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Integrated Cognitive-Behavioral Social Skills Training and Compensatory Cognitive Training for Negative Symptoms of Psychosis: Effects in a Pilot Randomized Controlled Trial

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Objective: **Negative symptoms and cognitive impairment in schizophrenia (SZ) remain unmet treatment needs as they are highly prevalent, associated with poor functional outcomes, and resistant to pharmacologic treatment. The current pilot randomized controlled trial examined the efficacy of an integrated Cognitive-Behavioral Social Skills Training and Compensatory Cognitive Training (CBSST-CCT) intervention compared to Goal-focused Supportive Contact (SC) on negative symptoms and cognitive performance.** ***Methods:*** **Fifty-five adults with SZ or schizoaffective disorder with moderate-to-severe negative symptoms were randomized to receive 25 twice-weekly, 1-h manualized group sessions (12.5 weeks total duration) of either CBSST-CCT or SC delivered by master's level clinicians in five community settings. Assessments of negative symptom severity (primary outcomes) and neuropsychological performance, functional capacity, social skills performance, and self-reported functional ability/everyday functioning, psychiatric symptom severity, and motivation (secondary outcomes) were administered at baseline, mid-treatment, post-treatment, and 6-month follow-up.** ***Results:*** **Mixed-effects models using baseline, mid-treatment, and post-treatment data demonstrated significant CBSST-CCT-associated effects on negative symptom severity, as assessed by the Scale for the Assessment of Negative Symptoms (p = .049, r = 0.22), with improvements in diminished motivation driving this effect (p = .037, r = 0.24). The CBSST-CCT group also demonstrated improved verbal learning compared to SC participants (p = .026, r = 0.36). The effects of CBSST-CCT appeared to be durable at 6-month follow-up.** ***Conclusions:*** **CBSST-CCT improved negative symptom severity and verbal learning in high-negative-symptom individuals relative to SC. CBSST-CCT warrants larger investigations to examine its efficacy in treating negative symptoms, along with other symptoms, cognition, and, ultimately, real-world functional outcomes. Clinical Trial registration number NCT02170051.**

Key words: psychosis/severe mental illness/cognitive rehabilitation/psychosocial intervention

Introduction

Schizophrenia is a debilitating mental illness associated with functional impairment, diminished quality of life, and premature mortality.[1–3] The disorder affects over 3 million people in the United States alone, and costs billions of dollars annually in terms of treatment, caregiving, and lost productivity.[4,5] Relative to positive symptoms of schizophrenia, negative symptoms like amotivation and anhedonia are especially problematic, as they are highly prevalent among those afflicted,[6,7] and lead to poor functional outcomes and quality of life.[8,9] Indeed, the NIMH-MATRICS consensus statement on negative symptoms of schizophrenia emphasized the need to develop and evaluate new treatments to reduce negative symptoms.[10] Similarly, the NIMH-MATRICS consensus statement on cognition emphasized the need for treatments of cognitive impairments to improve functioning in those with schizophrenia.[11] Impaired cognition is associated with negative symptoms and functional impairments,[12] and is a core feature of schizophrenia.[13] Effective pharmacologic treatments for negative symptoms and cognitive impairments have not been identified,[14] but psychosocial treatments have shown more promising results, with

improvements found for both negative symptoms[14–17] and cognition.[18] Clinical trials of interventions specifically designed to improve negative symptoms, cognition and, ultimately, functioning are especially needed.[19]

Two interventions that have shown promise for treating negative symptoms and cognitive impairments in schizophrenia are Cognitive-Behavioral Social Skills Training (CBSST)[20–24] and Compensatory Cognitive Training (CCT).[25–28] CBSST combines elements of Cognitive Behavioral Therapy (CBT) and Social Skills Training (SST), both evidence-based treatments for schizophrenia.[14,29–32] Some studies have demonstrated durable improvements in negative symptom severity in CBT, though most studies have measured negative symptom reduction only as a secondary outcome.[14,33–36] A few studies have found moderate effects on negative symptom severity as a primary outcome.[29,32,37,38] However, a number of reviews and meta-analyses have suggested that CBT does not significantly reduce negative symptom severity,[39–41] and some authors have noted that CBT could be difficult to deliver due to its high cognitive load or could place undue stress on individuals with high levels of negative symptoms.[42]

SST is also associated with improvements in negative symptoms and cognitive functioning.[14,29,30,43,44] The effects of CBT and SST appear most pronounced when combined with other treatments; they have demonstrated negative symptom decreases when paired with treatments such as family psychoeducation, motivational therapy, and community treatment.[17,29] CBSST has demonstrated small-to-medium effects on negative symptom severity.[24]

CCT is an intervention that uses cognitive strategy training and habit learning to improve prospective memory, attention, learning/memory, and executive functioning.[26,28] Like CBSST, CCT studies have investigated negative symptoms as a secondary outcome, but have shown significant negative symptom improvements.[25,27] Combining elements of CCT, CBT, and SST may prove beneficial, as each treatment modality targets different areas of functioning related to negative symptom severity. The CBT component of CBSST addresses defeatist beliefs, which have been associated with negative symptoms,[45–47] as a possible mechanism of change, whereas SST promotes social engagement and behavioral rehearsal.[43] CCT teaches strategies to implement skills,[28] which promotes self-reliance and compensation for cognitive deficits. Because CCT may also improve intervention adherence and skill learning via prospective memory and learning strategies, CCT and CBSST may have synergistic effects.

