UNIVERSITY OF CALIFORNIA, SAN DIEGO
SAN DIEGO STATE UNIVERSITY

Mechanisms of Change in Cognitive Behavioral Social Skills Training for Schizophrenia

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy

in

Clinical Psychology

by

Thomas Quinlan

Committee in charge:

University of California, San Diego

Professor Eric Granholm, Chair
Professor Wes Thompson
Professor Elizabeth Twamley

San Diego State University

Professor Joseph Price
Professor Scott Roesch

2014
The Dissertation of Thomas Quinlan is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

________________________________

________________________________

________________________________

________________________________

________________________________

________________________________

Chair

University of California, San Diego
San Diego State University
2014
# TABLE OF CONTENTS

Signature Page ............................................................................................................. iii

Table of Contents ........................................................................................................... iv

List of Tables .................................................................................................................. v

List of Figures ................................................................................................................ vi

Acknowledgements ....................................................................................................... vii

Vita................................................................................................................................... viii

Abstract of the Dissertation ......................................................................................... ix

Introduction .................................................................................................................... 1

Aims and Hypotheses ..................................................................................................... 22

Methods......................................................................................................................... 24

Results ........................................................................................................................... 39

Discussion ....................................................................................................................... 57

Appendix......................................................................................................................... 66

References....................................................................................................................... 68
LIST OF TABLES

Table 1. Baseline Descriptive Statistics and Demographics of Final Sample (N = 165) ...........................................................................................................................................28

Table 2. Descriptive Statistics for All Variables Used in Models ........................................41

Table 3. Bivariate Correlations Among Measures Included in the Models ..........................42

Table 4. Results of Linear Regression Showing Effects of Defeatist Attitudes and Group on Outcome Variable ..................................................................................................................47

Table 5. Results of Linear Regression Showing Effects of Social Disinterest and Group on Outcome Variable ..........................................................................................................................51

Table 6. Relationships Between Variables of Interest at Baseline, End of Treatment, and Follow Up .........................................................................................................................................56
LIST OF FIGURES

Figure 1. Cognitive model of functional outcome in schizophrenia........................................5

Figure 2. Dual mediational pathways between neurocognition and real world functioning. .................................................................11

Figure 3. Cross-lagged model of mediational effect of defeatist attitudes on the relationship between neuropsychological functioning and diminished motivation ........................................................................43

Figure 4. Cross-lagged model of mediational effect of diminished motivation on the relationship between defeatist attitudes and real world functioning ..........44

Figure 5. Cross-lagged model of mediational effect of functional capacity on the relationship between neurocognition and real world functioning.............................45

Figure 6. Change in motivation by level of DPAS and treatment group. .........................48

Figure 7. Change in effectiveness by level of DPAS and treatment group. .................49

Figure 8. Change in functioning by level of DPAS and treatment group. ..................50

Figure 9. Change in motivation by level of SDS and treatment group........................52

Figure 10. Change in effectiveness by level of SDS and treatment group. ..............53

Figure 11. Change in functioning by level of SDS and treatment group....................54
ACKNOWLEDGEMENTS

This dissertation and my doctoral training would not have been possible without the support of my primary advisor Dr. Eric Granholm. From day one Dr. Granholm has offered scientific support with the resources of his lab, and his own knowledge in this field. He has helped me in both my professional and personal development in both my research and my clinical endeavors. I have learned to become the clinical scientist I am today through the hard work and dedication of Dr. Granholm. Thanks also to Dr. Scott Roesch, who has provided me with statistical guidance across my research projects. He has been available for consultation and for support whenever he is needed. I am extremely grateful to the participants in this study who contributed to my clinical training experiences and made it possible for me to pursue my research interests.

I would like to thank Drs. Elizabeth Twamley, Wes Thompson, and Joseph Price for their contributions to this dissertation and to my development as a researcher. I would also like to acknowledge Drs. Michael Taylor and Elizabeth Klonoff and all of the faculty and staff at the SDSU/UCSD Joint Doctoral Program in Clinical Psychology for their contributions to my development as both a clinician and researcher.

Lastly, I would like to acknowledge all of my family and friends who provided support, love, and friendship throughout my doctoral training. I want to thank my parents who have sacrificed so much over their lives to helping me to obtain any goals that I wanted to pursue. They raised me to take on adversity and to continue striving to reach the finish.
VITA

2002 Bachelor of Arts, Brandeis University
2011 Master of Science, San Diego State University
2014 Doctor of Philosophy, San Diego State University/University of California, San Diego

PUBLICATIONS


ABSTRACT OF THE DISSERTATION

Mechanisms of Change in Cognitive Behavioral Social Skills Training for Schizophrenia

by

Thomas Quinlan

Doctor of Philosophy in Clinical Psychology

University of California, San Diego, 2014
San Diego State University, 2014

Professor Eric Granholm, Chair

Rationale: A cognitive model of functional outcome in schizophrenia posits that neurocognitive deficits can contribute to failure experiences and difficulties in daily living that may lead to the development of dysfunctional attitudes and negative appraisals about one’s self and one’s ability to perform goal-directed tasks. These cognitions and negative appraisals could increase the likelihood of negative symptoms, such as amotivation, apathy, anhedonia, and contribute to a lack of engagement in goal-directed tasks. Both defeatist performance beliefs and related social disinterest attitudes have
emerged as promising targets for cognitive therapy interventions. Defeatist performance beliefs refer to an individual’s tendency to overgeneralize from past failures to expected future performance (e.g. “If I fail partly, it is as bad as being a complete failure”, “If I ask a question, it makes me look inferior”). Social disinterest attitudes refer to an individual’s tendency to show less interest in social relationships and difficulty in anticipating pleasure from social-interpersonal relationships. These cognitions have emerged as potential treatment targets, but research is still lacking concerning whether cognitive therapy can improve negative symptoms and functioning in schizophrenia by changing dysfunctional attitudes.

Design: The current study examined whether dysfunctional attitudes were related to outcome in psychosocial interventions for negative symptoms and social functioning. Data were examined from two completed clinical trials of persons diagnosed with either schizophrenia or schizoaffective disorder (N=165) who were assigned to either Cognitive Behavioral Social Skills Training (CBSST) or an active goal-setting intervention called goal-focused supportive contact (GFSC). The primary aim was to evaluate whether mediational models that were supported by our previous cross-sectional research are confirmed in this longitudinal design. The stability of these models across time can help establish temporal-precedence, which is not possible in cross-sectional tests of mediation. The secondary aim of this study was to evaluate whether baseline levels of dysfunctional attitudes moderated negative symptom and functioning outcomes in CBSST.

Results: The longitudinal mediation models fit well and all proposed relationships were in the correct direction and generally significant. While support for complete mediation across all time points was not found, there was evidence for partial mediation
and the stability of the relationships across time. With regard to moderation, a series of linear regressions showed no significant moderation of negative symptom and functional outcomes based on baseline level of dysfunctional attitudes. Thus, while we did not find support for dysfunctional attitudes as a moderator of change in CBSST versus GSFC, data did support a theoretical model in which changes in dysfunctional cognitions predicted improvement in negative symptoms and social functioning.

Conclusion: Future studies should continue to evaluate relationships between dysfunctional cognitions and functional outcomes in schizophrenia, as there was support for these constructs being related. In addition, the impact of psychosocial interventions on negative symptoms and functional outcome in schizophrenia might be improved by strengthening their focus on reducing the severity of dysfunctional attitudes.
INTRODUCTION

Schizophrenia affects between .5% and 1.5% of the world’s population (American Psychiatric Association [DSM-5-], 2013). Individuals with schizophrenia account for the largest percentage of psychiatric hospitalizations and associated health care costs (Mueser & Gingerich, 2006). According to the DSM-IV-TR the diagnostic criteria for schizophrenia focus on four main areas: cognitive deficits, positive symptoms, negative symptoms, and impairment in functioning. Neurocognitive deficits have been found consistently across a wide range of areas including working memory, executive functioning, speed of processing, and verbal learning (for a review see Green, Kern, Braff, & Mintz, 2000; Heinrichs & Zakzanis, 1998). Many of these deficits can be found before the emergence of other symptoms and appear to be biologically based. Positive symptoms, according to the DSM-5, refer to the excess or distortion of normal functions (American Psychiatric Association) and include symptoms such as delusions, hallucinations, disorganized speech and behavior. Delusions and hallucinations are often referred to as psychotic symptoms. Negative Symptoms, once again according to the DSM-5, refer to the loss or reduction of normal functions (American Psychiatric Association) and include domains such as diminished emotional expression, alogia (a poverty of either content or amount of speech), and avolition (difficulty initiating goal driven activity, often associated with motivation). These negative symptoms tend to cause more impairment than do positive symptoms for persons with schizophrenia. Impairment in functioning is a diagnostic criterion based on the idea that schizophrenia leads to a decline in numerous areas of a person’s life (DSM-IV-TR). While much
research has focused on treatment of these symptoms either through pharmacology or psychosocial interventions, the underlying causes of this disorder are still debated.

While we do not fully understand what causes these deficits in functioning, the research to date has shown numerous possible contributors. Deficits in the domains of neurocognition discussed above appear in almost all people with schizophrenia and are associated with both negative symptoms and poorer functional outcome (Green & Nuechterlein, 1999). While neurocognitive deficits are associated with functional impairment (Green, 1996; Green Kern, & Heaton, 2004) they are not the only predictor of these impairments. For instance, deficits on neuropsychological tests account for only a moderate amount of variance in real world functioning (Bowie, Reichenberg, Patterson, Heaton & Harvey, 2006; Green, 1996). Therefore, the relationship between neurocognitive impairment and real world functioning in schizophrenia is mediated by several factors that might be good targets for future psychosocial interventions (Ventura, Hellemann, Thames, Koellner, & Nuechterlein, 2009; Schmidt, Mueller, & Roder, 2011).

Starting with the work of Zubin and Spring (1977), many researchers have proposed a diathesis stress model for schizophrenia. Broadly speaking, this model states that there are necessary but not sufficient biological factors that contribute to the development of a disorder (Compton & Harvey, 2010). This means that other factors (stressors) are also necessary in order for the disorder to fully manifest. This model is considered to have strong support since there is now little evidence that a single genotype can be implicated in the development of schizophrenia. This diathesis stress model provides a framework for researchers to investigate how symptoms not only emerge during a psychotic break, but how those symptoms develop and how they are maintained.
over the lifespan. The diathesis stress model can be useful when discussing both vulnerabilities to developing psychosis, and traits that maintain symptoms as varied as delusions, hallucinations, anhedonia, and avolition.

Apart from the genetic component of schizophrenia, increasing attention has been paid to specific biases in attitudes that have been found in people with schizophrenia. Most of this work has centered on a cognitive model of schizophrenia (Beck, 1952; Hole, Rush, & Beck, 1979; Beck & Rector, 2002; Kingdon & Turkington, 2005; Rector, Beck, & Stolar, 2005). This model posits that patterns of thoughts and feelings help to strengthen or reinforce behaviors. The real world deficits seen in functioning can be better understood by examining the processes that might be hyper-activated in this illness. The cognitive model of schizophrenia supports the idea that through observing the mechanisms by which people with schizophrenia develop their world views, both positive and negative symptoms can be understood. This has implications for the development of future interventions and for future treatment targets.

