Methods for Remediation of Theory of Mind (ToM) Deficits in Schizophrenia

by

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1. **Abstract:**

There is evidence that social cognitive deficits, impairments in cognitive processes used in social situations, in schizophrenia represent one of the key factors that contributes to poor functional outcome, a hallmark of the disorder. One domain of social cognition is Theory of Mind (ToM), which refers to the ability to infer or represent another’s emotional state (Premack, 1978). A prior meta-analysis suggests that deficits in ToM may represent a distinct, trait-marker for schizophrenia, which is separate from other domains of symptom fluctuation (Bora, Yucel, & Pantelis, 2009). Despite the specificity of this social cognitive deficit and its relationship to functional outcome, there are few brief and effective interventions that specifically target ToM. Thus, the purpose of the current research project was to pilot test a novel, brief intervention to improve ToM in patients with schizophrenia. We collected data from ten outpatients diagnosed with schizophrenia and fifteen age and gender-matched non-psychiatric controls. All patients and non-psychiatric controls were administered a brief battery of neurocognitive tests. Patients were then randomly assigned to one of two conditions: the experimental condition, which included a novel ToM intervention, or a control condition, in which patients received equivalent exposure to the outcome measures selected for the study. All patients were assessed on two social cognitive outcome measures before the intervention, as well as after the intervention and at a one-week follow-up, which were conducted by research assistants who were blinded to the condition of the patient. Results did not reveal a significant effect of our novel ToM training procedure; however, sample size was limited and treatment effect-sizes were moderate in range. Future study is warranted since this intervention
is clinically relevant as it may confer improvements not only in a patient’s ability to infer another’s emotions but might also enhance other aspects of functioning.

2. Introduction:

2.1: Symptoms:

Schizophrenia is a chronic psychiatric disorder typically associated with abnormal perceptions, hallucinations and disorganized thinking. Clinicians often use categories of symptoms in diagnosing schizophrenia, including positive and negative symptoms (Potuzak, Ravichandran, Lewandowski, Ongur, & Cohen, 2012). Positive symptoms include psychotic symptoms not seen in healthy persons, such as hallucinations, delusions and disorganized speech (NIMH, 2013). Hallucinations are sensory experiences in the absence of environmental stimuli; they commonly manifest in an auditory form as voices talking to the patient or voices speaking among themselves, and these voices may be negative or critical (Ng, Chun, & Tsun, 2012). In addition, hallucinations can manifest in other sensory modalities including visual, tactile, olfactory or gustatory experiences (Irmak, 2012). Delusions are abnormalities in inferential thinking and can commonly manifest as irrational beliefs that are grandiose or paranoid (Andreasen, 2000). Disorganized speech includes abnormalities in language characterized by frequent derailment and incoherence (Andreasen, 2000). Persons experiencing these positive symptoms are sometimes unable to tell what phenomena are real versus imagined.

In contrast to positive symptoms, negative symptoms are reductions in normal emotion and behavior patterns including blunted affect, social withdrawal, and diminished emotional expression (NIMH, 2013). Blunted affect refers to a severely
reduced facial, vocal and bodily expression of emotion (Lee, Chun, Yoon, Park, & Kim, 2014). Social withdrawal can manifest in seeking isolation, which may include avoiding crowds or not engaging in social situations (Cella et al., 2014).

Neurocognitive deficits are separate from positive and negative symptoms; these deficits are common in schizophrenia and have been linked to vocational and functional impairments (Hegde et al., 2013). These deficits in cognitive functioning can include impairments in working memory, executive functioning, and processing speed (APA, 2013). Working memory involves temporarily storing information for use while completing tasks or mental operations, as a guide for current behavior; it involves the stages of encoding, maintaining and manipulating (Driesen et al., 2008). Executive functioning is a cognitive function involved in planning and resolving conflict among various responses (Reichenberg & Harvey, 2007). Finally, processing speed refers to the ability to complete a task rapidly and efficiently through response to basic stimuli (Rucklidge & Tannock, 2002).

2.2: Diagnosis:

The diagnosis for schizophrenia, according to the Diagnostic Statistical Manual 5 (DSM-5) is based on six criteria (APA, 2013). Criterion A of the DSM-5 requires that two or more of the following symptoms be present for a significant time period over one month. These symptoms are (1) delusions, (2) hallucinations, (3) disorganized speech, (4) grossly disorganized or catatonic behavior and (5) negative symptoms, such as avolition or diminished emotional expression. Other criteria include reduction in level of functioning in areas such as work, self-care or interpersonal functioning (Criterion B) and continuous signs of disturbance that
persist for at least 6 months (Criterion C). Other criteria include exclusion of schizoaffective disorder and depressive or bipolar disorder with psychotic features (Criterion D), and exclusion of disturbance caused by substance, such as medication or drug abuse (Criterion E). The final criterion defines conditions under which schizophrenia is diagnosed with history of autism spectrum or other childhood communication disorders (Criterion F). Updates made to the DSM-5, with respect to the DSM-IV, include the removal of the five subtypes (paranoid, disorganized, catatonic, undifferentiated and residual) from the diagnosis of schizophrenia (Tandon & Carpenter, 2012). In addition, the DSM-5 requires that at least one of the symptoms of Criterion A be one of the first three listed, namely delusions, hallucinations or disorganized speech. Further, Criterion F of the DSM-5 includes other childhood communication disorders in addition to autism spectrum disorders. However, despite these six criteria that are used to define a diagnosis of schizophrenia, the DSM-5 describes schizophrenia as “a heterogeneous clinical syndrome” meaning that there is variance in the presentation of the disease in terms of cognitive, behavioral and emotional dysfunctions and related functional impairments.

