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Compensatory Cognitive Training for psychosis: Effects on negative symptom subdomains

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ABSTRACT

Research identifying the effects of cognitive training on negative symptoms of psychosis is limited. We examined the effects of Compensatory Cognitive Training (CCT) on expressive deficits and social amotivation in a randomized controlled trial comparing CCT to standard pharmacotherapy alone in 43 individuals with psychosis. ANCOVA analyses demonstrated significant CCT-associated effects on both expressive deficits and social amotivation. Moreover, improvements in both sub-domains were associated with improvements in global life satisfaction, with improvements in social amotivation also related to increased social contact. CCT appears to be a beneficial treatment approach for improving multiple aspects of negative symptoms.

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1. Introduction

Negative symptoms such as apathy, flattened affect, social withdrawal, and avolition are prevalent in schizophrenia (Bobes et al., 2010; Galderisi et al., 2013; Kraepelin, 1971) and are associated with poor functional outcomes (Fenton and McGlashan, 1991; Rabinowitz et al., 2012; Ventura et al., 2009, 2015) and quality of life (Meltzer et al., 1990; Narvaez et al., 2008; Norman et al., 2000; Wegener et al., 2005). Due to lack of pharmacological treatments for negative symptoms (Mucci et al., 2017), psychosocial treatments are needed (Kirkpatrick et al., 2006).

Although cognitive remediation/training does not primarily target negative symptoms, a growing body of literature suggests a small-to-moderate effect of cognitive training on negative symptoms, with maintenance of symptom reductions at follow-up (Cella et al., 2017). We previously demonstrated a large effect size ($d = 0.92$) of Compensatory Cognitive Training (CCT) on negative symptom severity, with a smaller effect at follow-up ($d = 0.43$; Twamley et al., 2012). These improvements, however, were measured by total negative symptom scores. Mounting evidence within the last decade suggests a two-factor structure of negative symptoms: expressive deficits and social amotivation (Blanchard and Cohen, 2006; Kirkpatrick and Fischer, 2006; Liemburg et al., 2013; Stiekema et al., 2016; Strauss et al., 2013). These factors may have different effects on functional and psychosocial outcomes (Stiekema et al., 2016). The literature suggests a strong association between social amotivation and functional outcomes (Fervaha et al., 2014a, 2014b; Messinger et al., 2011; Strauss et al., 2013), whereas the association between expressive deficits and social functioning appears weaker (Strauss et al., 2013; Foussias et al., 2011). As such, the distinction between the two domains has clinical significance.

The effect of cognitive training on negative symptom subdomains remains relatively unexplored. To our knowledge, only two randomized controlled trials have found beneficial effects of Cognitive Enhancement Therapy (Eack et al., 2013) on individual items (e.g., social withdrawal, affective flattening) and cognitive remediation (Ventura et al., 2017) on negative symptom subdomains (expressive and experiential symptoms). However, the effects of CCT on expressive deficits and social amotivation remain uninvestigated.

We sought to investigate CCT-associated differences in expressive deficits and social amotivation at post-treatment and to understand the association between changes in these negative symptom subdomains and changes in global and social quality of life. We hypothesized that improvements in social amotivation and expressive deficits would be associated with improvements in quality of life indicators.

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2. Method

2.1. Participants and procedures

Please see Twamley et al. (2012) for a complete description of the study methods. The University of California, San Diego Institutional Review Board approved the study (ClinicalTrials.gov identifier NCT01521026). All participants provided written informed consent. Eighty-nine community-dwelling adult outpatients with primary psychotic disorders (schizophrenia, schizoaffective disorder, psychotic mood disorder, or psychosis not otherwise specified) were enrolled; 69 participants completed baseline assessments and were randomized to receive standard pharmacotherapy (SP) alone or group-based CCT 2 h per week for 12 weeks along with SP. CCT is a brief, manualized intervention providing compensatory strategies targeting prospective memory, attention, learning/memory, and executive functioning (Twamley et al., 2012).

Fifty-one of the randomized participants completed the study; 43 had complete Positive and Negative Syndrome Scale (PANSS) data at baseline and post-treatment and were included in the current analyses (see sample characteristics and group differences in Table 1). These participants' data have been used in prior publications (Twamley et al., 2008; Twamley et al., 2012); however, inferential statistics specific to PANSS negative symptoms factors have not been published.