Figure 1 shows the model of functioning in schizophrenia that informs the current study. This figure shows that while neurocognitive functioning plays an important role in the development of functional outcome, this relationship is not simply a direct main effect. It has been shown that neurocognition and functional skill capacity are correlated (using performance based measures that involve demonstrating how to perform a skill using role-plays; Bowie et al., 2006; Keefe, Poe, Walker, Kang, & Harvey, 2006; PASS study, 2005; Twamley, Doshi, Nayak, Palmer, Golshan, Heaton, & Jeste, 2002). However, the relationship between skill capacity and real world functioning is weaker, suggesting that having the ability to perform a task does not guarantee that one will be
successful in regard to real world functioning. Other factors may help explain the overall relationships among neurocognition, negative symptoms, functional capacity, and real world functioning. A number of factors are likely to determine whether skills are actually performed in the real world, including environmental factors (e.g., institutional supports and hindrances) and personal factors (e.g., attitudes/expectations, anhedonia, motivation, moods, insight, etc.) that clearly influence outcome (Murray & Lopez 1997; Robinson, Woerner, McMeniman, Mendelowitz, & Bilder, 2004; Ho, Andreasen, & Flaum, 1997).
Figure 1. Cognitive model of functional outcome in schizophrenia
Research has shown that the role of cognitions and in particular defeatist performance beliefs (e.g. “I always fail,” “It’s not worth the effort”) play an important role in the relationships between neurocognition and negative symptoms and also between neurocognition and functional capacity (Rector, 2004; Grant & Beck, 2009; Gallegos, Link, Fish, & Granholm, 2009; Horan, Rassovsky, Kern, Lee, Wynn, & Green, 2010; Green, Hellmann, Horan, Lee, & Wynn, 2012; Granholm, Holden, Link, McQuaid, & Jeste, 2013; Quinlan, Granholm, & Roesch, in press). Also, research has explored the role of social disinterest attitudes (e.g. “My relationships with other people never get very intense,” “I prefer hobbies and leisure activities that do not involve other people”) in the relationship between and negative symptoms (Granholm, Ben-Zeev, & Link, 2009; Grant & Beck, 2010). These attitudes in part examine the relationship between disinterest in social activities and diminished expectations of pleasure from social activities. More severe social disinterest attitudes have been associated with poorer functional outcomes.

Defeatist performance beliefs are typically assessed using a subscale of 15 items from the Dysfunctional Attitudes Scale (DAS; Weissman, 1978; psychometric properties discussed under measures). These beliefs refer to one’s overgeneralization of negative expectations concerning performance and have been shown to correlate with scores of negative symptoms among patients with schizophrenia (Rector, 2004). Rector (2004) studied 56 subjects with schizophrenia to investigate how different Dysfunctional Attitudes related to both positive and negative symptoms. Defeatist performance beliefs related directly to negative symptoms and this relationship held even when controlling for depressive symptoms (Rector, 2004).
Research has found that defeatist performance beliefs may mediate the relationships between neurocognition and negative symptoms and social functioning. In a sample of people diagnosed with schizophrenia or schizoaffective disorder (N= 55) selected for high negative symptoms, Grant and Beck (2009) found that defeatist performance attitudes mediated the relationship between neurocognition and negative symptoms, as well as the relationship between neurocognition and subjective quality of life. Recent work by Beck, Grant, Huh, Perivoliotis, and Chang (2011) followed up on these initial findings by investigating participants who had high levels of negative symptoms and had been classified as having deficit syndrome (as assessed by the Schedule of the Deficit Syndrome; SDS, Kirkpatrick, Buchanan, McKenny, Alphs, & Carpenter, 1989). In this study, participants with the deficit syndrome had higher levels of defeatist beliefs compared to non-deficit participants who still exhibited high levels of negative symptoms. These attitudes were hypothesized to relate to negative symptoms and contribute to emotional withdrawal. In a sample of 74 participants, Couture, Blanchard, and Bennett (2011) found a relationship between defeatist performance attitudes and negative symptoms (in particular, diminished motivation).

In a sample of 111 people diagnosed with either schizophrenia or schizoaffective disorder, Horan, et al. (2010) found that defeatist performance attitudes mediated the relationship between functional skill capacity (as measured by the UCSD Performance-based Skills Assessment, or UPSA; Patterson, Goldman, McKibbin, Hughs, & Jeste, 2001) and negative symptoms, but not the relationship between skill capacity and functioning (measured through a semi-structured interview). Horan et al. (2010) also found a global model with the best fit suggested that the link between dysfunctional
attitudes and real-world functioning depended on the severity of negative symptoms. Neurocognition was not included in their models. Additionally, Green et al. (2012) studied how dysfunctional attitudes were linked to negative symptoms and examined both a single pathway and dual pathway model to explain the relationships among neurocognition, negative symptoms, functional capacity and real world functioning. These models did include a single outcome variable of early visual processing that was used as a proxy for neurocognition in the models.

In a preliminary study, we examined whether defeatist performance attitudes mediated the relationships between neurocognition and negative symptom and functional outcomes using a cross-sectional design (Quinlan, et al., in press). Using structural equation modeling, defeatist attitudes mediated the relationship between neurocognition and negative symptoms, such that poorer neurocognition predicted more severe defeatist attitudes, which in turn predicted more severe negative symptoms ($\chi^2 [12, N=179] = 24.65, p < .05; CFI = .950, RMSEA = .077$). This model showed improvement to the direct effects model with respect to both fit indices. All indicators showed moderate to high loadings and were significant at the .05 level. The direct pathway between neurocognition and defeatist performance beliefs, which can be interpreted as a regression coefficient, was significant. Additionally, the pathway between defeatist performance beliefs and negative symptoms was also significant.

However, in contrast to the relationship found by Grant and Beck (2009), defeatist attitudes were not found to be a significant mediator in the relationship between neurocognition and functional capacity or real world functioning. In the full model examining the relationships among these constructs, neurocognitive performance
predicted defeatist attitudes, and negative symptoms mediated the relationship between
defeatist attitudes and real world functioning, such that greater severity of defeatist
attitudes were associated with greater severity of negative symptoms, which was
associated with poorer functioning ($\chi^2 [55, N=179] = 113.42, p < .05$; descriptively (CFI
= .914, RMSEA = .100) (Quinlan, et al., in press). All indicators for the latent variables
demonstrated moderate to high loadings and were significant at the .05 level. By utilizing
structural equation modeling, we were able to expand on the work of Grant and Beck
(2009). While we were able to replicate the main finding of the relationship between
neurocognition and negative symptoms, we did not find the same mediation between
neurocognition and functioning. This may be due in part to our use of both functional
capacity measures, as well as a real world functioning measure, that examined what
clients reported doing in the real world. In contrast, Grant and Beck (2009) used a
subjective quality of life measure as their main outcome of functioning.

Additionally, we tested a single pathway versus dual pathway (as suggested by
Green et al., 2012). The single pathway model did fit well ($\chi^2 [32, N=179] = 72.56, p <
.05$; descriptively (CFI = .946, RMSEA = .084). We then examined a dual pathway
model (figure 2), which fit well ($\chi^2 [31, N=179] = 63.94, p < .05$; descriptively (CFI =
.957, RMSEA = .077). In order to compare which model fits better between competing
models we compared the differences in the chi-squared values ($\Delta \chi^2 = 8.62, \Delta df = 1, p <
.01$). A significant chi-squared difference suggested that the two pathway model with
fewer degrees of freedom (and therefore more estimated parameters) fit the data
significantly better than the one pathway model. Additionally, using Akaike’s
Information Criteria (AIC), a statistic developed on the principle of minimizing both bias
and variance (Akaike, 1974), to compare models, the dual pathway model fit better than the single pathway model (1.941 versus 8.560). This method is used not for hypothesis testing but rather for ranking models, with a lower score indicating a better fitting model (Akaike, 1974).
Figure 2. Dual mediational pathways between neurocognition and real world functioning
In addition to this modeling work, Gallegos et al. (2009) examined whether defeatist performance attitudes are associated with negative symptoms and social functioning task performance in schizophrenia compared to healthy comparison subjects. Attitudes were assessed in participants with schizophrenia or schizoaffective disorder (n = 93) and healthy controls (n = 53) using the Defeatist Performance Attitude Scale (DPAS). Gallegos et al. (2009) found that people with schizophrenia showed significantly higher DPAS scores compared to controls (SZ: M=51.4; SD=15.8; NC: M=26.6; SD=9.6; t(144)=10.49, p<.001). Severity of defeatist attitudes was also correlated with a performance-based functioning measure (MASC total efficacy score), r=-.23, p=.03, and with the SANS Amotivation/Asociality factor: r=.22, p=.03, and the Diminished Expression factor: r=.28, p=.01. In this study a possible relationship between defeatist cognitions and functional capacity was found. This contrasts with the results from our SEM work, but may be due to using single indicators versus a latent variable for functional capacity (Gallegos et al., 2009).

Recently Granholm et al. (2013) examined the role of defeatist beliefs in 79 older adults with schizophrenia or schizoaffective disorder. This study tested trajectories of functional outcomes in consumers with high or low baseline levels of defeatist attitudes. This study compared CBSST to GFSC and found that functioning trajectories over the course of the study were more positive for participants in the CBSST group. Improvement in defeatist attitudes was associated with better functioning in the CBSST group only. Interestingly, both treatments showed comparable improvements in amotivation, depression, anxiety, self-esteem, and life satisfaction. This suggests that for
participants with more severe defeatist attitudes at baseline, a cognitive behavioral intervention such as CBSST may be warranted.

These findings are consistent with the model of functional outcome in schizophrenia presented above; participants with schizophrenia showed more severe defeatist attitudes that were associated with poorer performance on a social problem-solving role-play task and more severe negative symptoms as compared to controls (Gallegos et al., 2009). The results from these studies suggest that changes in defeatist performance beliefs may be associated with better outcomes after a cognitive behavioral intervention based on the cognitive model of schizophrenia described above. These cognitive interventions attempt to challenge dysfunctional thoughts directly within a cognitive framework. In addition, these results suggest that persons with a high level of defeatist performance beliefs may benefit more from a cognitive intervention that specifically targets dysfunctional beliefs in order to improve functional outcome and negative symptoms.

Social disinterest attitudes have been assessed using a subscale of 15 items chosen for face validity from the Revised Social Anhedonia Scale (RSAS; Eckblad, Chapman, Chapman, & Mishlove, 1982). These attitudes refer to one’s disinterest in social activities and diminished expectations of pleasure from social activities (e.g. “I prefer watching TV to going out with others, “I could be happy living alone in a cabin in the woods”).

It is believed that these attitudes relate more to anticipatory pleasure than consummatory pleasure. Anticipatory pleasure refers to one’s expectation of pleasure from a future event while consummatory pleasure refers to one’s report of the amount of pleasure they experience from a given event. Prior research in the area of social
anhedonia has shown that anticipation of pleasure (or lack thereof) may account for lack of satisfaction in social interactions rather than the actual pleasure experienced during social activities (Gard, Kring, Gard, Horan, & Green, 2007). Gard et al. (2007) utilized experience sampling methods (ESM) in order to assess anticipatory versus consummatory pleasure in both participants with schizophrenia and healthy controls. Additionally, the researchers included a self-report trait measure (The Temporal Experience of Pleasure Scale; Gard, Gard, Kring, & John 2006) of these same constructs. For both the ESM methods, and the trait based measure, Gard, et al. (2007) found evidence for a deficit in anticipating but not experiencing pleasure in participants with schizophrenia. This deficit in anticipatory pleasure was related to poorer functional outcomes. Perivoliotis and Cather (2009) describe this deficit as an asocial belief related to disinterest in social experiences.