2.3: Prevalence and Incidence:

Schizophrenia has a lifetime prevalence, namely, the number of persons in the population who have been diagnosed with schizophrenia at some point in their life, of approximately 0.7% (Barry, Gaughan, & Hunter, 2012). According to the World Health Organization (WHO) the incidence rate, the number of new cases in a given period of time, of schizophrenia is approximately 3 per 10,000 per year and affects
about 24 million persons worldwide (WHO, 2013). In addition, seminal WHO studies support the idea that schizophrenia occurs with similar incidence across diverse cultures and presents with similar clinical features (Jablensky et al., 1992). Indeed these multi-year follow-up studies also support that patients with schizophrenia had a better course and outcome in developing countries. Nonetheless, the standardization of these projects’ methods, and the representativeness of sampling have been subject to critique in subsequent publications (Jablensky & Sartorius, 2008) and incidence and prevalence rates are not considered as culturally uniform as once thought.

One sociocultural trend observed in incidence of schizophrenia is evidence of higher rates of incidence among immigrant populations (Stilo & Murray, 2010). For example, a study conducted in the United Kingdom showed that ethnic minorities, particularly African-Caribbean and Black African, had notably high incidence rate ratios of schizophrenia (Fearon et al., 2006). Other studies that support an increased risk for developing schizophrenia among immigrants include studies of immigrants from Ethiopia to Israel (Weiser et al., 2008), those from Greece to Belgium (Charalabaki, Bauwens, Stefos, Medianos, & Mendlewicz, 1995), and those from Surinam to the Netherlands (Selten, Slaets, & Kahn, 1997). Taken together, immigration may represent a social risk factor for developing schizophrenia.

2.4: Etiology:

The etiology of schizophrenia is complex and not fully understood; however, there is evidence that it is influenced by both genetic and environmental factors (Jablensky, 2010). It is accepted that schizophrenia is a polygenic disorder, namely one influenced by multiple genes, and that adverse interactions with the environment
can contribute to an increased risk of onset (Bray, Leweke, Kapur, & Meyer-Lindenberg, 2010). Heritability estimates for schizophrenia are approximately 80% (Sullivan, Kendler, & Neale, 2003). A twin sharing identical genetic information (monozygotic) is at a 45% risk for developing schizophrenia if their twin is affected. The risk for developing schizophrenia is 10-15% if a first-degree relative is affected, and this rate drops to 2-4% if a second-degree relative is affected (Schwab & Wildenauer, 2013). Beyond degree of a relative affected, there is evidence that higher rates of schizophrenia occur among fraternal (dizygotic) twins compared to the general population (Klaning, Pedersen, Mortensen, Kyvik, & Skytthe, 2002). Further, some environmental factors that have been associated with development of schizophrenia include seasonality of birth (Cheng, Loh, Lin, Chan, & Lan, 2013), cannabis abuse and birth complications (Scherr et al., 2012).

2.5: Neurocognitive Deficits:

Neurocognitive deficits in schizophrenia are conceptualized as distinct from positive and negative symptoms. Several published factor analyses of neurocognitive tests measuring a variety of domains, including attention, verbal and non-verbal memory, language, executive-function and others, have revealed a group of separable neurocognitive domains in schizophrenia (Kern et al., 2011). These domains are represented in the recent Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) test battery, a National Institute of Mental Health (NIMH) initiative designed to provide the best objective assessment of the effects of novel, putatively cognitive-enhancing medications produced through industry and academia (Rajji et al., 2013). These domains include working memory, attention,
verbal learning and memory, problem solving and speed of processing (Green et al., 2004). Neurocognitive deficits can exist prior to onset of psychosis in persons who develop schizophrenia; this supports the model of schizophrenia as a neurodevelopmental disease (Hegde et al., 2013).

Neurocognitive deficits represent an important treatment target as they have been associated with functional outcome (Green, Kern, Braff, & Mintz, 2000) and are not improved by antipsychotic medication (Keefe et al., 2007). Thus current targets of treatment of neurocognitive dysfunction in schizophrenia are distinct from treatment of positive and negative symptoms (Harvey, Green, Keefe, & Velligan, 2004). One behavioral approach for treatment of neurocognitive deficits is cognitive remediation, which is defined as “a behavioral training based intervention that aims to improve cognitive processes with the goal of durability and generalization,” (Wykes, Huddy, Cellard, McGurk, & Czobor, 2011). For example, a recent meta-analysis on the efficacy of cognitive remediation in schizophrenia revealed a small to moderate effect of cognitive rehabilitation on cognitive outcome measures, both at treatment termination as well as during follow-up assessments (Wykes et al., 2011). Thus, cognitive remediation strategies represent an effective approach for targeting and improving certain cognitive deficits in schizophrenia.