The current study was a pilot randomized controlled trial comparing an integrated CBSST and CCT intervention (CBSST-CCT) to a goal-focused Supportive Contact (SC) control condition, using a parallel-group design with all treatments provided by masters-level therapists. The CBSST-CCT intervention integrated the CBT and SST content of CBSST with the compensatory strategies of CCT, to specifically target negative symptoms of schizophrenia in a sample with high negative symptom severity. We have published previously on the feasibility and acceptability of the study procedures and intervention.[48] We hypothesized that compared to the SC group, participants in the CBSST-CCT group would show significantly greater improvements in: (1) negative symptom severity (primary outcome), (2) cognition, (3) functioning, and (4) defeatist beliefs and motivation.

Methods

Experimental Design

In a randomized controlled trial, participants with schizophrenia or schizoaffective disorder were randomized to receive twenty-five 1-h sessions of either CBSST-CCT or SC. Two masters-level therapists provided both interventions at five separate locations in San Diego County (a board and care facility, a County-funded clubhouse, and three County-funded outpatient mental health clinics). Participants within each site were randomly assigned to treatment conditions using a 1:1 allocation ratio via a randomization list generated online (www.randomization.com). EWT revealed the group assignments to the study clinicians, and participants were aware of their group assignment. Assessments were administered by blind raters at baseline, midway through treatment (6 weeks), post-treatment (12.5 weeks), and 6-month follow-up.

Participants

Sixty-four participants were enrolled in the study; however, nine participants were withdrawn because they did not meet diagnostic criteria, leading to a final sample size of 55 (see Figure 1 for CONSORT Flow Diagram). Participants were included if they met the following criteria: (1) ability to provide voluntary informed consent, (2) Age 18–65, (3) DSM-IV diagnosis of schizophrenia or schizoaffective disorder based on Structured Clinical Interview for DSM-IV (SCID-IV),[49] (4) Moderate to severe negative symptoms on the Clinical Assessment Interview for Negative Symptoms (CAINS; total score >19),[50] (5) at least 6th-grade reading level on the WRAT-4 Reading subtest,[51] and (6) Stable on psychiatric medications for the past three months. Exclusion criteria were: (1) Prior CBT, SST, or CCT in the past 5 years, (2) Severe positive symptoms on the Brief Psychiatric Rating Scale (BPRS Delusions, Disorganization, or Hallucinations >5),[52] (3) Severe depression on the Calgary Depression Scale for Schizophrenia (CDSS; >8),[53] (4) Ocular damage/disease/surgery/medications that affect pupil dilation (pupillary response was used as a measure of motivation and effort and will be reported separately), (5) DSM-IV alcohol or substance dependence diagnosis in