Granholm et al. (2009) examined the relationship between change in social disinterest attitudes and improvement in everyday functioning in CBSST. This study found support for the role of a social disinterest in a cognitive model of functioning; participants with lower levels of social disinterest attitudes and also greater reduction of social disinterest attitudes during therapy reported better functional outcomes at the end of treatment. However, in these initial analyses no differences were found between the two treatment groups with respect to overall change in social disinterest attitudes (Granholm, et al., 2009). Participants were only included in this trial if they had complete data, which led to smaller sample sizes for the two treatment groups: GFSC (N= 39); CBSST (N= 40). Since these data were preliminary and did not include the entire sample
or data from the long term follow up, Granholm, et al. (2009) suggested that these relationships should be studied further.

Grant and Beck (2010) examined the role of these asocial attitudes in predicting asocial behavior in a group of participants (N= 123) with schizophrenia or schizoaffective disorder. The researchers examined how social disinterest attitudes might relate to social functioning after accounting for neurocognitive performance. Using hierarchical regression, asocial beliefs accounted for 18% of the variability in social functioning, with depression and negative symptoms accounting for another 9%. Contrary to prior research, neurocognition only accounted for 1% of the variance associated with social functioning. This study utilized longitudinal data on a small subset (N= 13) of participants in order to examine longer-term effects of asocial attitude. In this smaller sample, baseline asocial beliefs predicted level of asocial behavior one year later.

Beck et al. (2011) also examined the role of social disinterest attitudes in deficit syndrome patients. Participants with deficit syndrome exhibited higher levels of these asocial beliefs but were less symptomatic with respect to depression, anxiety, and distress than the non-deficit group. This study suggested a formulation of deficit syndrome in which both neurobiological factors as well as these dysfunctional attitudes contribute to the lower levels of social functioning and protection of self-esteem since these beliefs allow an individual to avoid situations in which they expect to fail (Beck, et al., 2011).

While evidence for social disinterest attitudes as a potential treatment target has only recently emerged (Granholm, et al., 2009; Grant & Beck, 2010; Beck, et al., 2011), social disinterest attitudes seem to be an important factor in a cognitive model of schizophrenia. As another possible mediator between neurocognition and both negative
symptoms and functional outcome, these asocial beliefs may function as a mechanism for change.

From a cognitive perspective, the link between neurocognition and these dysfunctional cognitions is hypothesized to arise due to failure experiences that occur in part due to the deficits in specific neurocognitive domains. Perivoliotis and Cather (2009) describe a cycle in which failure experiences due to neurocognitive deficits (e.g., sustaining attention, generating and implementing plans, and solving problems when solutions are not easily apparent) lead to increases in dysfunctional cognitions. In turn, these dysfunctional cognitions reinforce a person’s beliefs about the self, which causes withdrawal and avoidance. This cycle continues to reinforce the dysfunctional attitudes. These attitudes appear to emerge due to people’s appraisal of their failure experiences. These experiences function as a feedback loop of repeated failures which can include setting inappropriate goals based on prior failure experiences such as applying to full time work instead of part time work when the person has not been able to hold a steady job.

This research will expand on the current understanding of the meditational role of dysfunctional attitudes (defeatist performance beliefs and social disinterest) in the relationship between neurocognition and negative symptoms and functional capacity. These cognitions will also be studied in terms their roles as possible mechanisms of change in a cognitive therapy intervention in schizophrenia.

This study utilized data from two randomized controlled trials of Cognitive Behavioral Social Skills Training (CBSST). CBSST combines Cognitive Behavioral Therapy (CBT) and Social Skills Training (SST) interventions to target functional
impairment in people with psychotic disorders (Granholm, McQuaid, McClure, Pedrelli, & Jeste, 2002; Granholm, McQuaid, McClure, Auslander, Pedrelli, Patterson & Jester, 2005; McQuaid, Granholm, McClure, Roepke, Pedrelli, Patterson, & Jeste, 2000). In CBSST, cognitive interventions are used to challenge defeatist and asocial attitudes that interfere with social functioning, while also teaching skills to help consumers examine and question their unhelpful beliefs (increase their self-reflectiveness and improve success in social situations). By challenging dysfunctional attitudes and attempting to increase levels of insight, clients may be more likely to engage in functional behaviors and use the skills they have.

Randomized controlled trials comparing CBSST have been compared to both Treatment as Usual (TAU) (Granholm et al., 2002; Granholm, et al. 2005; Granholm, McQuaid, McClure, Link, Perivoliotis, Gottlieb, Patterson, & Jeste, 2007) and with an active Goal Focused Supportive Contact intervention (GFSC) Granholm, Holden, Link, McQuaid, 2013; Granholm Holden, Link, McQuaid, submitted) have been conducted. Goal Focused Supported Contact (GFSC) attempts to control for the non-specific factors of attending a group therapy. Weekly GFSC sessions were semi-structured and would typically consist of check-in and symptom review, followed by a flexible discussion of social functioning goal attainment in a supportive, respectful manner. All participants in both conditions are asked to work toward specific personalized social functioning goals.

Granholm et al. (2013) examined middle aged to older adults (at least 45; N= 64) with schizophrenia. Participants were included if they had data on the functional outcome measure (ILSS) at baseline and at least one post-baseline assessment. Comparable significant improvements were found for both treatment groups for diminished
motivation, depression, anxiety, self-esteem, and life satisfaction. This study also examined the functional trajectories using the Independent Living Skills Survey (ILSS; Wallace, Liberman, Tauber, & Wallace, 2000) as the primary outcome. These trajectories significantly differed between CBSST and GFSC, with participants in CBSST showing more positive trajectories. This finding was especially true for participants with more severe defeatist attitudes. Greater improvement in defeatist attitudes was also associated with better functioning for participants in CBSST but not GFSC (Granholm, et al., 2013). This study examined baseline defeatist attitudes using a median split to create subgroups of participants. The improvement in functioning was more pronounced at 18 month follow-up.

Granholm et al. (submitted) utilized mixed-effects regression models for intent to treat analyses to examine the effects of CBSST and GFSC on functioning and experiential negative symptoms. This sample included participants that were at least 18 years old (N = 149). Participants were included in analyses as long as they had completed baseline assessments and had been randomized to one of the treatment groups. In this trial, CBSST skills knowledge, functioning, experiential negative symptoms, and defeatist attitudes improved significantly more in CBSST relative to GFSC. Both treatment groups showed comparable improvements in positive symptoms and skill capacity for a performance based measure of social competence. Granholm et al. (submitted) replicated the findings from two prior trials of CBSST that had examined older adults specifically (Granholm, et al., 2005, 2007, 2013) with respect to functional outcomes and improvement in defeatist performance beliefs and expanded these results to a more general sample. However, Granholm et al. (submitted) found significant
improvement for experiential negative symptoms or defeatist attitudes for the more representative sample but not for older adults in CBSST relative to GSFC. In that study, the authors suggest that while there is promising evidence that functional outcomes and experiential negative symptoms might be impacted by change in defeatist attitudes, this would require further research that might be done by combining samples from multiple trials.

Most of the early work in cognitive therapy for schizophrenia focused predominantly on positive symptoms (see Wykes, Steel, Everitt, & Tarrier [2008] for a review). Even though these studies did not target negative symptoms as the primary outcome, a modest effect size (d= .44 over 34 randomized controlled trials) was found for reduction in negative symptoms (Wykes, et al., 2008). These trials also showed a small to medium effect size for functional outcomes (d= .37), which was comparable to that found for positive symptoms (d= .38). Building on this work, Granholm, et al. (2009) reviewed the studies with functional outcomes included by Wykes et al. (2008) as well as three additional three randomized controlled trials that had been published since then. Granholm et al. (2009) found positive results for CBT aimed at functional outcomes, suggesting that even when functioning was not a primary target, CBT interventions impacted these functional outcomes. In a recent formulation of cognitive therapy specifically for negative symptoms and functioning, Perivoliotis and Cather (2009) discussed the role of both defeatist performance beliefs and social disinterest attitudes (with a focus on anticipatory versus consummatory pleasure). This case formulation suggests that neurocognitive impairment might lead to repeated failure experiences, which in turn can lead to the development of dysfunctional attitudes as a coping
mechanism in which individuals have low levels of expectation for themselves and for their experience of pleasure (Perivoliotis & Cather, 2009). Based on the cognitive model, these attitudes would make ideal treatment targets, since they involve dysfunctional cognitions that can be targeted with goal oriented approaches. The interventions used in the two parent trials to this study were designed to challenge dysfunctional beliefs, and have a goal-oriented recovery approach.

Research examining theoretical models of functioning has been limited to analysis of data collected cross-sectionally. These designs allow researchers to examine hypotheses about theoretical models using a single point in time. While this research is a necessary first step in establishing where we want to target our interventions, it has numerous limitations. In order to examine theoretical models, researchers often have to make assumptions about temporal precedence based on prior research. Interventions that have been based on meditational work may be faulty if the assumptions about temporal precedence are violated.

It may be possible to impact negative symptoms and functional capacity through challenging these defeatist performance attitudes and also through increasing interest in social situations. In order to examine this, it is necessary to have longitudinal data. With longitudinal data, hypotheses about the mechanisms of change within a cognitive model and a cognitive intervention can be directly tested. In order to address the above limitations and to add to the current literature on theoretical modeling of functional impairment in schizophrenia, the present study examined the roles that defeatist performance beliefs and social disinterest attitudes play in the prediction of changes in functional impairment and negative symptoms over time. Testing of mediational models
can be useful not only in understanding possible causal relationships in psychopathology research, but also can help in identifying possible treatment targets for future research (MacKinnon & Luecken, 2008). This will help identify possible mechanisms by which people may improve social functioning and negative symptoms and also might provide a rationale to use a CBSST intervention or a GFSC intervention for people with more severe dysfunctional cognitions. The current study aimed to explore the mechanisms of change for numerous areas of outcome including negative symptoms and social functioning. Data from two completed trials of persons diagnosed with either schizophrenia or schizoaffective disorder assigned to either CBSST or GFSC groups and followed until the end of treatment and at follow up were examined.
AIMS AND HYPOTHESES

Aim 1: To test the meditational role of defeatist performance beliefs and social disinterest attitudes with respect to the relationship between neurocognition and negative symptoms or functional outcomes (Figure 5 Aim 1 - Longitudinal Mediation). Statistical analyses were planned to analyze the stability of theoretical models concerning dysfunctional attitudes as a mediator of change in negative symptoms and functional capacity using auto-regressed cross-lagged models. These models use data from earlier time points to make predictions about data from future time points, in a longitudinal design. The stability of these models across time helps to establish temporal-precedence and move beyond cross-sectional tests of mediation. Since these models allow for the testing of competing hypotheses in nested models, a better case for longitudinal mediation can be made. We hypothesize that models in which defeatist performance beliefs and social disinterest attitudes mediate the relationships between neurocognition and negative symptoms and functional capacity (social competence) will remain stable across time and will be the best fit for this data when compared to competing alternate models.

Aim 2: To examine whether baseline levels of defeatist attitudes and social disinterest attitudes in a cognitive therapy intervention predict improvement in negative symptom and social functioning differently based on type of intervention (Figure 6; Aim 2-Moderation). Moderation analyses using linear regressions was planned to explore this aim. Based on the current literature base it was hypothesized that baseline levels of defeatist performance beliefs and social disinterest attitudes will be related to improvement in negative symptoms and social functioning to a greater extent for
consumers who received CBSST, as compared to those who received a Goal Focused Supportive Therapy (GFST) control treatment. It is hoped that this may help to identify the mechanisms by which people improve social functioning and negative symptoms within a cognitive intervention. This could suggest that CBSST would be more appropriate for people with greater baseline severity of dysfunctional attitudes since these attitudes are hypothesized to lead to failure experiences related to functional outcomes and negative symptoms.
METHODS

The present study utilized archival data collected as part of the following grants awarded to Dr. Eric Granholm: “Functional Rehabilitation for Older Patients with Schizophrenia” (FROPS, VA Merit RR&D: 03341R) and “Cognitive Behavioral Skills Training for Schizophrenia” (CBSTS, NIMH: R01 MH071410-01A1). This study capitalized on the longitudinal design and cognitive interventions in order to test causality and stability in the theoretical models.