2.6: Social Cognitive Deficits:

Social cognitive deficits are linked to impairments in communication, maintaining employment and community function in persons diagnosed with schizophrenia (Couture, Penn, & Roberts, 2006). Social cognitive impairments have been conceptualized as divided into several domains including facial affect
recognition (FAR), attribution bias, and Theory of Mind (ToM) (Fiszdon, Fanning, Johannesen, & Bell, 2013). Similar to neurocognitive deficits, deficits in social cognitive functioning are evident prior to the onset of schizophrenia (Dworkin et al., 1993) and appear to be stable overtime, throughout different phases of the illness (Green et al., 2012). In addition, there is evidence that social cognition, and specifically Theory of Mind (ToM), uniquely contributes to interpersonal skills, beyond that explained by neurocognitive domains such as memory and executive functioning (Pinkham & Penn, 2006). Furthermore, there is evidence that certain social cognitive abilities, which are complex and cognitively demanding, are related to intelligence quotient (IQ), yet distinct from positive and negative symptoms (Bliksted, Fagerlund, Weed, Frith, & Videbech, 2014). Overall, social cognitive deficits represent a unique subdomain of deficit in schizophrenia that is related to functional impairments.

2.7: Remediation of Social Cognitive Deficits:

Though social cognitive deficits are resistant to pharmacological treatment, there is evidence that social cognitive training procedures improve some domains of social cognition, including facial affect recognition (FAR) and Theory of Mind (ToM)(Kurtz & Richardson, 2012). FAR is defined as the ability to process facial emotions, whereas ToM is understood to be the ability to understand and respond to social cues and interpreting other’s emotions (Yalcin-Siedentopf et al., 2014). Some social cognitive training procedures are “targeted” treatments that focus on certain domains of social cognition, whereas others are “broad-based” interventions that may incorporate social skills training, neurocognitive training and other techniques.
One example of a targeted treatment protocol for social cognitive deficits is Social Cognition Enhancement Training (SCET). SCET aims to bolster appraisal of social cues and interpreting the perspectives or emotions of others, which both pertain to ToM. The major training materials of the protocol are cartoons, which are used to teach strategies for recognizing social cues. Such remediation techniques have promising preliminary findings; in a preliminary randomized controlled trial, patients that received SCET showed improvement in social cognitive functioning relative to patients who did not receive SCET (Kwon, 2006). However SCET is relatively long in duration, with a reported treatment protocol that spanned six months. As treatment non-adherence and amotivation are relevant treatment obstacles for patients diagnosed with schizophrenia, a multi-month program may pose a risk in terms of treatment attrition (Jaeger et al., 2013).

2.8: Biological Correlates of Neurocognitive and Social Cognitive Deficits:

Recent studies have examined the biological correlates to neurocognitive and social cognitive deficits in schizophrenia with imaging techniques, including structural and functional magnetic resonance imaging (fMRI) and positron emission tomography (PET). Relatively early imaging studies observed abnormalities in the structural integrity or activity of certain neural regions including the temporal and prefrontal cortex in patients diagnosed with schizophrenia (Friston & Frith, 1995). Further, although many aspects of the pathophysiology of schizophrenia remain unclear, it has been hypothesized that schizophrenia-related phenomena arise from misconnection or inappropriate integration of such regions (Friston & Frith, 1995). One brain region of interest that is relevant to neurocognitive deficits is the
dorsolateral prefrontal cortex (DLPFC), which is involved in attention and executive processes (Fuster, 1999). Deviations relative to non-psychiatric controls have been observed in metabolic activity in the DLPFC and associated with deficits in processing speed in schizophrenia; further, structural deficits of the DLPFC in patients with schizophrenia have been linked to deficits in working memory (Molina et al., 2009). Studies of first-episode, neuroleptic naive patients with schizophrenia have given some insight into the association between aberrant intrinsic brain activity and neurocognitive deficits, without the confounding effects of long-term medication exposure. In one such study, aberrant bilateral activity in the orbitofrontal cortex was related to deficits in processing speed (He et al., 2013).

The literature on the association between neural abnormalities and social cognitive deficits in schizophrenia is more limited. Nonetheless, there is evidence that when performing a social cognitive task, patients with schizophrenia compared to healthy controls, show decreased activation in visual processing regions, specifically the occipital and temporal regions (Bjorkquist & Herbener, 2013). Recent fMRI studies support associations between social cognitive deficits and abnormal brain activation and connectivity, specifically patients diagnosed with schizophrenia showed reduced connections between the amygdala and insula cortex while performing a social cognitive task (Mukherjee et al., 2014). Further, studies of first-episode patients with schizophrenia have given some insight into understanding the association between structural neural abnormalities and deficits in social cognition. For example, one such study showed an association between social cognitive impairment and reduced gray matter density in the left middle frontal gyrus, the right
supplementary motor cortex, the left superior temporal gyrus and the left inferior parietal lobe (Bertrand et al., 2008). Overall, imaging studies have supported that the amygdala, visual processing regions, and various others may be neural regions that are relevant to social cognitive deficits in schizophrenia.

2.9: Theory of Mind:

The ability to infer or represent another’s emotional state is known as Theory of Mind (ToM) (Premack, 1978). Deficits in ToM are present in various psychiatric disorders; some of the most extensive research on ToM deficits has been focused on impairments in patients diagnosed with autism-spectrum disorders (Baroncohen, Leslie, & Frith, 1985). More recently, there has been research on ToM impairments in schizophrenia (Brune, 2006). Deficits in ToM exist in patients diagnosed with schizophrenia who are remitted and non-remitted; this suggests that ToM may represent a trait-related mentalizing impairment (Bora et al., 2009).