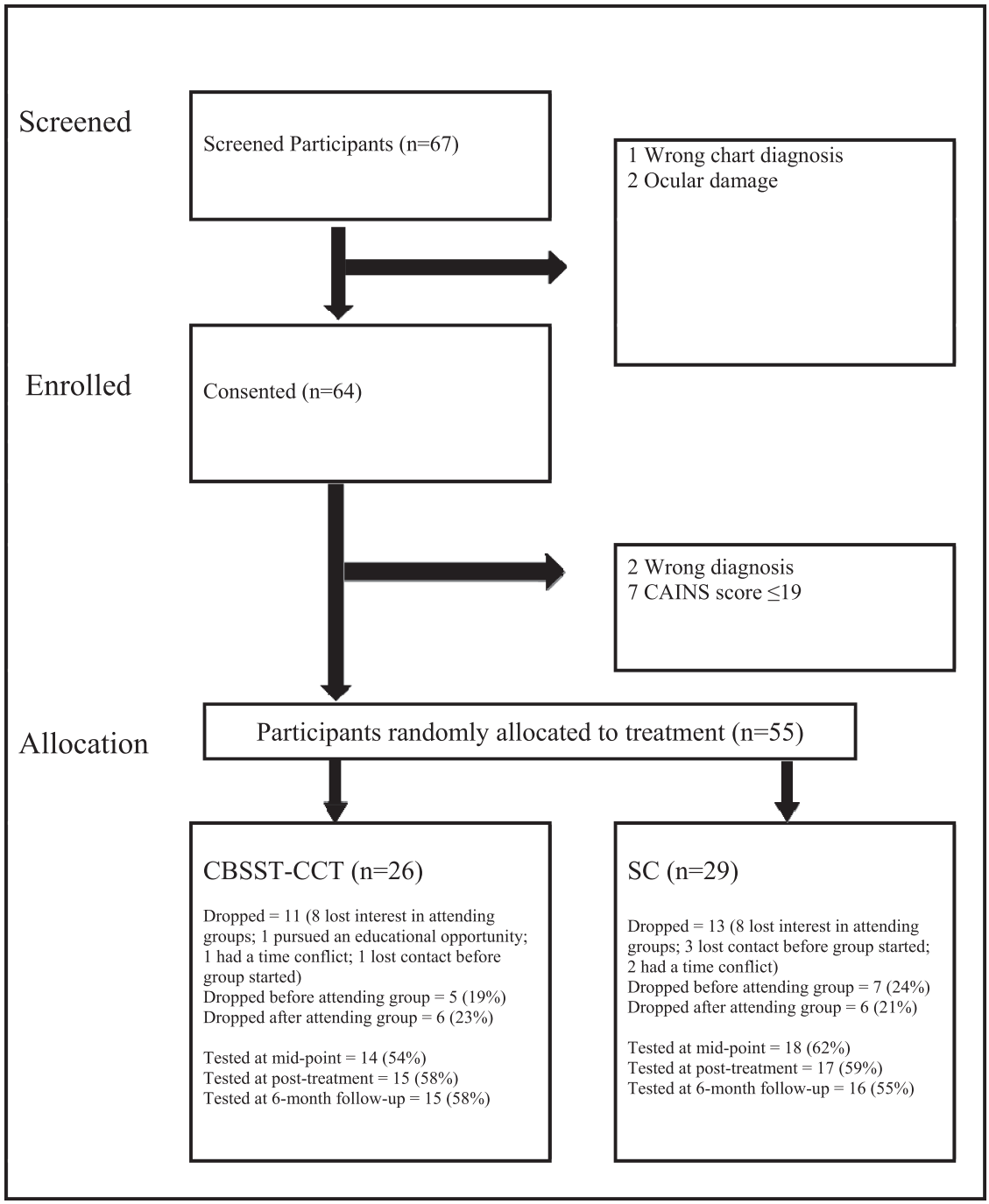

Fig. 1. CONSORT flow diagram.

past 6 months, and (6) Level of care required would interfere with outpatient therapy (eg, hospitalized; severe medical illness). The University of California San Diego Institutional Review Board approved the study (clinical trial registration number NCT02170051).

Interventions

CBSST-CCT. See Table 1 for an overview of CBSST-CCT integration. Modules of the integrated CBSST-CCT treatment included cognitive training, cognitive skills, social skills, and problem-solving skills. An initial cognitive training module included compensatory strategies focusing on prospective memory, attention, and learning and memory. These skills were presented first to enhance attention, learning, and memory to assist with the learning of CBSST content. The CBSST portions of treatment (ie, modules on cognitive skills, social skills, and problem solving) were modified to strengthen the impact on negative symptoms by focusing on challenging defeatist

Table 1. Integration of CBSST and CCT by Content Area

CBSST		CCT
Cognitive Training Module: 8 sessions		
	CCT domains and strategies:	
	Prospective memory	Calendar use; to-do lists; prioritizing tasks; linking tasks together with cues; placing items in automatic places; use of routines to automate tasks
	Attention and vigilance	Active listening during conversations (limit distractions, eye contact, asking questions, paraphrasing); taking breaks to refocus
	Learning and memory	Note taking; paraphrasing: association of novel and already learned information; chunking; categorization; acronyms; visual imagery; overlearning
Cognitive Skills Module: 5 sessions		
Introduce CBT concepts, including relationships between thoughts, actions, and feelings; automatic thoughts; thought challenging by examining evidence for beliefs; mistakes in thinking		
Address symptoms and challenge defeatist beliefs that interfere with real-world skill performance		
Help participants learn and remember to use their CBT skills		
Social Skills Module: 6 sessions		
Practice communication skills and psychosocial interactions (e.g., asking someone for support) via behavioral role plays	Practice conversational attention skills to improve cognitive aspects of communication and social communication	
Practice expressing positive and negative feelings, making requests, sharing feelings, and communicating assertively		
Address self-efficacy and defeatist performance beliefs		
Problem Solving Skills Module: 6 sessions		
Improve basic problem-solving skills	Practice cognitive flexibility and planning strategies in addition to problem-solving	
Develop plans to solve real-world problems and improve illness self-management	Practice self-talk and self-monitoring while problem-solving	
	Practice hypothesis testing using pro and con evidence	
	Reinforce cognitive flexibility strategies to help participants realize when they should try a different strategy to achieve their goals	
Behavioral activation to improve negative symptoms		
Develop confidence in effective problem-solving	Use repetition and practice of executive skills to increase confidence	

performance beliefs, adding motivational interviewing techniques, targeting affect expression and recognition, and adding behavioral activation components. These modules were CBSST-focused, but still included some CCT strategies (eg, conversational attention strategies in the social skills module, cognitive flexibility and planning strategies in the problem-solving skills module).