The methodology in the parent studies was nearly identical. After informed consent and baseline assessment, participants were randomly assigned to either CBSST or GSFC. Participants were then treated for 9 months (over 36 sessions) and followed longitudinally. Participants received compensation for completing the assessments, but not for attending the therapy sessions. The CBSST intervention is a group therapy that provides 3 modules of six sessions each (Thought Challenging, Social Skills Training, and Problem Solving). The modules are intended to be completed twice.

The primary skill taught in the Thought Challenging module focuses on practicing simple steps for belief modification (e.g., the 3C’s—Catch It, Check It, Change It) and the module focuses on using this skill as well as behavioral experiment activities. The general concepts of CBT such as the relationship among thoughts, feelings, and behaviors, as well automatic thoughts, mistakes in thinking, and examining evidence for thoughts are presented to address symptoms and challenge dysfunctional cognitions. The primary target for the Social Skills Training module is communication skills. Behavioral role plays are used in a variety of situations such as interactions with friends and family, making new friends, and learning how to effectively communicate with health care
providers and other support persons. The Problem Solving module uses a five step problem solving technique (SCALE: Specify the problem, Consider all possible solutions, Assess the best Solution, Lay out a plan, Execute and evaluate the outcome). This module focused on creating realistic and feasible plans to solve problems that interfere with participants’ individual goals.

GFSC is an enhanced supportive contact intervention that focused on functional goals and provided the same amount of therapist and group contact as CBSST (36 weekly 2-hr. sessions). Similar to CBSST, there was an emphasis on setting and achieving functional goals. Sessions were semi-structured and consisted of checking in about symptoms, crisis management, followed by an open discussion by participants about setting and working towards individual goals. Sessions contained elements of psychoeducation, empathy, and non-directive reinforcement of goal directed behaviors that arose from the group discussions. There was minimal therapist guidance for these discussions.

There were notable differences in the two trials. While the FROPS trial targeted a middle age and older adult population (age > 45 years), the CBSTS trial included subjects aged 18 years or older. Also in the CBSTS trial, but not the FROPS trial, participants met with one of the group therapists at the beginning of treatment and every three months to generate and monitor progress toward personalized goals for social functioning. In the CBSTS trial participants received 36 weekly group therapy sessions, and were assessed with the full battery needed for analysis at baseline, end of treatment (9 months), and at one year follow up (21 months). The FROPS trial differed slightly in the schedule of assessments with participants being assessed at baseline, end of treatment (9 months), and
at nine months after treatment ended (18 months).

Participants

The sample was drawn from two separate randomized clinical trials comparing CBSST to GFSC. These studies were approved by the Institutional Review Board of the University of California, San Diego, and written informed consent was obtained from all participants or their legal guardians. Participants were at least 18 years old at baseline and had a diagnosis of either schizophrenia or schizoaffective disorder as determined by the SCID-IV. In addition participants were excluded for comorbid medical conditions or illness severity that would interfere in study participation, and participants could not have been exposed to SST or CBT in the past 5 years.

Participants were recruited from outpatient treatment centers and residential settings in San Diego, California. After baseline participants were randomized to receive either CBSST or a goal focused supportive contact group (GFSC). Participants completed a comprehensive battery at baseline, end of treatment, and at follow up, which included measures of neurocognition, negative symptomatology, social functioning, positive symptoms and dysfunctional attitudes. Analyses were conducted on all participants who attended at least 6 sessions (the equivalent of one full module for the CBSST group). Since this study focused on possible mechanisms of change, we wanted to ensure that participants had been exposed to treatment. The mean number of sessions attended was 26.8 (SD= 13.2; range 6-48). This led to a sample size of 165 individuals diagnosed with either schizophrenia or schizoaffective disorder, as determined by the Structured Clinical Interview for DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1995). The mean age at baseline was 47.0 years old (SD= 11.0; range= 18.5 – 78.3). The participants were
predominantly male (64%), never married (60%), and living in assisted housing (58%).
For ethnicity our sample was mainly Caucasian (61%), and included 15% African
American, 13% Hispanic and 11% other ethnicities (including bi and multiethnic
participants). Additionally the sample had on average a high school education (years of
education \( M= 12.4; \ SD= 1.9 \)). The mean age of onset was 24.6 (SD= 8.6), and 96.5% of
subjects were currently taking at least one antipsychotic medication. Medications were
not adjusted as part of the participation in this study. There were no significant group
differences of age of onset or use of antipsychotics at baseline. Table 1 provides
additional demographic and clinical characteristics of the final sample.

Participants that were excluded did not differ significantly from participants that
were included with regard to gender, race, living situation, marital status, PANSS total,
Defeatist Performance Beliefs, Total Negative Symptoms, or Neuropsychological
Impairment. The mean Social Disinterest scores differed significantly (included: mean =
6.55, SD = 2.90; excluded: mean = 5.42, SD = 2.94); \( t_{223} = -2.57, P = .011 \) at baseline.
This difference suggests that people who had more severe dysfunctional attitudes were
more likely to attend groups. The mean age of included individuals was significantly
greater than excluded individuals (included: mean = 47.03, SD = 11.01; excluded mean =
43.39, SD = 10.27); \( t_{225} = -2.26, P = .025 \). The difference in age was likely due to a
lower dropout rate in the clinical trial that enrolled only older patients, where
transportation to therapy was provided.
Table 1. Baseline Descriptive Statistics and Demographics of final sample (N = 165)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>47.0(11.0)</td>
</tr>
<tr>
<td>Years of Education</td>
<td>12.4(1.9)</td>
</tr>
<tr>
<td>Caucasian, %</td>
<td>61</td>
</tr>
<tr>
<td>Male, %</td>
<td>64</td>
</tr>
<tr>
<td>Assisted Living, %</td>
<td>58</td>
</tr>
<tr>
<td>PANSS Total</td>
<td>69.7(19.0)</td>
</tr>
<tr>
<td>SANS Total</td>
<td>8.0 (3.8)</td>
</tr>
<tr>
<td>Expressive Negative Symptoms</td>
<td>3.6 (2.3)</td>
</tr>
<tr>
<td>Experiential Negative Symptoms</td>
<td>4.5 (2.3)</td>
</tr>
<tr>
<td>Defeatist Beliefs (DPAS)</td>
<td>53.0(17.1)</td>
</tr>
<tr>
<td>Social Disinterest (RSAS)</td>
<td>7.4 (4.0)</td>
</tr>
<tr>
<td>Global Neuropsychological Functioning</td>
<td>35.9 (7.2)</td>
</tr>
<tr>
<td>Speed of Processing</td>
<td>35.5 (8.7)</td>
</tr>
<tr>
<td>Working Memory</td>
<td>39.5 (9.0)</td>
</tr>
<tr>
<td>Verbal Learning</td>
<td>29.7 (10.9)</td>
</tr>
<tr>
<td>Executive Functioning</td>
<td>39.2 (8.8)</td>
</tr>
<tr>
<td>MASC Effectiveness</td>
<td>3.3(1.1)</td>
</tr>
<tr>
<td>ILSS</td>
<td>.71(.10)</td>
</tr>
</tbody>
</table>

Note: PANSS= Positive and Negative Syndrome Scale; SANS= Scale for the Assessment of Negative Symptoms; DPAS= Defeatist Performance Attitude Scale; RSAS= Revised Social Anhedonia Scale; MASC= Maryland Assessment of Social Competence; ILSS= Independent Living Skills Scale.
Measures

Neurocognition. Numerous domains of neurocognition were assessed at all three time points using a comprehensive battery of tests that have been shown to related to functioning (Green, 1996; Green, et al., 2000), including speed of processing, working memory, verbal learning, visual learning, and executive functioning. Based on the confirmatory factor analyses conducted as part of Quinlan et al. (in press), these domains suggested a single factor of neurocognition that included four of the five domains. When the domain of visual learning was included in the factor analysis the data did produce adequate fit. This is important because the analyses for the current study utilized path analysis and linear regression which necessitated the use of a single summary score for these domains of neurocognition. Domain Scores were created for each domain using age corrected t-scores, and then aggregated to create a global summary score of overall cognitive functioning.

Speed of Processing

-- Trail Making Test A (Reitan & Wolfson, 1993): In part A of this test of visuomotor speed, subjects connect, in order, a series of circles containing ascending numbers as fast as possible. The dependent variable is the amount of time required to complete.

-- Brief Assessment of Cognition in Schizophrenia Symbol Coding (Keefe, Goldberg, Harvey, Gold, & Coughenour, 2004): Subjects are asked to rapidly and accurately match numbers to a set of nonsense symbols during a 90-second period. The dependent variable is the total score for correct coding.

Working Memory

-- Wechsler Adult Intelligence Scale-III Letter-Numbering Sequencing (Wechsler,
This test examines performance of auditory working memory. The subject listens to a scrambled list of letters and numbers and arranges them in ascending order with numbers first and then letters. Full credit is given if the letters are recalled in perfect order before the numbers. All other errors of omission or order lead to the item being scored as incorrect. The dependent variable is the total score.

--Wechsler Memory Scale-III Spatial Span (Wechsler, 1997b): In this test of spatial working memory, subjects watch an examiner tap a set of boxes in a predetermined sequence and then imitate the sequences, both forward and backward. The dependent variable used in this study was total score for forward and backward conditions.

**Verbal Learning**

--Hopkins Verbal Learning Test Total Recall (Brandt, 1991): A repeatable test with 6 alternate forms of verbal learning and delayed recall. Subjects are presented with 12 item lists for 3 learning trials. Delayed recall and recognition conditions are administered later. Dependent variables used in this study will be total learning over three trials (for the acquisition variable) and total delayed recall score (for the recall component).

**Frontal/Executive**

--Delis Kaplan Executive Functioning Scale Card Sorting: Free Sorting, Correct Number of Sorts (Delis, Kaplan, & Kramer, 2001): Subjects are asked to create groupings of cards based on a common factor. The dependent variables for this task include a total score based on participant’s descriptions of the groups they create, and in addition the number of sorts participants are able to recognize when the cards are grouped for them.

-- Delis Kaplan Executive Functioning Scale 20 Questions: (Delis, et al., 2001): Subjects are asked to figure out an item chosen from a group of items by asking only yes/no
question. Dependent variables for this task include both the number of items eliminated by the first question (initial abstraction) and the total number of questions asked.

-- Delis Kaplan Executive Functioning Scale Word Context: Consecutively Correct (Delis, et al., 2001): Subjects are asked to figure out the meaning of words from a “foreign language” based on a set of clues that reveal information about the word. Subjects are instructed to guess what the word means after each clue even if they think their answer is correct. The dependent variable for this task is the number of consecutively correct responses.

-- Brief Assessment of Cognition in Schizophrenia Letter Fluency (Keefe, et al., 2004): Subjects will be asked to produce as many as they can within a one-minute period that begin with a specific letter. The dependent variable is the number of different words excluding repetitions and intrusions.