Despite the specificity of ToM deficits and their relationship to functional outcome, there are few brief, effective interventions that enhance ToM. One intervention, Social Cognition Interaction Training (SCIT), effectively targets ToM as one element of a broader intervention; however, the full training program spans about eighteen weeks (Combs et al., 2007). A recent study, which attempted to develop a shortened version of SCIT failed to produce improvement in ToM (Horan et al., 2009). Multi-faceted approaches to remediation, such as the SCIT, may obscure which variables are the key, active ingredients of treatment that underlie social cognitive improvements in these studies. The present study was designed to address
this issue, in performing a pilot study designed to investigate whether specific, targeted remediation strategies improve ToM deficits in schizophrenia.

2.10 Present Study:

This pilot study involved testing a new, one session, 30-minute remediation strategy that aimed to improve ToM through a modification of the Inference Intention Task (IIT) (Sarfati, Hardy-Bayle, Besche, & Widlocher, 1997) a standardized measure of ToM. More specifically, we designed a novel remediation strategy based on *didactic instruction*, namely providing a teaching strategy that incorporates practice at the moment of instruction, and *self-monitoring verbalization* techniques, which involve participants orally describing and reflecting on learned strategies as they are used. Prior meta-analytic studies have provided evidence of behavioral training as an effective approach for remediating ToM deficits; however, these programs can span several weeks or months (Kurtz & Richardson, 2012). Only one prior study, to our knowledge has studied brief, specific methods for remediation of ToM deficits. In that study, half of the subjects diagnosed with schizophrenia showed improved performance when they were provided with verbal cues, instead of only non-verbal, pictorial cues under standard conditions (Sarfati, Passerieux, & Hardy-Bayle, 2000). However, these verbal cues were written descriptions of the comic-style picture items, which individuals would be unlikely to encounter in everyday life; this raises questions regarding the generalizability of such a strategy.

In contrast, didactic and self-monitoring strategies promote generalization by providing skills that can be used in situations outside the testing context. Self-monitoring strategies have been shown to be effective in improving executive
functioning, as measured by the Wisconsin Card Sorting Test; these improvements were durable, evident after a one-month follow-up and generalized to other measures of executive functioning (Choi & Kurtz, 2009). Further, structured, didactic generalization strategies, including corrective feedback, have also been effective at remediating performance on measures of executive functioning (Bellack, Mueser, Morrison, Tierney, & Podell, 1990) and are a centerpiece of highly successful social-skills training programs (Kurtz & Mueser, 2008). Thus, a brief, novel intervention for ToM deficits that uses generalizable, didactic and self-monitoring strategies may be effective since these techniques have been successful in interventions for other domains of cognition in schizophrenia.

2.11 Hypotheses:

Given the moderate gains in a ToM-related task with verbal cues in prior studies (Sarfati et al., 2000) and the generalized success of verbal self-monitoring strategies (Choi & Kurtz, 2009), it was hypothesized that a remediation strategy combining didactic training and verbalized self-monitoring strategies would improve ToM abilities in patients diagnosed with schizophrenia. Specifically, the primary hypothesis was that the experimental participant group, which received the remediation strategy, would improve on a measure of ToM, the Inference Intention Task (IIT), relative to a control outpatient group that was exposed to the same assessments without ToM training. Further, it was hypothesized that this improvement in the experimental group would persist during a one-week follow-up assessment. As a secondary hypothesis, it was predicted that the experimental participants, would show generalization of this training to a different domain of social
cognition, namely facial affect recognition, relative to the patients in the control condition, and that this improvement would persist at a one week follow-up assessment.

3. Methods:

3.1: Design:

All procedures for the study met relevant institutional review board (IRB) approval. More specifically, procedures for enrolled outpatients diagnosed with schizophrenia or schizoaffective disorder met institutional review board approval at Hartford Hospital and Wesleyan University. Further, procedures for non-psychiatric, age- and gender-matched non-psychiatric controls met IRB approval at Wesleyan University. Prior to participation in the study, both outpatients and non-psychiatric controls signed informed, written consent forms. Further, outpatients also signed a release of protected health information (PHI). Outpatient participants were randomly assigned to either an experimental or control condition of the study through a coin flip. Outpatients of both conditions were administered a battery of tests at a baseline assessment including a brief estimate of intelligence quotient (IQ), and a battery of cognitive tasks. The baseline assessment was immediately followed with the intervention, only for the experimental group. Immediate and one-week follow-up assessments of the two outcome measures were administered for both patient groups (See Table 1). Non-psychiatric, matched controls were assessed with the same baseline battery of tests but at a single time-point to create normative values for certain tests selected for the research.
3.1.1: Theory of Mind Training:

The primary outcome measure was a measure of Theory of Mind, the Inference Intention Task (IIT) (Sarfati et al., 1997) and ToM training used stimuli that were based on items of this measure. In the baseline assessment, the complete 28 items of the IIT were administered. The intervention involved the administration of 7 novel items that were designed for training purposes and modeled after the 28 items of the IIT. The intervention was based on a generalization strategy for training on tasks of executive functioning, which draws on didactic and self-monitoring training strategies (Bellack et al., 1990). The intervention was didactic in that it involved the research assistant teaching the patients how to distinguish foils on the task. Further, the intervention involved a verbal self-monitoring strategy, as the patients were prompted to engage in verbal reasoning as they completed the task (see Appendix, Figure 3 for training script, and Figure 5 for an example of an intervention item).