Goal-Focused Supportive Contact (SC). SC provided the same amount of therapist and group member contact as CBSST-CCT. The SC intervention primarily focused on individual recovery goals (eg, living situation, education, work, or social relationships). The focus on personalized recovery goals was intended to increase motivation and reduce drop-out. The semi-structured treatment sessions included check-ins about symptoms, discussion about setting and working toward recovery goals, psychoeducation, and empathic support. Sessions also included non-directive reinforcement of goal-setting and planning. Participants receiving SC were not trained in cognitive-behavioral coping strategies, social skills, problem solving, or compensatory cognitive strategies.

All participants continued to receive their current treatments, including pharmacotherapy, with their current providers during the study. All treatment sessions were audio recorded; a random 20% of the sessions were selected and evaluated for fidelity using a measure adapted from the Cognitive Therapy Scale for Psychosis (CTS-Psy)[54] and the Social Skills Training Fidelity Scale,[55] as well as items to capture CCT interventions.

Measures

Symptom Severity. Negative symptom severity was measured using two interviewer-rated scales, the Clinical Assessment Interview for Negative Symptoms (CAINS)[50] and the Scale for the Assessment of Negative Symptoms (SANS).[56] The CAINS included the Motivation and Pleasure (MAP) and Expression subscales. Based on factor analytic studies of the SANS,[57–59] two negative symptom factors of *diminished expression* and *diminished motivation* were also derived. Positive symptoms were measured using the positive symptom subscale of the expanded Brief Psychiatric Rating Scale (BPRS).[52] Depression was assessed using the Calgary Depression Scale for Schizophrenia.[53] Insight into symptoms was measured using the self-report Birchwood Insight Scale.[60]

Cognitive Measures. Neurocognition was assessed with the MATRICS Consensus Cognitive Battery (MCCB),[61] a battery designed for repeated assessment of neurocognitive abilities relevant in schizophrenia. Administered subtests from the battery included measures of processing speed (Trail Making Test, Part A; Brief Assessment of Cognition in Schizophrenia Symbol-Coding; and Category Fluency), sustained attention (Continuous Performance Test—Identical Pairs), working memory (Wechsler Memory Scale-III Spatial Span and University of Maryland Letter-Number Span), verbal learning (Hopkins Verbal Learning Test—Revised [HVLT-R]), visual learning (Brief Visual Memory Test—Revised), and reasoning and problem solving (Neuropsychological Assessment Battery [NAB] Mazes). All *T*-scores were corrected for age, gender, and education. A global composite score was calculated for the entire battery, which was calculated by averaging adjusted *T*-scores across all individual tests.

Functioning. Self-reported daily living skills were assessed using the Specific Levels of Functioning Scale (SLOF),[62] which included the average of the interpersonal relationships, activities, and work skills subdomain scores. Living skills were also assessed using the Independent Living Skills Scale (ILSS).[63] Performance-based functional capacity was assessed using the UCSD Performance-Based Skills Assessment-Brief (UPSA-B)[64] wherein participants were asked to complete life-like financial and communication tasks. Performance-based social competence was assessed using the Social Skills Performance Assessment (SSPA),[65] where participants role-played two social scenarios.

Defeatist Beliefs and Motivation. Asocial beliefs were assessed using the Asocial Belief Scale,[66] and defeatist performance beliefs were assessed using the Defeatist Performance Attitude Scale (DPAS), a 15-item subscale of the Defeatist Attitude Scale.[45] Intrinsic motivation was evaluated using 3 items (sense of purpose, motivation, curiosity) from the Heinrichs-Carpenter Quality of Life Scale (QLS-3).[67]

Statistical Analyses

Baseline differences by intervention group were examined using independent samples *t*-tests for continuous variables and chi-square tests for categorical variables. Mixed-effects models were fitted to the data using R[68] with the lme4[69] and lmerTest[70] packages to examine treatment efficacy by evaluating group differences in the longitudinal trajectories of the primary and secondary outcomes over the intervention period. Maximum likelihood estimation was used. All available data from all randomized participants were included in analyses, consistent with the intent to treat approach. The random intercepts for individuals were included in all models. Time in weeks was included in the model as a continuous predictor (with 0 [baseline] as the reference point), and treatment group (CBSST-CCT [1]; SC [0]) was included in the model as a categorical predictor. Participants in the SC group were, on average, significantly older than CBSST-CCT group participants (Table 2), so baseline age (grand-mean centered) was included as a covariate in all models, except for objective cognitive-outcome models given the use of age-adjusted scores. Additionally, models included the fixed effects of group, time, and the group-by-time interaction. Given the novelty of the integrated CBSST-CCT intervention and that this is a pilot clinical trial, significance values were not adjusted for multiple tests, and we focused on effect sizes for all