**Defeatist Performance Attitudes** Defeatist performance attitudes were assessed using a subscale of the original Dysfunctional Attitudes Scale (DAS; Weissman, 1978) that contains 15 items (Defeatist Performance Attitudes Scale (DPAS); Cane, Olinger, Gotlib, & Kuiper, 1986; see Appendix for items) measuring one’s overgeneralization concerning performance (e.g. If I fail partly, it is as bad as being a complete failure). The original DAS has shown internal consistency in an unselected adult population of .85 (Oliver & Baumgart, 1985), and has been found to have test-retest reliability of .84 over a 2 month period and .74 for a three month period (Cane, Olinger, Gotlib, & Kuiper, 1986). For the current study the internal consistency was similar to these findings (Cronbach’s alpha of .86 at baseline). Scoring for the DPAS is on a 7 point scale (1-7) with total scores ranging from 15-105. Higher scores indicate more severe defeatist attitudes.
Social Disinterest Social disinterest attitudes were assessed using a subset of items from the Revised Social Anhedonia Scale (RSAS; Eckblad, et al., 1982). The RSAS contains 40 True/False items that assess an individual’s tendency to show less interest in social relationships and difficulties in experiencing pleasure from social-interpersonal relationships. 15 items were chosen based on face validity in order to assess social disinterest and to avoid items that were driven by emotional experiences. This scale has been used previously (SDS; Granholm, et al., 2009; Grant and Beck, 2010; see Appendix for Items) and showed comparable internal consistency to the original RSAS (Cronbach’s alpha was .65 at baseline and .66 at end of treatment; Granholm et al. 2009). In the current study Cronbach’s alpha was .62 at baseline. Higher scores indicate more severe social disinterest.

Negative Symptoms Negative symptomatology was assessed using the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1984). This measure assesses negative symptoms across 5 different domains. These domains cover affective flattening, alogia, avolition-apathy, anhedonia-asociality, and attention. Items are rated on a 0-5 scale with higher scores indicating more severe negative symptoms. A global summary score is created based on the items in a given domain. We achieved high inter-rater reliability in this study (ICC= .83 for SANS total). We used a modified version of the scale for the Assessment of Negative Symptoms based on factor analytic studies (Blanchard & Cohen, 2006; Sayers, Curran, & Mueser, 1996) and the MATRICS Consensus Statement recommendations (Kirkpatrick, Fenton, Carpenter, & Marder., 2006), which has been used in recent negative symptom pharmacologic trials (e.g., CONSIST, Buchanan, Javitt, Marder, Schooler, Gold, & McMahon, 2007). These studies
suggest two factors for negative symptoms: diminished motivation (items 17 and 22) and diminished expression (items 8 and 13). The global score for attention was dropped due to the fact that attention is now considered by many to overlap with domains of neurocognition and thought disorder dimensions (Sayers, et al., 1996; Blanchard & Cohen, 2006). Diminished motivation is a sum of the global scores for avolition and anhedonia, and diminished expression is a sum of the global scores for affective flattening and alogia. The main outcome variable for the analyses is diminished motivation (also called experiential negative symptoms) due to multiple findings that this is the factor associated with dysfunctional cognitions (Quinlan et al., in press; Granholm et al., 2013, Granholm, submitted).

Functional Capacity  The Maryland Assessment of Social Competence (MASC; Bellack, Sayers, Mueser, & Bennett, 1994; Sayers, Bellack, Wade, Bennett, & Fong, 1995), a social role-play measure, assessed participants’ ability to resolve interpersonal problems. The instrument takes consists of three 3-minute role-play communication scenarios (1 conversation initiation and 2 assertion), during which the participant interacts with a live confederate. The measure has three parallel sets of scenarios, which were used to control for multiple administrations in our longitudinal assessments. Participant responses are videotaped for subsequent coding by blinded raters on dimensions of verbal content, nonverbal communication behavior, and an overall effectiveness score that incorporates consideration of the other two ratings. The effectiveness score for each scene was combined to create an overall effectiveness variable. A high level of inter-rater reliability (ICC=.88) was achieved for the total effectiveness score in the parent trials.
Functioning: Self-reported functioning was assessed using the Independent Living Skills Survey (ILSS) (Wallace, et al., 2000), which assesses functioning across ten domains over the past 30 days: Personal Hygiene (12 items), Appearance and Care of Clothing (9 items), Care of Personal Possessions (6 items on everyday household chores), Food Preparation/Storage (7 items), Health Maintenance (7 items), Money Management (5 items), Transportation (5 items), Leisure and Community (12 items), Job Seeking (4 items), and Job Maintenance (3 items). The scale was administered in an interview format with the examiner reading items and making ratings. Each item is answered “yes” (the activity was performed) or “no” (the activity was not performed) (0 = “No,” 1 = Yes”) or “unable to demonstrate” (e.g., meals are prepared for the participant in an assisted-living facility). Available items rated “yes” or “no” in each domain were averaged and the mean of all available domains was used in the analyses (ILSS Total range = 0 – 1).

Analyses Assumptions of each statistical test were met including both the normality of individual variables as well as multivariate normality for all analyses. Data were screened for multivariate non-normality using Mardia’s (1970, 1974) Normalized Coefficient. Based on the recommendation of Bentler (2007) values of Mardia’s Coefficient greater than 5.00 were indicative of multivariate non-normality. No evidence of multivariate non-normality was found.

Because there was a high level of dropout across time points (22% loss from baseline to end of treatment, and 33% from baseline to follow up) missing data analyses were used in order to correct for subjects who dropped out between time points. Modern day missing data techniques allow researchers to keep participants who dropped out
while still maintaining acceptable levels of power (for a review of Missing Data Techniques and their applications see Graham, 2009). For this study, Full Information Likelihood Maximization (FIML), which uses Expectation Maximization (EM) algorithm parameter estimates to make use of partially complete data (McLachlan & Krishnan, 1996), were used for the longitudinal mediation analyses. FIML uses a single step to account for missing data by estimating both parameters and standard errors (Graham, 2009). FIML has been found to work well with smaller sample sizes as well as with larger amounts of missing data (Enders, 2001).

For the moderation analyses, using linear regression, Multiple Imputation (MI) was utilized. The goal of MI is to restore error variance that is lost when only single imputation methods are used. These methods impute a number of datasets so that random error variance is added to the data. In single imputation values will always lie on the regression line, so they are not useful for hypotheses testing (Graham, 2009). SPSS uses a Markov Chain Monte Carlo algorithm that uses a fully conditional specification (also called chained imputations) method to produce imputed databases (Raghunathan & Siscovick, 1996; van Buuren, Boshuizen, & Knook, 1999; Raghunathan, Lepkowski JM, Van Hoewyk, & Solenberger, 2001). This is a flexible method that does not require that all assumptions of multivariate normality are met and have been seen to be comparable when estimating linear regression coefficients when compared to a method that utilized multiple imputation under the normal model (Lee & Carlin, 2010). MI has been found to perform well even in small sample sizes even with large multiple regression models and as much as 50% missing data (Graham & Schafer, 1999).
The decision to use a separate missing data technique for each aim is based on the variables of interest in the aims. The decision was made to use MI for the moderation analyses because it was necessary to compute individual items in order to create variable summary scores. We were interested in creating difference scores for our outcome measures and MI allows for researchers to constrain the imputation of missing values so that imputation will not produce variable estimates that are out of range for a given measure. The decision to use FIML for the mediation analyses is based on the fact that it has historically been used when testing specific models that do not plan to include auxiliary variables. This method allowed for the examination of a priori models of mediation through Mplus, which uses FIML procedures and has demonstrated that these methods work well for SEM/Pathway models (Graham, 2009).

**Aim 1** In order to test the stability of the models proposed by Grant and Beck (2009) and Quinlan et al. (unpublished) in which defeatist performance beliefs and social disinterest attitudes mediate the relationships between neurocognition and negative symptoms and social functioning, auto-regressed cross-lagged models (Cole & Maxwell, 2003) were tested using longitudinal data. In these models each variable is regressed on all of the variables that precede it in time. These models allow an examination of how data from earlier time points predict data from our later time points (Cole & Maxwell, 2003; Tein, Sandler, MacKinnon, & Wolchik, 2004). This method helps establish temporal precedence for data collected across time by making predictions about future data points from previous data points. First the overall measurement model was examined to establish a level of model fit. With a good level of fit (using both Chi-square as well as descriptive fit indices) we can continue testing the stability of our model over time. A
good-fitting model is generally considered one that produces a non-significant chi-square value. Unfortunately, the chi-squared statistic is highly influenced by sample size and can lead to rejecting good-fitting models with large samples (Ullman, 2001). In order to account for this issue, a ratio is computed of chi-square/degrees of freedom. A ratio below 3 was considered acceptable for fit (Carmines & McIver, 1981). Goodness of fit was also assessed using descriptive fit indices such as Comparative Fit Index (CFI) and Standardized Root Mean Square Residual (SRMR). CFI values of >.9 indicate good fit, with values >.95 indicating excellent fit (Bentler, 1992). For SRMR, values of .08 or less indicate good model fit and values between .09-.10 indicate adequate fit. These empirically-based benchmarks are discussed in several reviews (Hu & Bentler, 1998, 1999; Kline, 2004). The level of fit must be established in order to justify examining the model at multiple time points. Next, we examined the parameters for equality across the waves of data. We wanted to establish that proposed theoretical relationships between variables remain in the correct direction at every time point. Finally, we estimated our mediational and direct effects. We believe that this model will remain stable even with intervention because change in variables should show the same proposed pathways regardless of group. These models will help identify a possible treatment target which we hypothesize to be defeatist performance beliefs and social disinterest attitudes.

**Aim 2** In order to test whether attitudes (either defeatist performance beliefs or social disinterest) predicted change on the outcome variables differently for participants of either CBSST or GFSC moderation analyses were conducted. This was accomplished using linear regression equations. We used the baseline levels defeatist performance beliefs and social disinterest attitudes to examine the role of these variables in predicting
changes in social functioning and negative symptoms based on group (CBSST versus GFSC). The goal of this aim was to examine how intervention type can impact these relationships differentially. The outcome variables for these analyses used change scores. The use of change scores as dependent variables has been controversial due to beliefs about unreliability (Kessler 1977) and regression towards the mean over time (Markus, 1980). However, research has suggested (Allison, 1990) that the use of change scores when examining the change of means over time is warranted especially in randomized controlled designs. This view is based on findings that the examination of change scores has been demonstrated to be powerful tests of causal hypotheses (Overall & Woodward, 1975) as well as change scores being appropriate for testing randomized experimental designs (Maxwell & Howard, 1981). Allison (1990) argued that the conventional methods to control for time 1 scores in predicting time 2 can lead to inferences that are incorrect especially in regression models that have nonequivalent control group designs. It is believed that change scores should be used unless there is an expected causal effect of the pre-test on the post-test or when subjects are assigned to groups based on their pre-test scores.
RESULTS

Aim 1

Aim 1 examined the mediational relationships proposed by Quinlan, et al. (in press) utilizing longitudinal data to establish temporal precedence. The models proposed by Quinlan et al. (in press) utilized Structural Equation Modeling, which allowed for testing of latent variables. However, due to power considerations, the models tested in aim 1 used pathway models that used observed variables. Descriptive statistics for all the variables used in both aims are shown in Table 2, while correlations among all variables are shown in Table 4.