After, the intervention, an immediate follow-up of the full 28 items of the IIT was administered. To control for exposure to the IIT items and attention from the experimenter, outpatient participants who were randomly assigned to the control condition received the IIT a second time without any additional explanation of the task. Finally, for both the experimental and control patient groups, a one-week follow-up of the full IIT was administered (see Table 1). In addition, for both patient groups the Penn Emotional Acuity Test (PEAT) was administered following each of the three administrations of the IIT. The PEAT is a measure of facial affect recognition (Erwin et al., 1992) which is a key aspect of social cognition; in this project, the PEAT served as a secondary outcome measure to assess generalization of...
training effects. Initial testing, was approximately ninety to one hundred and twenty minutes in duration and one week follow-up testing was twenty to thirty minutes in duration.

The research assistants who conducted the immediate and one-week follow-up assessments were blinded to the condition of the patients. In order to confirm blinding, assessors were asked to guess the condition (experimental or control) of the patients; assessors guessed the correct condition of the patient with an accuracy of 30%.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Assessment Time Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>BASE → INTER→ PT-1 → PT-2</td>
</tr>
<tr>
<td>Control</td>
<td>BASE→ PT-1 → PT-2</td>
</tr>
</tbody>
</table>

Table 1: Design of experiment for outpatient groups (n=10).
Note: BASE= neurocognitive, ToM, and facial affect recognition assessments prior to intervention; INTER=intervention; PT-1=Post-training 1 (immediate follow-up), ToM and facial affect recognition assessment after intervention or control period; PT-2= Post-training 2 (one week follow-up) ToM and facial affect recognition assessment one week after termination of the intervention or control period.

3.2: Participants:

3.2.1: Outpatients:

The study included (n=10) clinically stable outpatients (n=5 males) diagnosed with schizophrenia or schizoaffective disorder. Patients were recruited from the Institute of Living at Hartford Hospital in Hartford, CT (n=9), or InterCommunity Mental Health Center (n=1) in East Hartford, CT. Exclusion criteria for outpatients included significant and uncorrected auditory or visual impairment, significant neurological insult other than schizophrenia, lack of proficiency in English, or significant substance use in the past three months. Inclusion criteria included
diagnosis of schizophrenia or schizoaffective disorder, and stabilization on antipsychotic medication. Recruitment of outpatients occurred either through informational meetings among the Principal Investigator (PI), research assistants, outpatients and their clinicians following group treatment sessions or through treating clinicians at the Institute of Living and InterCommunity Mental Health Center.

There were no significant differences between the experimental (n=5) and the control patient group (n=5) with regard to demographic and clinical characteristics (Table 2). The two groups were comparable with regard to the demographic variables of age (p=0.69), education (p=0.33), gender (p=0.49), and race (p=0.49). In terms of clinical variables, there were no significant differences between groups in duration of illness (p=0.55), age of onset (p=0.67), number of hospitalizations for schizophrenia (p=0.54), and percentage of patients on atypical antipsychotic medications (p=0.49). The patient groups represent chronic patients stabilized on antipsychotic medication.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental Patient Group (n= 5) Mean ± SD</th>
<th>Control Patient Group(n=5) Mean ± SD</th>
<th>t value (t) or Chi-Square (χ²)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>31.00 ± 3.74</td>
<td>33.40 ± 12.24</td>
<td>t=0.42</td>
<td>0.69</td>
</tr>
<tr>
<td>Education (years)</td>
<td>13.20 ± 1.64</td>
<td>12.40 ± 0.55</td>
<td>t=-1.03</td>
<td>0.33</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>60%</td>
<td>80%</td>
<td>χ²=0.48</td>
<td>0.49</td>
</tr>
<tr>
<td>Race (% Caucasian)</td>
<td>80%</td>
<td>80%</td>
<td>χ²=0.48</td>
<td>0.49</td>
</tr>
<tr>
<td>Illness duration (years)</td>
<td>9.40 ± 6.58</td>
<td>13.60 ± 13.72</td>
<td>t=0.62</td>
<td>0.55</td>
</tr>
<tr>
<td>Age Onset (years)</td>
<td>22.20 ± 5.50</td>
<td>20.40 ± 7.09</td>
<td>t=-.45</td>
<td>0.67</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td>10.00 ± 5.10</td>
<td>7.40 ± 7.47</td>
<td>t=-.64</td>
<td>0.54</td>
</tr>
<tr>
<td>Medication(% atypical)</td>
<td>60%</td>
<td>80%</td>
<td>χ²=0.48</td>
<td>0.49</td>
</tr>
</tbody>
</table>

Table 2: Demographic and clinical characteristics of experimental and control groups.