Table 2. Baseline Demographic, Clinical, and Assessment Characteristics (n = 55)

	CBSST-CCTMean (SD) (n = 26)	SC Mean (SD) (n = 29)	t or chi-square (or use symbol for chi-square)	P-value	Effect Size (Cohen's d)
Demographic characteristics					
Age (years)	47.73 (11.36)	53.24 (7.35)	2.16	**.035**	−0.58
Education (years)	12.04 (1.69)	11.72 (2.63)	−0.52	.605	0.14
Race/ethnicity (% White-NH)	27%	52%	3.51	.061	0.25*
Gender (% Male)	65%	55%	0.60	.440	−1.04*
Currently employed (%)	4%	7%	0.25	.619	−0.67*
Symptom severity					
CAINS total	27.31 (5.68)	27.59 (5.00)	0.19	.847	−0.05
CAINS motivation and pleasure	25.27 (3.88)	25.83 (4.04)	0.52	.604	−0.14
CAINS expression	2.04 (3.00)	1.76 (2.23)	−0.40	.694	0.11
SANS total	9.00 (2.74)	8.72 (2.43)	−0.40	.694	0.11
SANS diminished motivation	21.81 (4.36)	22.24 (3.43)	0.41	.682	−0.11
SANS diminished expression	4.92 (5.70)	4.00 (5.32)	−0.61	.542	0.13
BPRS positive symptoms	5.38 (1.98)	5.24 (2.13)	−0.26	.798	0.07
Birchwood Insight Scale	9.04 (2.16)	8.79 (2.25)	−0.41	.682	0.11
Calgary Depression Scale	1.35 (1.70)	2.07 (1.73)	1.56	.124	−0.42
Functioning					
SSPA total score	3.09 (0.54)	2.95 (0.49)	−1.03	.309	0.27
UPSA total score	60.04 (19.09)	66.48 (15.85)	1.37	.178	−0.37
SLOF functional composite	3.90 (0.65)	3.75 (0.85)	−0.74	.465	0.20
ILSS composite score	0.82 (0.06)	0.79 (0.05)	−1.72	.092	0.54
Cognition					
WRAT-4 reading subtest	88.88 (12.48)	93.21 (10.00)	1.42	.160	−0.38
MCCB global	35.70 (7.92)	38.10 (9.71)	0.98	.330	−0.27
MCCB processing speed	31.56 (13.86)	34.55 (12.51)	0.83	.408	−0.23
MCCB attention/vigilance	36.87 (11.57)	33.96 (14.08)	−0.78	.440	0.23
MCCB working memory	29.84 (12.70)	33.86 (14.30)	1.09	.283	−0.30
MCCB verbal learning	35.00 (5.64)	38.03 (12.10)	1.15	.256	−0.32
MCCB visual learning	33.64 (10.73)	36.48 (13.65)	0.84	.404	−0.23
MCCB reasoning/problem solving	40.44 (8.98)	43.90 (11.65)	1.21	.233	−0.33
Defeatist beliefs and motivation					
Asocial Belief Scale	6.65 (3.90)	6.59 (3.16)	−0.07	.944	0.02
Defeatist attitudes (DPAS)	49.00 (17.90)	56.10 (12.89)	1.70	.095	−0.46
Intrinsic motivation (QLS – 3 items)	6.31 (2.60)	7.14 (2.40)	1.23	.224	−0.33

*φ.
Bold font denotes p<.05. BPRS = Brief Psychiatric Rating Scale; CAINS = Clinical Assessment Interview for Negative Symptoms; DPAS = Defeatist Performance Attitude Scale; ILSS = Independent Living Skills Survey; MCCB = MATRICS Consensus Cognitive Battery; QLS = Quality of Life Scale; SANS = Scale for the Assessment of Negative Symptoms; SLOF = Specific Levels of Functioning Scale; SSPA = Social Skills Performance Assessment; UPSA = University of California San Diego Performance Assessment; WRAT = Wide Range Achievement Test.

analyses. Effect sizes are reported as correlation coefficients estimated from t statistics and degrees of freedom for the mixed-effect model regression parameter estimates and interpreted as follows: small = 0.10; medium = 0.30; large = 0.50.[71]

Finally, through exploratory analyses, we considered the durability of treatment effects for those variables that showed significant CBSST-CCT effects at post-treatment by examining the average change from treatment endpoint to 6-month follow-up in additional mixed-effects models.

