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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.

Keywords

expressive deficits; social amotivation; social functioning; quality of life; cognitive remediation; schizophrenia

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., 2015, 2009) and quality of life (Meltzer et al., 1990; Narvaez et al.,

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Contributors

Zanjbeel Mahmood completed the data analyses and wrote the first draft of the manuscript. Jillian M.R. Clark assisted with data interpretation and manuscript writing. Elizabeth W. Twamley designed the study, oversaw the data analyses, and assisted with data interpretation and manuscript writing. All authors approved the final manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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.

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 two hours 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 [$F(1,40)=52.86$, $p\leq.001$, $\eta_p^2=.57$] and baseline social amotivation [$F(1,40)=55.97$, $p\leq.001$, $\eta_p^2=.58$] 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 [$F(1,40)=5.22$, $p=.028$, $\eta_p^2=.12$] and social amotivation [$F(1,40)=14.55$, $p<.001$, $\eta_p^2=.27$], 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 (Figures 1 and 2). Moreover, improvements in social amotivation ($r=-.382$, $p=.014$) and expressive deficits ($r=-.310$, $p=.049$) were associated with improvements in global life satisfaction, with improvements in social amotivation also related to increased objective social quality of life ($r=-.444$, $p=.004$).

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 factors (Liemburg et al., 2013). Given that social amotivation is a key contributor to the association between negative symptoms and functional outcomes (Foussias et al., 2015), and the demonstrated moderate beneficial effect of CCT on this subdomain, this study provides further evidence in support of the clinical significance of examining negative symptoms factors in lieu of global symptoms to enhance targeted treatment outcomes.

Our findings are consistent with prior studies reporting reductions in similar negative symptom domains (i.e., expressive symptoms, experiential symptoms; Ventura et al., 2017), as well as individual negative symptoms (e.g., social withdrawal, blunted affect; Eack et al., 2013), associated with intensive, 12–24 month cognitive remediation interventions. Although participants in our sample were older (mean=48) than the participants in these prior studies (mean=22 and mean=26, respectively), taken together, these results suggest cognitive training may have a positive effect on negative symptom severity for a wide age range of individuals with varying duration of psychosis. The positive impact may extend to improvements in subjective and objective quality of life. Furthermore, the aggregated findings suggest varying approaches to cognitive training (i.e., compensatory and restorative) yield improvements in negative symptoms.

Although not a focus of the current study, mechanisms of improvement in negative symptom domains should be considered. Relevant to this study, the CCT intervention supported generalization of cognitive strategies to everyday functioning and offered frequent facilitator-participant contact, which have been suggested as potential mechanisms underlying reduction of negative symptoms (Cella et al., 2017). Furthermore, Twamley and colleagues (2012) reported improvements in verbal memory over the course of the CCT intervention. Verbal memory has been associated with negative symptoms (Ventura et al., 2009) and negative symptom improvement secondary to neurocognitive improvement also has been suggested (Ventura et al, 2017). Moreover, defeatist beliefs appear to mediate the relationship between cognitive impairment and negative symptoms (Grant and Beck, 2009), providing a framework for future investigations of mechanisms underlying the effects of CCT on negative symptom domains.

Study limitations are noteworthy, including small sample size and attrition; however, there were no significant differences between CCT completers and those who began CCT and later dropped out (Twamley et al., 2012). The findings should be considered preliminary until replicated in a study with a larger sample and an active control condition. The current analyses were exploratory, in response to an unexpected benefit of CCT on global negative symptoms. As such, the original trial was not designed to test effects on negative symptom

severity. Future investigations should utilize improved measures such as the Brief Negative Symptom Scale (Kirkpatrick et al., 2011) and Clinical Assessment Interview for Negative Symptoms (Kring et al., 2013). Furthermore, our findings may not generalize to inpatient samples or individuals with deficit syndrome. Non-specific therapeutic effects while engaged in CCT may be a factor in reducing severity of symptoms. Despite these limitations, our study provides preliminary support for the beneficial effects of CCT on negative symptom subdomains.