3.2.2: Healthy Controls:

Fifteen non-psychiatric, age- and gender-matched controls participated in the study. Of the fifteen non-psychiatric controls, adult males were included at
approximately a 2:1 ratio, consistent with prior studies of gender distribution in schizophrenia (McGrath et al., 2004). Non-psychiatric controls were recruited from the surrounding community of Middletown, CT, and were between the ages of 18 to 55. Similar to that of outpatients, exclusion criteria included significant auditory or visual impairment, and lack of proficiency in English. Further, exclusion criteria for non-psychiatric controls included self-reported history of diagnosis of schizophrenia or any other psychotic disorder, or self-reported first-degree relative with schizophrenia or other psychotic disorder. Exclusion criteria also included history of a head injury, such as a concussion, leading to a loss of consciousness for 30 minutes or more. Information regarding eligibility for participation was obtained via a brief set of questions answered over the phone (see Appendix, Figure 6 for screening questionnaire). Recruitment occurred through flyers placed around the Wesleyan University Campus and Middletown community, as well as through word of mouth (see Appendix, Figure 7 for non-psychiatric control recruitment flyer).

Non-psychiatric controls (n=15) were matched to the outpatient sample (n=10) on the variables of age, and gender (see Table 3). Thus, there were no significant differences in comparing the demographic parameters of age (p=0.21), and gender (p=0.86). Race was also similar across the groups (p=0.85). However, there was a significant difference (p=0.04) in years of education.
Table 3: Demographic characteristics of non-psychiatric controls and outpatients. Note: *= p<.05.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outpatients (n=10) Mean ± SD</th>
<th>Non-psychiatric Controls (n=15) Mean ± SD</th>
<th>T value (t) or Pearson Chi-Square (χ²)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>32.20 ± 8.63</td>
<td>38.07 ± 12.36</td>
<td>t= 1.30</td>
<td>0.21</td>
</tr>
<tr>
<td>Education (years)</td>
<td>12.80 ± 1.23</td>
<td>15.07 ± 3.17</td>
<td>t= 2.50</td>
<td>0.04*</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>70%</td>
<td>66.7%</td>
<td>χ² =0.03</td>
<td>0.86</td>
</tr>
<tr>
<td>Race (% Caucasian)</td>
<td>70%</td>
<td>73.3%</td>
<td>χ² =0.03</td>
<td>0.85</td>
</tr>
</tbody>
</table>

3.3: Measures of IQ, Neurocognition and Social Cognition

3.3.1: Baseline Neurocognitive Assessments:

Assessment of Intelligence Quotient (IQ):

The Wechsler Test of Adult Reading (WTAR) (Whitney, Shepard, Mariner, Mossbarger, & Herman, 2010) was used as a proxy for intelligence quotient (IQ), which estimates intellectual functioning before the onset of an injury or illness, and was administered to all participants. The task is based on reading 50 words with atypical grapheme to phoneme translations, and duration is less than ten minutes. The WTAR was used to generate estimated Full Scale Intelligence Quotient (FSIQ) scores, which were continuous and ranged from 64 to 124.

Verbal Episodic Memory:

The measure of verbal episodic memory that was administered to all participants was the Hopkins Verbal Learning Test (HVLT) (Shapiro, Benedict, Schretlen, & Brandt, 1999). This brief assessment consisted of twelve target nouns and probes total and delayed word recall, retention and recognition discrimination. For this research project we only administered the three learning trials and did not administer the delayed portion of the assessment. The raw score from the sum of the
three trials of the HVLT was selected for analysis and was standardized against data from a normative sample that was divided into age groups.

**Speed Information Processing and Executive Functioning:**

The measure of speed information processing and executive functioning, the Trail Making Test (TMT) (Spreen, 1998) was administered to all participants. This brief task was administered in the format of pencil and paper, and required ordering and connecting a series of numbers and/or letters on a page. There are two subtests of this measure, Trail Making A and Trail Making B, which are both continuous variables that are measured via time to complete the task. These scores were standardized against scores of a normative sample divided into age groups.

**Verbal Fluency:**

The Controlled Oral Word Association Test (COWAT) (Spreen, 1998) was used to assess verbal fluency in all participants. This task was verbally administered and measured the participant’s ability to make associations to specified letters. Specifically, in the task, participants were probed to generate words to a phonemic cue “F”, “A” and “S” as well as to the categorical cue of “Animals” during a one-minute duration. The raw number of items produced in the task was used as a continuous measure, and was converted to standardized scores based on performance of a normative sample.

**3.3.2: Social Cognitive Outcome Measures:**

**Facial Affect Recognition:**

The Penn Emotion Acuity Test (PEAT) (Erwin et al., 1992) was used as a measure of facial affect recognition (FAR). In this computerized assessment,
participants were required to judge the affect presented in photographs of professional actors on a 7-point Likert scale of emotions ranging from very happy to very sad. We selected the total correct score on this task, which may range from 0 to 40, as the measure of study, and created standardized scores relative to performance of our sample of non-psychiatric controls. The measure was administered to patients both before and after ToM remediation and at a one-week follow-up.

