scale. Cognitive gains were increases in Overall Composite T-scores on the MATRICS Consensus Cognitive Battery.

^t
 $p < .10$.

^{*}
 $p < .05$.

^{**}
 $p < .01$.

Table 3

Correlations between baseline motivation for work/school (WPI) and later functioning gains

	Role Gains 6 months	Role Gains 12 months	Social Gains 6 months	Social Gains 12 months
Baseline Extrinsic Motivation	0.12	0.10	0.06	0.35*
Baseline Intrinsic Motivation	0.36*	0.26	0.37*	.32 ^t

WPI = Work Preference Inventory. Functional gains measured by increases of ratings on the Global Functioning Scale Role and Social items.

^t
 $p < .10$.

*
 $p < .05$

Table 4

Correlations between Work Preference Inventory subdomains at baseline and later functioning gains

	Role Gains 6 months	Role Gains 12 months	Social Gains 6 months	Social Gains 12 months
Baseline EM: outward	- 0.11	- 0.22	.31 ^t	0.43 [*]
Baseline EM: compensation	0.18	0.21	- 0.24	- 0.06
Baseline IM: challenge	0.42 [*]	0.27	0.17	0.28
Baseline IM: enjoyment	0.10	0.11	0.45 ^{**}	0.22

Note. EM = Extrinsic Motivation; IM = Intrinsic Motivation

^t
 $p < .10$.^{*}
 $p < .05$.^{**}
 $p < .01$

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