Results

A total of 55 participants were randomized (see Figure 1), but 12 participants did not attend any group sessions

(CBSST-CCT: $N = 5$ [19%]; SC: $N = 7$ [24%]) and an additional 6 participants in each treatment group dropped out after starting groups, resulting in a total dropout rate of 42% in CBSST-CCT and 45% in SC. There were no group differences in any baseline demographic, clinical, or outcome measures between those who dropped out and those who did not. For the total sample, the mean number of sessions attended was 8.65 (SD = 8.16; range 0–25) for CBSST-CCT and 10.41 (SD = 9.30; range 0–25) for SC. For more information about acceptability and treatment fidelity, see Mahmood et al.[48]

Table 2 shows the baseline demographic, clinical, and outcome measure characteristics. The CBSST-CCT and SC groups did not differ significantly on any of these variables, except for age; the SC group was, on average, significantly older ($t[53] = 2.16$, $p = .035$, $d = -0.58$).

End of Treatment Effects

Table 3 presents parameter estimates, *P*-values, and effect sizes for the effects of group, time, and the group-by-time interaction for all mixed-effects models through the 12-week intervention period. For SANS total scores, there was a significant group-by-time interaction ($t[1, 75.87] = -2.00$, $P = .049$, $r = -0.22$) such that the CBSST-CCT group showed significantly greater improvement in negative symptom severity compared to the SC group. This effect on negative symptoms was primarily driven by greater improvements in the SANS diminished motivation factor ($t[1, 75.40] = -2.12$, $p = .037$, $r = -0.24$). Compared to those in the SC condition, the CBSST-CCT group also showed greater improvement in verbal learning, as assessed by the HVLT-R ($t[1, 35.36] = 2.32$, $p = .026$, $r = 0.36$), and reasoning and problem solving, as assessed by the NAB Mazes ($t[1, 33.91] = 1.83$, $p = .076$, $r = 0.30$); although the latter did not reach statistical significance. These significant group-by-time interactions are plotted in Figure 2.

Durability Effects at 6-Month Follow-up

Durability analyses comparing change in scores from post-treatment to 6-month follow-up showed no significant group-by-time time effects for post-treatment change in negative symptom severity (SANS total: $t[1, 31.87] = 1.68$, $p = .103$, $r = 0.29$; SANS diminished motivation factor: $t[1, 30.19] = 1.18$, $p = .246$, $r = 0.21$) or verbal learning/memory ($t[1, 31.20] = 0.16$, $p = .873$, $r = 0.03$), suggesting a lack of significant change from intervention endpoint to follow-up.

Discussion

The goals of the current pilot randomized controlled trial were to examine the efficacy of the integrated

Table 3. Mixed Effects Models – Immediate Post-intervention Estimates for Group-by-time Interaction.

		Group × Time			
	Measures	*B*	SE	p	r
Symptom severity	CAINS total	−0.10	0.13	.423	−0.09
	CAINS motivation and pleasure	−0.13	0.11	.245	−0.13
	CAINS expression	0.03	0.06	.540	0.07
	SANS total	**−0.13**	**0.07**	**.049**	**−0.22**
	SANS diminished motivation	**−0.23**	**0.11**	**.037**	**−0.24**
	SANS diminished expression	−0.20	0.14	.141	−0.17
	BPRS positive symptoms	0.02	0.06	.761	0.03
	Birchwood Insight Scale	−0.10	0.06	.115	−0.17
	Calgary Depression Scale	0.03	0.04	.508	0.08
Cognition/Functioning	MCCB global	0.07	0.09	.418	0.14
	MCCB processing speed	0.09	0.17	.602	0.09
	MCCB attention/vigilance	−0.39	0.25	.132	−0.28
	MCCB working memory	−0.08	0.15	.587	−0.10
	MCCB verbal learning	**0.43**	**0.18**	**.026**	**0.36**
	MCCB visual learning	0.09	0.18	.611	0.09
	MCCB reasoning/problem solving	0.34	0.18	.076	0.30
	SSPA total score	0.02	0.01	.211	0.20
	UPSA total score	0.41	0.32	.214	0.21
	SLOF functional composite	−0.01	0.02	.685	−0.05
	ILSS composite score	0.002	0.001	.195	0.15
Defeatist beliefs and motivation	Asocial Belief Scale	−0.08	0.07	.309	−0.12
	Defeatist attitudes (DPAS)	−0.54	0.46	.243	−0.13
	Intrinsic motivation (QLS–3 items)	0.06	0.07	.415	0.09

Bold font denotes $p < .05$. BPRS = Brief Psychiatric Rating Scale; CAINS = Clinical Assessment Interview for Negative Symptoms; DPAS = Defeatist Performance Attitude Scale; ILSS = Independent Living Skills Survey; MCCB = MATRICS Consensus Cognitive Battery; QLS = Quality of Life Scale; SANS = Scale for the Assessment of Negative Symptoms; SLOF = Specific Levels of Functioning Scale; UPSA = University of California San Diego Performance Assessment.