**Theory of Mind:**

The Inference Intention Task (IIT)(Sarfati et al., 1997) is a nonverbal task that targets ToM through comic strips. The task involves 28 different comic strip items, each depicting a distinct simple action. Each comic strip item presents a story in three successive pictures, and after being presented with the sequence, the subject is asked to identify which of three potential answer options most logically completes the story of the comic strip. Of the three answer options, one is the correct answer, one is pictorially similar to the final picture of the comic strip, and one involves an everyday action with no relation to the comic strip story (see Appendix, Figure 4 for a sample item of the IIT). This measure is continuous and is scored via summing the total correct responses. The scores range from zero to a total of 28 items correct; these scores were converted into continuous standardized z-scores relative to the performance of the non-psychiatric control sample. The measure was administered to patients both before and after ToM remediation and at a one-week follow-up.

**3.4: Data Analysis and Statistics:**

The Statistical Package for the Social Sciences (SPSS 19.0) was used to analyze the data. Raw scores for all neurocognitive and social cognitive measures
were converted to standardized $z$-scores. All measures, with the exception of the PEAT and the IIT, had tables of standardized scores calculated from a normative sample and divided into age groups (T scores). For the PEAT and IIT, standardized scores were created based on data from the non-psychiatric control sample. Individual outpatient scores were subtracted from the mean of non-psychiatric controls and this difference was divided by the standard deviation of non-psychiatric controls’ scores. For quantitative demographic and clinical variables, means were compared between sample groups with independent sample $t$-tests. Categorical variables were compared between groups with the Chi-Square Test of Independence, through the “cross tabs” function of SPSS. Means of the primary and secondary outcome measures at the three assessment points were plotted through the program, Excel with error bars of standard error. IIT and PEAT difference scores between baseline assessment and follow-up immediately after ToM training or control exposure were created for each participant and then compared across patient groups. In addition effect-size analysis was used to quantify the effects of the intervention by comparing the baseline and immediate follow-up scores of both outcome measures for both patient groups. Finally, an Analysis of Covariance (ANCOVA) approach was used to compare follow-up IIT and PEAT scores between groups using baseline IIT and PEAT scores as a covariate, respectively.

4. Results:

4.1: Cognitive Results of Patients and Non-Psychiatric Controls:

Differences in performance were evident between the psychiatric outpatients and the non-psychiatric controls on several neurocognitive measures (see Table 4).
There was a significant difference in scores on both sections of the Trail Making Test (TMT), Trail A \( (t=4.75, p=0.000) \) and Trail B \( (t=-2.40; p=0.03) \). There was also a significant difference in comparing scores for the categorical task (“Animals” cue) of the verbal fluency test \( (t=-2.49, p=0.02) \). There were no significant differences for estimates of intelligence quotient based on the WTAR \( (p=0.24) \). There were also no significant differences in verbal episodic memory, measured by the HVLT \( (p=0.89) \), verbal fluency measured by the letters task \( (p=0.78) \), or social cognition measured by the IIT \( (p=0.47) \) or the PEAT \( (p=0.67) \).

<table>
<thead>
<tr>
<th>Cognitive Test</th>
<th>Outpatients (n=10) Mean ± SD</th>
<th>Non-psychiatric Controls (n=15) Mean ± SD</th>
<th>t value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTAR (FSIQ)</td>
<td>98.10 ± 13.08</td>
<td>103.47 ± 9.26</td>
<td>-1.21</td>
<td>0.24</td>
</tr>
<tr>
<td>HVLT (T score)</td>
<td>40.70 ± 10.79</td>
<td>41.53 ± 16.52</td>
<td>-0.14</td>
<td>0.89</td>
</tr>
<tr>
<td>Trails A (T score)</td>
<td>41.00 ± 5.96</td>
<td>54.53 ± 8.26</td>
<td>-4.75</td>
<td>0.00**</td>
</tr>
<tr>
<td>Trails B (T score)</td>
<td>37.20 ± 9.10</td>
<td>46.93 ± 10.41</td>
<td>-2.40</td>
<td>0.03*</td>
</tr>
<tr>
<td>Verbal Fluency, Letters task (T score)</td>
<td>42.90 ± 13.19</td>
<td>41.67 ± 8.23</td>
<td>0.29</td>
<td>0.78</td>
</tr>
<tr>
<td>Verbal Fluency, “Animals” task (T score)</td>
<td>35.80 ± 7.12</td>
<td>44.60 ± 9.55</td>
<td>-2.49</td>
<td>0.02*</td>
</tr>
<tr>
<td>IIT</td>
<td>20.50 ± 6.79</td>
<td>22.27 ± 5.16</td>
<td>-0.74</td>
<td>0.47</td>
</tr>
<tr>
<td>PEAT</td>
<td>23.10 ± 6.77</td>
<td>24.20 ± 5.88</td>
<td>-0.43</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Table 4: Comparing mean raw scores and standardized cognitive test scores between non-psychiatric controls \( (n=15) \) and outpatients diagnosed with schizophrenia \( (n=10) \). Note: * = \( p<.05 \); ** = \( p<.01 \)

4.2: Social Cognitive Results for Experimental and Control Patient Groups:

4.2.1: Comparing Change in Scores on Primary Outcome Measure:

Results comparing IIT scores obtained at the three assessment points and change in scores between the three assessment points were non-significant. There were no significant differences between the experimental and control patient groups in the change in IIT score between the baseline and immediate follow-up (Table 5).
Nonetheless, there appears to be a trend indicating a greater increase in IIT score between baseline and immediate follow-up in the experimental group, which received the intervention, compared to the control group (Figure 1). Also, patients in the experimental group showed moderate-sized within-group improvement on the IIT between baseline and immediate follow-up (d=0.48). However, control patients also showed moderate-sized IIT improvement between these assessment points (d=0.35).