The cross-lagged model examining the mediational effect of defeatist attitudes on the relationship between neuropsychological functioning and diminished motivation (see figure 3) showed good fit on both indices as well as the chi-squared ratio ($\chi^2$ [18, N= 165] = 39.57, p < .05; $\chi^2$/df ratio = 2.20; CFI = .94, SRMR = .053). All pathways except for one were in the proposed direction and were generally significant. The pathway between neurocognition at baseline and diminished motivation at end of treatment was not in the proposed direction (and also was not significant). All auto-regressive effects between variables at ever time point were significant. The meditational pathway between neurocognition at baseline and defeatist beliefs at end of treatment was in the proposed direction but not significant. However, this relationship was significant between end of treatment and follow-up. The meditational pathway between defeatist beliefs and diminished motivation was significant from baseline to end of treatment, but was not significant between end of treatment and follow-up (p = .11).
The cross-lagged model examining the mediational effect of diminished motivation on the relationship between defeatist attitudes and real world functioning (see figure 4) showed acceptable fit on one fit index and the chi-square ratio ($\chi^2 [18, N=165] = 50.75, p < .05; \chi^2/df \text{ ratio } = 2.82; \text{CFI } = .87, \text{SRMR } = .095$). All pathways were in the proposed direction. All auto-regressive effects between variables at every time point were significant. The mediational pathway between defeatist beliefs at baseline and diminished motivation at end of treatment was significant. However, this relationship only showed a trend ($p = .053$) between end of treatment and follow-up. The meditational pathway between diminished motivation and real world functioning was not significant from baseline to end of treatment, nor between end of treatment and follow-up ($p = .11$).

The cross-lagged model examining the mediational effect of functional capacity (using overall effectiveness) on the relationship between neuropsychological functioning and real world functioning (see figure 5) showed good fit on one fit index and adequate on the other; less than adequate fit was found for the chi-square ratio ($\chi^2 [18, N=165] = 62.91, p < .05; \chi^2/df \text{ ratio } = 3.50; \text{CFI } = .91, \text{SRMR } = .088$). All pathways were in the proposed direction and were generally significant. All auto-regressive effects between variables at every time point were significant. The mediational pathway between neurocognition at baseline and social functional capacity at end of treatment was in the proposed direction and significant. This relationship remained significant between end of treatment and follow-up. The meditational pathway between social functional capacity and real world functioning was significant from baseline to end of treatment, and remained a trend between end of treatment and follow-up ($p = .092$).
Table 2. Descriptive Statistics for all Variables Used in models

<table>
<thead>
<tr>
<th>Variable</th>
<th>GFSC (N = 87)</th>
<th>CBSST (N = 78)</th>
<th>Total (N = 165)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Global Neurocognition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>34.77</td>
<td>6.76</td>
<td>37.26</td>
</tr>
<tr>
<td>End of Treatment</td>
<td>35.27</td>
<td>5.27</td>
<td>36.30</td>
</tr>
<tr>
<td>Follow Up</td>
<td>35.67</td>
<td>6.08</td>
<td>36.40</td>
</tr>
<tr>
<td>Diminished Motivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>4.60</td>
<td>2.33</td>
<td>4.35</td>
</tr>
<tr>
<td>End of Treatment</td>
<td>4.01</td>
<td>2.20</td>
<td>4.00</td>
</tr>
<tr>
<td>Follow Up</td>
<td>4.14</td>
<td>2.46</td>
<td>3.71</td>
</tr>
<tr>
<td>Defeatist Attitudes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>53.68</td>
<td>17.51</td>
<td>52.26</td>
</tr>
<tr>
<td>End of Treatment</td>
<td>51.21</td>
<td>16.98</td>
<td>50.39</td>
</tr>
<tr>
<td>Follow Up</td>
<td>50.59</td>
<td>15.83</td>
<td>49.04</td>
</tr>
<tr>
<td>Social Disinterest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>6.51</td>
<td>2.98</td>
<td>6.59</td>
</tr>
<tr>
<td>End of Treatment</td>
<td>6.64</td>
<td>2.77</td>
<td>5.84</td>
</tr>
<tr>
<td>Follow Up</td>
<td>6.33</td>
<td>2.69</td>
<td>6.00</td>
</tr>
<tr>
<td>ILSS Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>0.69</td>
<td>0.11</td>
<td>0.72</td>
</tr>
<tr>
<td>End of Treatment</td>
<td>0.71</td>
<td>0.17</td>
<td>0.71</td>
</tr>
<tr>
<td>Follow Up</td>
<td>0.69</td>
<td>0.17</td>
<td>0.71</td>
</tr>
<tr>
<td>MASC Effectiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>3.03</td>
<td>1.25</td>
<td>3.35</td>
</tr>
<tr>
<td>End of Treatment</td>
<td>3.28</td>
<td>1.19</td>
<td>3.62</td>
</tr>
<tr>
<td>Follow Up</td>
<td>3.44</td>
<td>1.40</td>
<td>3.42</td>
</tr>
</tbody>
</table>
### Table 3. Bivariate Correlations Among Measures Included in the Models

<table>
<thead>
<tr>
<th></th>
<th>Global Neurocognition T1</th>
<th>Global Neurocognition T2</th>
<th>Global Neurocognition T3</th>
<th>Diminished Motivation T1</th>
<th>Diminished Motivation T2</th>
<th>Diminished Motivation T3</th>
<th>Defeatist Attitudes T1</th>
<th>Defeatist Attitudes T2</th>
<th>Defeatist Attitudes T3</th>
<th>Social Disinterest T1</th>
<th>Social Disinterest T2</th>
<th>Social Disinterest T3</th>
<th>ILSS Total T1</th>
<th>ILSS Total T2</th>
<th>ILSS Total T3</th>
<th>MASC Effectiveness T1</th>
<th>MASC Effectiveness T2</th>
<th>MASC Effectiveness T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Neurocognition T2</td>
<td>681**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Neurocognition T3</td>
<td>640**</td>
<td>792**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diminished Motivation T1</td>
<td>-0.072</td>
<td>0.04</td>
<td>-0.017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diminished Motivation T2</td>
<td>0.061</td>
<td>0.038</td>
<td>0.015</td>
<td>0.284**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diminished Motivation T3</td>
<td>-0.081</td>
<td>-0.053</td>
<td>-0.196*</td>
<td>-0.014</td>
<td>-0.017</td>
<td>-0.299**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defeatist Attitudes T1</td>
<td>-0.115</td>
<td>-0.039</td>
<td>-0.081</td>
<td>0.210**</td>
<td>0.249</td>
<td>0.166*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defeatist Attitudes T2</td>
<td>-0.111</td>
<td>-0.111</td>
<td>-0.125</td>
<td>0.143</td>
<td>0.116</td>
<td>0.116</td>
<td>0.472**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defeatist Attitudes T3</td>
<td>-0.178*</td>
<td>-0.183*</td>
<td>-0.301**</td>
<td>0.065</td>
<td>0.156*</td>
<td>0.145</td>
<td>0.374**</td>
<td>0.444**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disinterest T1</td>
<td>-0.158</td>
<td>-0.101</td>
<td>-0.108</td>
<td>0.357**</td>
<td>0.185*</td>
<td>0.190</td>
<td>0.215**</td>
<td>0.104</td>
<td>-0.114</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disinterest T2</td>
<td>-0.202**</td>
<td>-0.233**</td>
<td>-0.293**</td>
<td>0.235**</td>
<td>0.269**</td>
<td>0.249**</td>
<td>0.285**</td>
<td>0.267**</td>
<td>0.299**</td>
<td>-0.416**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disinterest T3</td>
<td>-0.102</td>
<td>-0.123</td>
<td>-0.182*</td>
<td>0.101</td>
<td>0.171</td>
<td>0.181*</td>
<td>0.239**</td>
<td>0.285**</td>
<td>0.342**</td>
<td>0.288**</td>
<td>0.402**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILSS Total T1</td>
<td>0.181*</td>
<td>0.137</td>
<td>0.195*</td>
<td>-0.353**</td>
<td>-0.221**</td>
<td>-0.220**</td>
<td>-0.138</td>
<td>0.122</td>
<td>-0.141</td>
<td>-0.129</td>
<td>-0.199*</td>
<td>-0.122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILSS Total T2</td>
<td>0.068</td>
<td>0.150</td>
<td>0.173*</td>
<td>-0.182</td>
<td>-0.188*</td>
<td>0.151</td>
<td>-0.104</td>
<td>-0.114</td>
<td>-0.134</td>
<td>-0.108</td>
<td>-0.124</td>
<td>-0.060</td>
<td>0.344*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILSS Total T3</td>
<td>0.140</td>
<td>0.158</td>
<td>0.280*</td>
<td>-0.153</td>
<td>-0.080</td>
<td>-0.206*</td>
<td>-0.130</td>
<td>-0.158</td>
<td>-0.159</td>
<td>-0.171</td>
<td>-0.157</td>
<td>-0.124</td>
<td>0.345**</td>
<td>0.174</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASC Effectiveness T1</td>
<td>0.323**</td>
<td>0.208*</td>
<td>0.162*</td>
<td>-0.146</td>
<td>0.037</td>
<td>0.020</td>
<td>-0.164</td>
<td>-0.124</td>
<td>-0.191*</td>
<td>-0.215**</td>
<td>-0.180*</td>
<td>-0.218*</td>
<td>0.151</td>
<td>0.113</td>
<td>0.084</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASC Effectiveness T2</td>
<td>0.349**</td>
<td>0.430**</td>
<td>0.330**</td>
<td>0.036</td>
<td>-0.086</td>
<td>0.161</td>
<td>-0.112</td>
<td>-0.224*</td>
<td>-0.218*</td>
<td>-0.081</td>
<td>-0.234**</td>
<td>-0.197**</td>
<td>0.148</td>
<td>0.204</td>
<td>0.192</td>
<td>0.314**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASC Effectiveness T3</td>
<td>0.192**</td>
<td>0.325**</td>
<td>0.354**</td>
<td>0.005</td>
<td>-0.110</td>
<td>-0.143</td>
<td>0.004</td>
<td>-0.072</td>
<td>-0.220*</td>
<td>-0.003</td>
<td>-0.185</td>
<td>-0.175</td>
<td>0.151</td>
<td>0.137</td>
<td>0.168</td>
<td>0.289**</td>
<td>0.312</td>
<td></td>
</tr>
</tbody>
</table>

Note: * Significant at p < .05; ** Significant at p < .01,
Note: * Significant at p < .05; ** Significant at p < .01, *** Significant at p < .001

**Figure 3.** Cross-lagged model of mediational effect of defeatist attitudes on the relationship between neuropsychological functioning and diminished motivation
Figure 4. Cross-lagged model of mediational effect of diminished motivation on the relationship between defeatist attitudes and real world functioning

Note: * Significant at p < .05; **Significant at p < .01, ***Significant at p < .001
Figure 5. Cross-lagged model of mediational effect of functional capacity on the relationship between neurocognition and real world functioning

Note: * Significant at p < .05; **Significant at p < .01, ***Significant at p < .001
Aim 2

All analyses were conducted on the imputed data sets created by SPSS using Multiple Imputation. Moderation analyses were conducted using linear regressions in order to examine whether attitudes (either defeatist performance beliefs or social disinterest) predicted change on the outcome variables differently for participants of either CBSST or GFSC. There were no main effects of group, no main effects of attitudes, and no interaction effects between attitudes and group (see table 4 for results for defeatist attitudes as well as Figures 6, 7, and 8, and see table 5 for results for social disinterest as well as Figures 9, 10, and 11). Further follow up analyses were conducted to explore whether there were significant changes from baseline to end of treatment and also from baseline to follow up in outcome variables independent of group and attitudes.
Table 4. Results of Linear Regression Showing Effects of Defeatist Attitudes and Group on Outcome Variables