2.2. Measures and data analysis

Psychiatric symptom severity was measured using the PANSS (Kay et al., 1987), a structured interview assessing positive symptoms, negative symptoms, and general psychopathology on a seven-point scale (1 [Absent]-7[Extreme]). Expressive deficit and social amotivation subdomains were generated according to the factor structure proposed by Liemburg et al. (2013). The expressive deficit factor included items assessing blunted affect, poor rapport, lack of spontaneity and conversation flow, mannerisms and posturing, motor retardation, and disturbance of volition, whereas social amotivation was comprised of emotional withdrawal, passive/apathetic social withdrawal, and active social avoidance items. Quality of life was measured by the Quality of Life Interview (Lehman, 1988), which assesses both subjective (life satisfaction, 1[lowest]-7[highest]) and objective quality of life. We examined subjective global quality of life, subjective social quality of life, and objective social quality of life (i.e., degree of social contact with non-family members).

Independent samples *t*-tests and Chi-square analyses were conducted to examine demographic and clinical characteristics. No data transformations were needed upon inspection of normality and independence of covariates and treatment effects. Analysis of covariance (ANCOVA), with baseline symptoms entered as covariates, was used to examine differences in negative symptom subdomains between the CCT and SP groups at post-treatment. Pearson correlations were conducted to examine the association between changes in negative symptom factor scores and changes in quality of life indicators. Analyses were conducted using SPSS version 24.0.

3. Results

ANCOVA analyses indicated that both baseline expressive deficits [$F(1,40) = 52.86$, $p \leq .001$, η_p^2=0.57] and baseline social amotivation [$F(1,40) = 55.97$, $p \leq .001$, η_p^2=0.58] were significantly related to post-treatment expressive deficits and social amotivation, respectively. There was a significant difference at post-treatment between the CCT and SP groups on the negative symptom factors of both expressive deficits [$F(1,40) = 5.22$, $p = .028$, η_p^2=0.12] and social amotivation [$F(1,40) = 14.55$, $p < .001$, $\eta_p^2 = 0.27$], after adjusting for baseline scores. A reduction in both expressive deficits and social amotivation from baseline to post-treatment was observed in the CCT group (Figs. 1 and 2). Moreover, improvements in social amotivation ($r = -0.382$, $p = .014$) and expressive deficits ($r = -0.310$, $p = .049$) were associated with improvements in global life satisfaction, with improvements in social amotivation also related to increased objective social quality of life ($r = -0.444$, $p = .004$).

4. Discussion

Our findings suggest a moderate beneficial effect of CCT on social amotivation and a small beneficial effect on expressive deficits. Improvements in these negative symptom subdomains were associated with improvements in global quality of life and, in the case of social amotivation, increased social contact. These results are consistent with prior literature identifying small-to-moderate effects of cognitive remediation on global negative symptoms (Cella et al., 2017). Additionally, the current study extends this literature by examining effects of CCT on separate expressive deficit and social amotivation negative symptom

Table 1
Baseline group comparison of randomized participants ($n = 43$).

	Compensatory Cognitive Training ($n = 19$)	Standard pharmacotherapy ($n = 24$)		
	Mean/% (SD)	Mean/% (SD)	t or χ^2	*p*-Value
Demographics				
Age	46.05 (9.50)	49.79 (7.45)	−1.45	.16
Female, %	26.3%	33.3%	0.25	.62
Education, years	13.37 (1.80)	13.17 (1.66)	0.38	.71
Racial/ethnic minority, %	21.10%	41.70%	2.05	.15
Marital status, ever married, %	42.10%	41.70%	5.51	.36
Housing, living independently, %	0.57 (0.13)	0.57 (0.15)	0.20	.84
Chlorpromazine equivalent dose, mg	490.60 (560.77)	287.12 (241.56)	1.51	.14
Neuropsychological raw scores				
Premorbid IQ estimate	104.95 (9.69)	107.67 (10.48)	−0.87	.39
Clinical/functioning measures				
PANSS positive symptoms score	15.11 (6.32)	17.08 (6.27)	−1.02	.31
PANSS negative symptoms score	16.58 (8.13)	14.83 (5.06)	0.86	.39
Expressive deficits	11.58 (5.80)	8.75 (4.22)	1.85	.07
Social amotivation	7.47 (4.34)	6.83 (3.29)	0.55	.59
HDRS score (depressive symptoms)	19.05 (12.05)	16.96 (7.53)	0.69	.50
QOLI global life satisfaction	3.97 (1.59)	4.46 (1.43)	−1.04	.31
QOLI subjective social satisfaction	4.77 (1.48)	4.83 (1.01)	−0.16	.87
QOLI objective social quality of life	2.64 (1.05)	2.73 (0.93)	−0.29	.77

Abbreviations: PANSS = Positive and Negative Syndrome Scale; HDRS = Hamilton Depression Rating Scale; QOLI = Quality of Life Interview.