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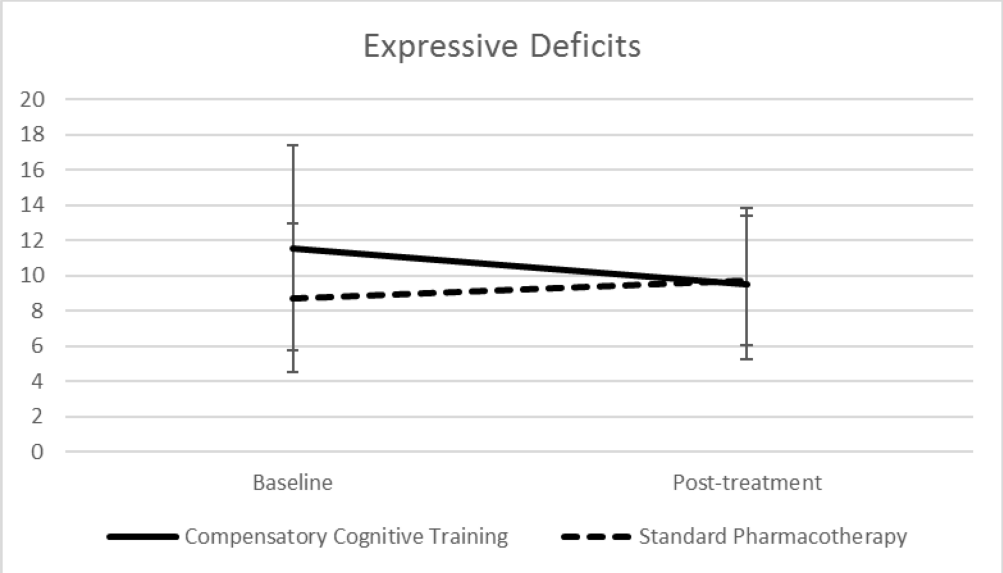

Figure 1.

Post-treatment effects of Compensatory Cognitive Training and Standard Pharmacotherapy on the Expressive Deficits negative symptom subdomain (n=53).

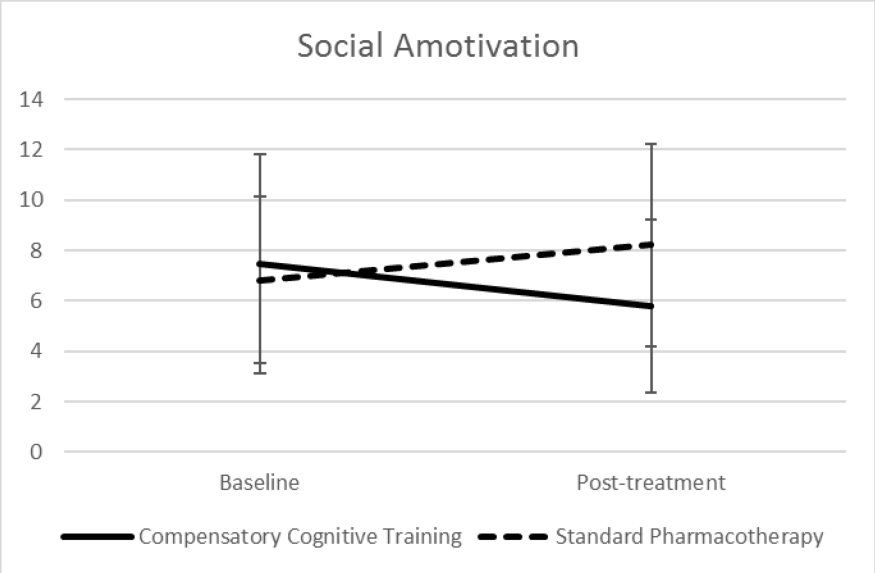

Figure 2.

Post-treatment effects of Compensatory Cognitive Training and Standard Pharmacotherapy on the Social Amotivation negative symptom subdomain (*n*=53).

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[a]**
Demographics				
Age	46.05 (9.50)	49.79 (7.45)	−1.45	.16
Female, %	26.3%	33.3%	.25	.62
Education, years	13.37 (1.80)	13.17 (1.66)	.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, %	.57 (.13)	.57 (.15)	.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)	−.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)	.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)	.55	.59
HDRS score (depressive symptoms)	19.05 (12.05)	16.96 (7.53)	.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)	−.16	.87
QOLI objective social quality of life	2.64 (1.05)	2.73 (.93)	−.29	.77

[a]Bold font denotes significant difference.

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