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>B</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diminished Motivation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – End of Treatment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>0.241</td>
<td>0.572</td>
<td>0.57</td>
</tr>
<tr>
<td>DPAS</td>
<td>0.001</td>
<td>0.084</td>
<td>0.93</td>
</tr>
<tr>
<td>Group X DPAS</td>
<td>-0.002</td>
<td>-0.066</td>
<td>0.95</td>
</tr>
<tr>
<td><strong>Diminished Motivation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Follow Up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.19</td>
<td>-0.43</td>
<td>0.67</td>
</tr>
<tr>
<td>DPAS</td>
<td>-0.014</td>
<td>-0.77</td>
<td>0.44</td>
</tr>
<tr>
<td>Group X DPAS</td>
<td>-0.006</td>
<td>0.23</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>ILSS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – End of Treatment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.29</td>
<td>-0.90</td>
<td>0.39</td>
</tr>
<tr>
<td>DPAS</td>
<td>-0.001</td>
<td>-0.71</td>
<td>0.48</td>
</tr>
<tr>
<td>Group X DPAS</td>
<td>0.001</td>
<td>-0.91</td>
<td>0.37</td>
</tr>
<tr>
<td><strong>ILSS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Follow Up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.007</td>
<td>-0.28</td>
<td>0.78</td>
</tr>
<tr>
<td>DPAS</td>
<td>-0.001</td>
<td>-0.62</td>
<td>0.54</td>
</tr>
<tr>
<td>Group X DPAS</td>
<td>0.001</td>
<td>0.45</td>
<td>0.65</td>
</tr>
<tr>
<td><strong>MASC effectiveness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – End of Treatment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>0.029</td>
<td>0.11</td>
<td>0.91</td>
</tr>
<tr>
<td>DPAS</td>
<td>0.005</td>
<td>0.45</td>
<td>0.66</td>
</tr>
<tr>
<td>Group X DPAS</td>
<td>-0.001</td>
<td>-0.071</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>MASC effectiveness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Follow Up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.31</td>
<td>-1.26</td>
<td>0.22</td>
</tr>
<tr>
<td>DPAS</td>
<td>0.009</td>
<td>0.8</td>
<td>0.44</td>
</tr>
<tr>
<td>Group X DPAS</td>
<td>0.005</td>
<td>0.26</td>
<td>0.94</td>
</tr>
</tbody>
</table>
Figure 6. Change in motivation by level of DPAS and treatment group
Figure 7. Change in effectiveness by level of DPAS and treatment group
Figure 8. Change in functioning by level of DPAS and treatment group
Table 5. Results of Linear Regression Showing Effects of Social Disinterest and Group on Outcome Variable

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>B</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diminished Motivation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – End of Treatment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>0.25</td>
<td>0.61</td>
<td>0.54</td>
</tr>
<tr>
<td>SDS</td>
<td>-0.18</td>
<td>-1.71</td>
<td>0.089</td>
</tr>
<tr>
<td>Group X SDS</td>
<td>0.066</td>
<td>0.44</td>
<td>0.66</td>
</tr>
<tr>
<td><strong>Diminished Motivation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Follow Up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.16</td>
<td>-0.37</td>
<td>0.71</td>
</tr>
<tr>
<td>SDS</td>
<td>-0.1</td>
<td>-0.88</td>
<td>0.39</td>
</tr>
<tr>
<td>Group X SDS</td>
<td>-0.096</td>
<td>-0.62</td>
<td>0.53</td>
</tr>
<tr>
<td><strong>ILSS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – End of Treatment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.029</td>
<td>-0.912</td>
<td>0.38</td>
</tr>
<tr>
<td>SDS</td>
<td>0.000</td>
<td>0.009</td>
<td>0.99</td>
</tr>
<tr>
<td>Group X SDS</td>
<td>0.000</td>
<td>-0.03</td>
<td>0.98</td>
</tr>
<tr>
<td><strong>ILSS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Follow Up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.006</td>
<td>-0.27</td>
<td>0.79</td>
</tr>
<tr>
<td>SDS</td>
<td>0.002</td>
<td>0.34</td>
<td>0.74</td>
</tr>
<tr>
<td>Group X SDS</td>
<td>-0.002</td>
<td>-0.22</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>MASC effectiveness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – End of Treatment:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>0.019</td>
<td>0.074</td>
<td>0.94</td>
</tr>
<tr>
<td>SDS</td>
<td>0.11</td>
<td>1.87</td>
<td>0.073</td>
</tr>
<tr>
<td>Group X SDS</td>
<td>-0.11</td>
<td>-1.38</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>MASC effectiveness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline – Follow Up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-0.34</td>
<td>-1.38</td>
<td>0.18</td>
</tr>
<tr>
<td>SDS</td>
<td>0.11</td>
<td>1.72</td>
<td>0.10</td>
</tr>
<tr>
<td>Group X SDS</td>
<td>-0.036</td>
<td>-0.30</td>
<td>0.77</td>
</tr>
</tbody>
</table>
Figure 9. Change in motivation by level of SDS and treatment group
Figure 10. Change in effectiveness by level of SDS and treatment group
Figure 11. Change in functioning by level of SDS and treatment group
Paired t-tests examined the differences between baseline values of variables and values at end of treatment and baseline values and values at follow up (table 6). Scores differed significantly between diminished motivation at baseline versus end of treatment (baseline M = 4.48, SD = 2.29; end of treatment M = 4.01, SD = 2.23; t_{971} = 2.23 p = .026), and versus follow up (baseline M = 4.48, SD = 2.29; follow up M = 3.93, SD = 2.29; t_{390} = 2.48 p = .016). Scores differed significantly between MASC effectiveness at baseline versus end of treatment (baseline M = 3.18, SD = 1.32; end of treatment M = 3.44, SD = 1.11; t_{538} = -2.40 p = .017), and versus follow up (baseline M = 3.18, SD = 1.32; follow up M = 3.43, SD = 1.50; t_{50} = -2.05 p = .045). Scores did not differ significantly between defeatist attitudes at baseline versus end of treatment (baseline M = 53.01, SD = 17.16; end of treatment M = 50.82, SD = 15.102; t_{3907} = 1.67 p = .095), but differed significantly versus follow up (baseline M = 53.01, SD = 17.16; follow up M = 49.86, SD = 15.22; t_{491} = 2.18 p = .030). No significant differences were found for ILSS total or social disinterest. Effect sizes using Cohen’s d were calculated (see table 6). We used guidelines suggested by Cohen (Cohen 1988) for cut-offs for small (.2), medium (.5), and high (.8) effect sizes.
Table 6. Relationships between variables of interest at baseline, end of treatment, and follow up

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time Point</th>
<th>Mean</th>
<th>SD</th>
<th>T</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diminished Motivation</td>
<td>Baseline</td>
<td>4.48</td>
<td>2.29</td>
<td>2.23*</td>
<td>.208</td>
</tr>
<tr>
<td></td>
<td>End of Treatment</td>
<td>4.01</td>
<td>2.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diminished Motivation</td>
<td>Baseline</td>
<td>4.48</td>
<td>2.29</td>
<td>2.41*</td>
<td>.236</td>
</tr>
<tr>
<td></td>
<td>Follow Up</td>
<td>3.94</td>
<td>2.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILSS Total</td>
<td>Baseline</td>
<td>0.71</td>
<td>0.11</td>
<td>-0.25</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>End of Treatment</td>
<td>0.71</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILSS Total</td>
<td>Baseline</td>
<td>0.71</td>
<td>0.11</td>
<td></td>
<td>.076</td>
</tr>
<tr>
<td></td>
<td>Follow Up</td>
<td>0.70</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASC Effectiveness</td>
<td>Baseline</td>
<td>3.18</td>
<td>1.32</td>
<td>-2.40*</td>
<td>.213</td>
</tr>
<tr>
<td></td>
<td>End of Treatment</td>
<td>3.44</td>
<td>1.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASC Effectiveness</td>
<td>Baseline</td>
<td>3.18</td>
<td>1.32</td>
<td>-2.05*</td>
<td>.177</td>
</tr>
<tr>
<td></td>
<td>Follow Up</td>
<td>3.43</td>
<td>1.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defeatist Attitudes</td>
<td>Baseline</td>
<td>53.01</td>
<td>17.16</td>
<td>1.67</td>
<td>.136</td>
</tr>
<tr>
<td></td>
<td>End of Treatment</td>
<td>50.82</td>
<td>15.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defeatist Attitudes</td>
<td>Baseline</td>
<td>53.01</td>
<td>17.16</td>
<td>2.18*</td>
<td>.194</td>
</tr>
<tr>
<td></td>
<td>End of Treatment</td>
<td>49.86</td>
<td>15.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disinterest</td>
<td>Baseline</td>
<td>6.55</td>
<td>2.90</td>
<td>1.12</td>
<td>.099</td>
</tr>
<tr>
<td></td>
<td>End of Treatment</td>
<td>6.26</td>
<td>2.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Disinterest</td>
<td>Baseline</td>
<td>6.55</td>
<td>2.90</td>
<td>1.40</td>
<td>.135</td>
</tr>
<tr>
<td></td>
<td>Follow Up</td>
<td>6.17</td>
<td>2.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

The goal of this dissertation was to examine the role of possible mechanisms for change in functional outcome and experiential negative symptoms in people with schizophrenia. Figure 1 from our prior research informed the current study and represents a theoretical model that formed the foundation for the examination of factors that contribute to functional outcome in schizophrenia. This model includes pervasive deficits of neurocognition that impact the way individuals approach the world, especially in the context of failure experiences that these deficits can lead to (Perivoliotis & Cather, 2009).

The failures associated with neurocognitive deficits have been hypothesized to lead to the development of dysfunctional cognitions, which causes people to withdrawal and avoid productive engagement in goal-directed functioning activities (Rector, 2004; Perivoliotis & Cather, 2009; Grant & Beck, 2009; Couture et al., 2011; Quinlan et al., unpublished). Unfortunately the research to date examining these relationships has utilized cross-sectional data, which does not allow researchers to draw conclusions about causality in the role of potential mediators and moderators of treatment. This research expanded on the current understanding of the meditational role of dysfunctional attitudes (defeatist performance beliefs and social disinterest) in the relationship between neurocognition and negative symptoms and functional capacity. These cognitions were also studied in terms their roles as possible mechanisms of change in a cognitive therapy intervention. In this context, the broad aim of this dissertation was to assess the role of dysfunctional attitudes in producing change in a psychosocial intervention.

Aim 1: Longitudinal Mediation Models
In the present study we hypothesized the relationships found from Quinlan et al. (unpublished, figure 2) would be found across three time points. We predicted that defeatist attitudes would mediate the relationship between neurocognition and diminished motivation, that diminished motivation would mediate the relationship between defeatist attitudes and real world functioning, and finally that functional capacity would mediate the relationship between neurocognition and functional outcome. All three models showed adequate to good fit. Additionally, all pathways (except for one) were in the proposed directions and the autoregressive pathways (which examined the prediction of a given variable based on prior time points of that same variable) were all significant.