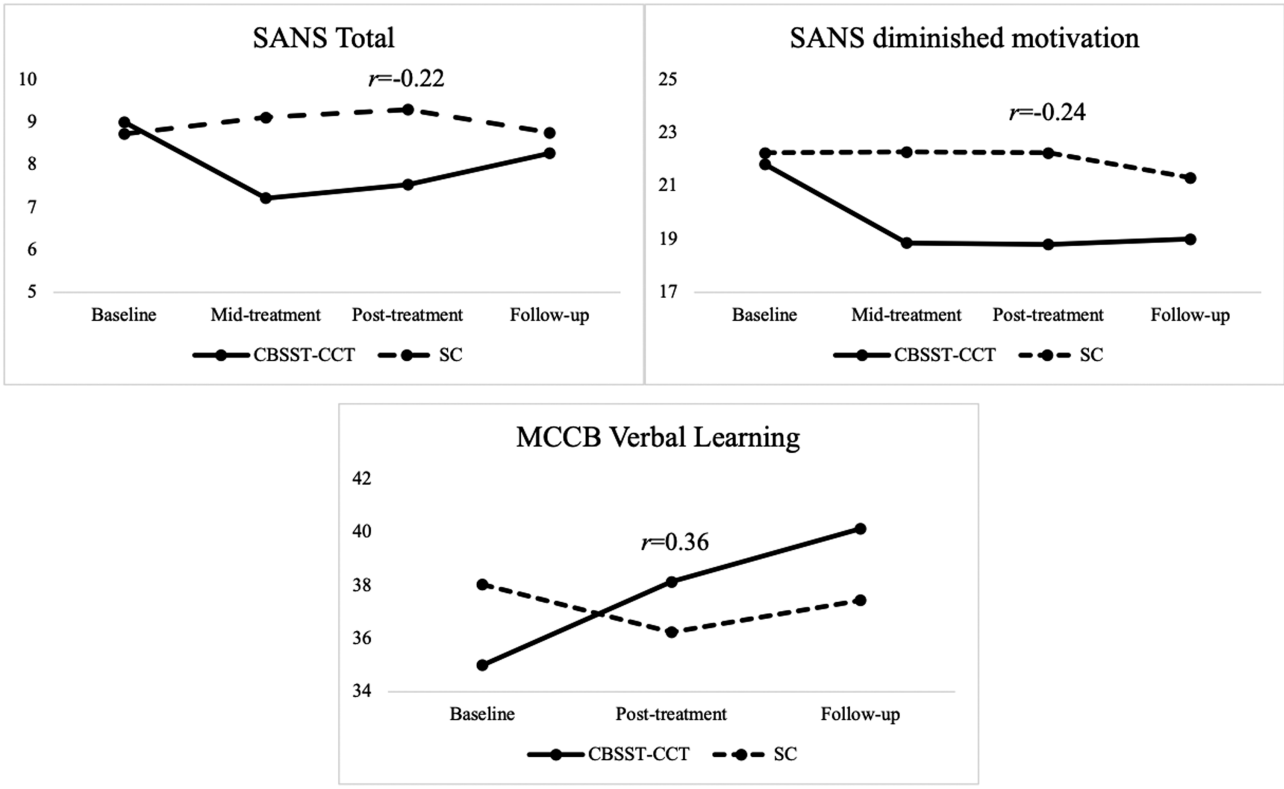

Fig. 2. Mean of outcomes by treatment group. Note: CBSST-CCT = Cognitive Behavioral Social Skills Training/Compensatory Cognitive Training; SC = Goal-focused Supportive Contact; MCCB = MATRICS Consensus Cognitive Battery; SANS = Scale for the Assessment of Negative Symptoms.

CBSST-CCT intervention compared to a robust control condition on negative symptom severity, functioning, and objective cognitive performance in individuals with schizophrenia and elevated negative symptoms. We found small-to-medium effects of CBSST-CCT on overall negative symptom severity, driven by improvements in the diminished motivation factor, as well as verbal learning and memory performance. Additionally, there was a trend toward improvement in reasoning and problem-solving. In terms of long-term training effects, CBSST-CCT-associated improvements in both negative symptom severity and verbal learning/memory were maintained through 6 months, although there was a moderate, but nonsignificant, worsening of negative symptoms over follow-up. Learning and memory are cognitive domains targeted in CBSST-CCT, so it is possible that participants continued utilizing intervention strategies following treatment, which enabled durability of treatment effects over time. It is important to note that the statistically significant improvements in the CBSST-CCT group were detectable even in the context of a small sample size and significant drop-out rates. These findings add to our previous separate randomized controlled trials of CBSST and CCT in schizophrenia that have also demonstrated positive treatment effects on cognition, functioning, quality of life, and negative symptom severity (CBSST).[22,24,27]

The present study has severable notable strengths. To date, few other studies have examined the efficacy of a psychosocial intervention designed specifically for the treatment of negative symptoms in individuals with schizophrenia (see reviews and meta-analysis).[29,72,73] By requiring the presence of moderate-severe negative symptomatology and excluding those with severe depressive or positive symptoms, we minimized the likelihood that negative symptom improvement was secondary to improvement in positive or depressive symptoms; this approach is in line with recommendations from the NIMH-MATRICS Consensus Statement on Negative Symptoms.[10] In addition to its potential synergistic effects, the integrative nature of CBSST-CCT may help to reduce time and cost burdens associated with delivering the interventions separately. Notably, the present study overcame many limitations of prior research (see Elis et al. for review)[29] by including a robust control group, a comprehensive neuropsychological assessment battery, measures of negative symptom severity that include experiential and motivational symptoms, a 6-month follow-up period, and fidelity monitoring. Finally, because CBSST-CCT was successfully delivered by masters-level therapists in community settings, it has the potential to be more accessible than interventions requiring doctoral-level clinicians.

We found moderate (d = .26), but nonsignificant, improvement in defeatist attitudes on the Defeatist Performance Attitude Scale, which was a target mechanism to improve negative symptoms. This may be because we did not recruit a sample enriched for defeatist attitudes, as our sample had average levels of defeatist attitudes. In our prior trials, we[74,75] and others[76] have found significant improvement in DPAS in CBSST and other CBT interventions targeting defeatist attitudes in schizophrenia, and found largest effects for DPAS (d = .90–1.00) and experiential negative symptoms (d = .72–.90) when only including participants with moderate-to-severe DPAS and negative symptoms.[56] We have also found that patients with more severe DPAS scores showed a larger improvement in functioning (d = 1.11) in CBSST relative to patients with low DPAS scores (d = .18).[23] Thus, participants with moderate-to-severe defeatist attitudes may be more likely to improve in these interventions, recognizing that an intervention targeting defeatist attitudes is not likely to be helpful for patients who do not have them and that multiple factors may contribute to negative symptoms.

Significant improvement in experiential negative symptoms was found for the SANS but not for the CAINS. Unlike the SANS, the CAINS was developed to avoid over-reliance on behavioral or performance deficits (eg, work, school, social activity) to inform experiential deficits. Thus, the greater improvements found for the SANS than for CAINS may be due to capturing both experiential negative symptom and functioning behavior improvements on the SANS. Small-to-medium but nonsignificant improvements were found for functioning measures (SSPA d = .41; UPSA d = .43; ILSS d = .30).

This preliminary trial had a high dropout rate. A total of 55 participants were randomized, but 12 participants did not attend any group sessions. Of the participants who did attend at least one therapy session, 28% (12 of 43), dropped out after starting groups. High screen failure and dropout rates before starting therapy during run-in periods is common in clinical trials with similar persistent negative symptom criteria. For example, a screen failure rate of 44% was found in a psychosocial trial using similar criteria[77] and this rate is slightly higher than in pharmaceutical trials with similar criteria.[78] This demonstrates the challenges of conducting psychosocial clinical trials with this population. In addition, challenges related to the limited public transportation system and long travel distances in San Diego County also may have contributed to dropout. In our prior trials, when transportation was provided to therapy, we found much better retention rates. Mueser and colleagues[79] also found greater attendance (90% vs 66%) at sites with the lowest need for transportation assistance. We have found better retention (86%) when we have provided transportation, including in clinical trials with participants with schizophrenia with persistent negative symptoms (90% at 12 weeks).[74]

In addition to the high dropout rate, the study had other limitations. Given the modest sample size, we did not correct for multiple statistical comparisons. Although the successful delivery of CBSST-CCT in a community setting is a strength, future studies should consider how various factors may affect treatment adherence and outcomes in individuals with elevated negative symptoms. Future studies should also address the mechanisms of CBSST-CCT effects and modifiable predictors of treatment outcomes. Despite these limitations, preliminary findings from the current pilot randomized controlled trial suggest that CBSST-CCT has the potential to improve negative symptoms and cognitive functioning in individuals with schizophrenia. A larger investigation of CBSST-CCT is warranted to further examine its efficacy in treating negative symptoms, along with potential mediators and moderators of treatment effects.

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Conflict of Interest

Dr. Granholm has an equity interest in Granholm Consulting, Inc., a company that may potentially benefit from the research results as he receives income from the company for CBSST workshops and consulting. The terms of this arrangement have been reviewed and approved by the University of California, San Diego in accordance with its conflict of interest policies.

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