The first model (figure 3) examined the role of defeatist attitudes on the relationship between neurocognition and diminished motivation. Results for the meditational pattern were not fully supported. Contrary to our hypothesis, greater neurocognitive deficits at baseline did not predict more severe defeatist attitudes at end of treatment; however greater neurocognitive deficits at end of treatment did predict severity of defeatist attitudes at follow up. Additionally, more severe defeatist attitudes at baseline did predict a greater level of diminished motivation at end of treatment and there was a trend \( p = .11 \) in defeatist attitudes predicting higher levels of diminished motivation at follow up. As found previously in Quinlan et al. (in press), there was no direct effect between neurocognition and diminished motivation at any of the time points. The path models partially supported our hypothesis that defeatist performance attitudes are related to experiential negative symptoms, which replicates the results found cross-sectionally (Beck & Grant, 2009; Green et al., 2012; Quinlan et al., in press).
The second model (figure 4) examined whether diminished motivation mediated the relationship between defeatist performance beliefs and real world functioning. Unlike the other models studied in this aim, Quinlan et al. (in press) did not test this model formally but as part of a larger dual pathway model. Results for the mediated patterns were not fully supported in these analyses. As proposed, defeatist attitudes at baseline predicted diminished motivation at end of treatment. This relationship persisted between end of treatment and follow-up and was close to significant (p = .053). However, greater diminished motivation did not predict poorer real world functioning from baseline to end of treatment. There was some evidence that this relationship was present between end of treatment and follow-up, but this was only a trend (p = .11). It may be that lag time between assessments was not great enough for the variables of interest to have changed (of note, we did find significant improvement in diminished motivation, but not real world functioning in this trial). As expected based on our prior research (Quinlan et al., in press), defeatist attitudes were not related to real world functioning at any point.

The final model (figure 5) examined whether functional capacity mediated the relationship between neurocognitive deficits and real world functioning. This relationship has been well replicated (Bowie, et al., 2006; Twamley et al., 2002, Quinlan et al., in press) and showed the most evidence for mediation in the current study. Greater impairment in baseline levels of neurocognition predicted worse social functional capacity at end of treatment. This relationship remained significant between end of treatment and follow-up. Additionally, functional capacity predicted real world functioning from baseline to end of treatment, and this significant relationship remained a trend between end of treatment and follow-up (p = .092). While neurocognition and real
world functioning were strongly correlated at baseline, it appears that these effects were mediated by the relationship between functional capacity at later time points (the direct effects were small and non-significant).

The data from Aim 1 provide evidence that the relationships proposed by Quinlan et al. (in press) are partially supported. While none of the models demonstrated full mediation, the relationships between all variables were generally in the predicted directions and mediational pathways showed varying levels of support. The models showed rank-order stability as evidenced by significant autoregressive pathways.

Aim 2: Moderation

Based on the existing research base, we predicted that baseline levels of both defeatist attitudes and social disinterest attitudes would moderate the effect of group on change in experiential negative symptoms, social capacity, and real world functioning. Our first hypothesis was that participants with more severe levels of defeatist performance beliefs at baseline would show greater improvement in the outcome variables for the CBSST group versus the GSFC group. Our second hypothesis was that social disinterest attitudes would also show the same pattern of results. These relationships were examined comparing baseline to end of treatment as well as baseline to follow-up. It was predicted that these moderation effects would be found at end of treatment and at follow-up.

Moderation analyses using linear regression showed no significant main effects of attitudes on change for any of the variables of interest. Additionally, no main effects were found for participants in CBSST groups versus those in GSFC. Finally, no interaction effects were found between baseline level of attitudes and group membership. There was
a trend for a main effect of social disinterest attitudes on change in diminished motivation from baseline to end of treatment (p= .089) and for social disinterest attitudes on change in social capacity effectiveness from baseline to end of treatment (p= .073).

Exploratory analyses were conducted in order to further understand possible changes in the variables of interest. These analyses revealed that diminished motivation differed significantly from baseline to both end of treatment and follow-up. We also found that participants improved on their social competence (MASC) from baseline to end of treatment and follow-up. No significant changes were found for real world functioning. This lack of change for real world functioning as compared to the social competency and negative symptoms might in part explain some of the findings from the earlier theoretical models in which defeatist attitudes predicted experiential negative symptoms but negative symptoms did not predict change in functioning. It may be that the variable of interest (ILSS) did not show enough change or variance for the relationship to be found or that changes in functioning might not be observed in the time period assessed. It may be possible that changes in negative symptoms and functional capacity can be found immediately, but that the skills learned need more time to generalize to real world applications.

With respect to attitudes, there was a significant decrease in severity of defeatist attitudes from baseline to follow up but not at the earlier end of treatment time point. In the models presented above we found that the relationship between neurocognition and defeatist attitudes was not significant from baseline to end of treatment but was significant from end of treatment to follow up. The significant decrease in defeatist
attitudes emerging after more time has passed may relate to that finding. No significant changes were found for social disinterest attitudes.

There was no support for Aim 2 that attitudes moderated the relationship between group assignment and change in outcome variables. However it is noteworthy that participants did improve on several key areas of interest irrespective of which treatment they received. Both CBSST and GSFC are active treatments in which participants set goals that they are trying to work on while in treatment. While skills were not taught as part of the GSFC groups, participants did still meet weekly, set functional goals, and discussed these with other group members, which may have impacted their social capacity and diminished motivation. These findings suggest that interventions that are aimed at functional goal setting are beneficial for people with schizophrenia.

Limitations and future directions

While this study builds on the current research by utilizing longitudinal data, it does have some limitations. In order to have sufficient power to examine the role of mediators in this study we used data from all participants irrespective of group assignment. Because our initial proposed hypotheses were that these groups would differ in their impact on both the mediator variables and the outcome variables, it would have been ideal to test our longitudinal models by separating out the groups. This approach would have required a much larger sample size. However, since the hypothesized mediational relationships suggest that change in the mediator will predict change in the dependent variable, we would have expected that combining the groups should not impact these relationships as any change in earlier time points would be hypothesized to lead to change in later time points.
Subjects that were included in analyses and those that were excluded differed on two variables (age and level of social disinterest). The mean Social Disinterest scores differed significantly (included: mean = 6.55, SD = 2.90; excluded: mean = 5.42, SD = 2.94); \( t_{223} = -2.57, P = .011 \) at baseline. This finding is interesting because it suggests that individuals with more severe dysfunctional attitudes attended more sessions. While prior research has suggested that individuals who do not anticipate pleasure from activities are more likely to not engage (Gard, et al., 2007, Perivoliotis & Cather, 2009) it is also possible that individuals with higher levels of social interest follow through on activities in the community and would not be seeking social engagement through a psychosocial intervention. It may be that the structure of group and the supportive environment helped to engage those with more severe social disinterest.

The mean age of subjects that were included was significantly greater than those who were excluded from analyses (included: mean = 47.03, SD = 11.01; excluded mean = 43.39, SD = 10.27); \( t_{225} = -2.26, P = .025 \). The difference in age was likely due to a lower dropout rate in the clinical trial that enrolled only older patients, where transportation to therapy was provided. Prior research has combined data from these two cohorts and age has not appeared to play a role in outcomes (Granholm, 2009).

Participants did not differ on gender, race, living situation, marital status, total positive symptoms, defeatist attitudes, total negative symptoms, or neuropsychological impairment.

We attempted to account for the high dropout rates (22% loss from baseline to end of treatment, and 33% from baseline to follow up) in the total sample by utilizing modern missing data techniques. These methods are used in order to preserve unbiased
parameter estimates and to maintain estimated variance that should be close to the true population variance (Graham, 2009). We utilized Full Information Likelihood Maximization (FIML) to make use of partially complete data (McLachlan & Krishnan, 1996) for the mediational analyses. This method has been shown to be useful when testing specific models that do not plan to include auxiliary variables. In addition FIML has been found to work well with smaller sample sizes as well as with larger amounts of missing data (Enders, 2001).

For the moderation analyses, using linear regression, Multiple Imputation (MI) was utilized. This decision was made because we needed to compute variable summary scores and MI allows for researchers to constrain the range of missing values in order to allow for the creation of such variables. MI has been found to perform well even in small sample sizes even with large multiple regression models and as much as 50% missing data (Graham & Schafer, 1999).

Additionally, there are slight differences in the follow-up time period (9 months versus 1 year), and in the age of the two populations. While previous work by Granholm, et al. (2009) and Quinlan, et al. (in press) have combined data from these two trials with no noted difficulties, it is still a limitation of this study. The decision to combine the databases was done in order to maximize power and sample size for the statistical techniques being proposed. Additionally, the research in social disinterest attitudes is limited and has been based on a measure that has not been fully validated. The items chosen were based on face validity and the measure showed comparable internal consistency to the original RSAS (Cronbach’s alpha was .65 at baseline and .66 at end of treatment in a study by Granholm, et al., 2009; .62 at baseline in the current study).
Assessing social functioning is often done with performance based tasks that can cover a wide range of functional domains. Our outcome measure (the MASC) specifically examines social functioning and the ability to initiate a conversation and make a request of a confederate. This is not a broad measure of multiple functional domains, but does highlight the domain of functional capacity most related to the attitudes of interest in this study. Additionally, social functioning is a primary target in Cognitive Behavioral Social Skills Training.

Future research is needed to understand the mechanisms of change for people with schizophrenia as well as the role of attitudes as possible mediators in the relationships among neurocognition, negative symptoms, social functioning, and real world functioning. The proposed mediational models did reveal that relationships among the variables of interest were all in the hypothesized direction (except for the pathway between baseline neurocognition and diminished motivation at follow up) and were generally significant. This suggests that the relationships may exist, but that other factors that we did not account for may play a role in how these relationships manifest. It would also be helpful to have an additional wave of data, as effects from treatment may only emerge after participants have had time to practice skills. It might also be beneficial to study the role of mediator variables across multiple time points in the absence of an intervention. Future studies should continue to evaluate relationships between dysfunctional cognitions and functional outcomes in schizophrenia, as there was support for these constructs being related. In addition, the impact of psychosocial interventions on negative symptoms and functional outcome in schizophrenia might be improved by strengthening their focus on reducing the severity of dysfunctional attitudes.
APPENDIX

DPAS Items

1. It is difficult to be happy unless one is good-looking, intelligent, rich and creative.
2. People will probably think less of me if I make a mistake.
3. If I do not do well all the time, people will not respect me.
4. If a person asks for help, it is a sign of weakness.
5. If I do not do as well as other people, it means I am an inferior human being.
6. If I fail at my work, then I am a failure as a person.
7. If you cannot do something well, there is little point in doing it at all.
8. Making mistakes is fine because I can learn from them.
9. If someone disagrees with me, it probably indicates he/she does not like me.
10. If I fail partly, it is as bad as being a complete failure.
11. If other people know what you are really like, they will think less of you.
12. If I am to be a worthwhile person, I must be truly outstanding in one major respect.
13. People who have good ideas are more worthy than those who do not.
14. If I ask a question, it makes me look inferior.
15. I cannot trust other people because they might be cruel to me.
SDS Items

1. My relationships with other people never get very intense.

2. I prefer hobbies and leisure activities that do not involve other people.

3. When others try to tell me about their problems and hang-ups, I usually listen with interest and attention.

4. There are things that are more important to me than privacy.

5. I prefer watching television to going out with other people.

6. I like to make long distance phone calls to friends and relatives.

7. I sometimes become deeply attached to people I spend a lot of time with.

8. People sometimes think I’m shy when I really just want to be left alone.

9. People who try to get to know me better usually give up after awhile.

10. I could be happy living all alone in a cabin in the woods or mountains.

11. I’m much too independent to really get involved with other people.

12. There are a few things more tiring than to have a long, personal discussion with someone.

13. I don’t really feel very close to my friends.

14. I find that people too often assume that their daily activities and opinions will be interesting to me.

15. I attach very little importance to having close friends.
REFERENCES