![Control vs. Intervention Group Mean IIT Scores at Three Stages of Assessment](image)

Figure 1: Bar graph comparing the mean IIT scores of the control patient group (n=5) versus the patient group that received the intervention (n=5) at three assessment points. Error bars denoting standard error are included.

<table>
<thead>
<tr>
<th></th>
<th>Intervention Patient Group (Mean ± SD)</th>
<th>Control Patient Group (Mean ± SD)</th>
<th>t value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change between baseline and immediate follow-up</td>
<td>0.85 ± 1.37</td>
<td>0.39 ± 0.49</td>
<td>0.712</td>
<td>0.49</td>
</tr>
<tr>
<td>Change between immediate and one week follow-up</td>
<td>0.12 ± 0.45</td>
<td>0.12 ± 0.45</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 5: Change in standardized IIT scores between three assessment points for intervention (n=5) and control (n=5) patient groups. Note: Standardized scores for Table 5 and 6 were calculated from mean scores and standard deviations of non-psychiatric control group. Signs of the standardized scores were switched (from negative to positive) to reflect positive change in IIT score.
4.2.2: Comparing Change in Scores on Secondary Outcome Measure:

There was no significant difference in change in standardized PEAT scores from baseline to immediate follow-up in comparing the intervention and control patient group (p=0.86), see Table 6. There were very small-sized within-group advances on the PEAT in the experimental (d=0.07) and control (d=0.00) groups.

![Bar graph comparing the mean PEAT scores of the control patient group (n=5) versus the patient group that received the intervention (n=5) at three assessment points. Error bars denoting standard error are included.](image)

Table 6: Change in standardized PEAT scores between three assessment points for intervention (n=5) and control (n=5) patient groups.
4.3: Analysis of Covariance:

An analysis of covariance (ANCOVA) was conducted to compare the follow-up IIT scores (dependent variable) of the intervention and control patient group, while controlling for the covariate of baseline IIT score. The result was non-significant, (p=0.712). Similar methods were used for conducting an ANCOVA to compare PEAT scores between patient groups; the follow-up PEAT scores served as the dependent variable, while controlling for baseline PEAT scores as the covariate. These results were also non-significant (p=0.859).

5: Discussion:

The literature on social cognitive remediation programs for schizophrenia has expanded over the past decade, and some interventions have contributed to improvement in various domains of social cognition and aspects of functional outcome (Wolwer et al., 2005). However, many effective broad-based interventions span many weeks in duration (Kurtz & Richardson, 2012). This pilot study represents a novel and brief one-session intervention using didactic instruction and self-monitoring verbalization targeted at Theory of Mind deficits in schizophrenia. No similar interventions, to our knowledge, have been developed. It is perhaps the only such intervention; further, other brief cognitive interventions of similar design have been effective for patients diagnosed with schizophrenia (Choi & Kurtz, 2009). Nonetheless, one of the major limitations of this pilot study is the limited size of the outpatient sample. The ramifications of this limitation, and other limitations, are highlighted in the following sections.
5.1: Evaluating Hypotheses:

5.1.1: Evaluating Primary Hypothesis:

There is mixed evidence to support the primary hypothesis that the novel intervention can improve ToM abilities in schizophrenia. It was expected that the intervention would significantly improve ToM abilities, namely the IIT score of the experimental patient group would increase significantly between baseline and immediate follow-up; however, results were non-significant (see Table 5). Nonetheless, the size-effect analysis revealed a moderate-sized effect of the intervention in terms of improving IIT score between baseline and immediate follow-up assessments in the experimental patient group (d=0.48). However, a moderate-sized within-group improvement was also observed in the control group (d=0.35), which may suggest that improvement on the IIT is due to practice effects. Further, the non-significant results of the analysis of covariance also do not support the primary hypothesis.

These results may be non-significant as a result of the small sample of outpatients. In the current study each patient group has five participants; however, the research project has been approved by the IRB of Hartford Hospital to recruit twenty more patients. Perhaps with control and experimental patient groups of about fifteen participants each, significant findings supporting the primary hypothesis will emerge.

Our results confirm the expectation of no change in IIT score between immediate and one week follow-up. Since participants did not receive further training between the immediate and one-week follow-ups, it was expected that IIT performance would be unchanged. This was supported by the data, as the change in
IIT score between immediate and one-week follow-up assessments is small in magnitude for both patient groups (Figure 1), and the change in standardized IIT score is the same for the two groups (p=1.00)(Table 5).

5.1.2: Evaluating Secondary Hypothesis:

The secondary hypothesis is not supported by the findings of this research project. According to the secondary hypothesis, the effects of the intervention would generalize to confer improvement on a measure of facial affect recognition, the PEAT, between baseline and immediate follow-up assessments. However, the intervention group did not show significant improvement on the PEAT between these assessment points (see Table 6). In addition, effect-size analysis comparing baseline and immediate follow-up PEAT scores revealed very small-effect sizes for the intervention group (d=0.07) and the control group (d=0.00). Further, the results were non-significant in the ANCOVA analysis in which PEAT follow-up scores were compared between patient groups.

The secondary hypothesis may have not been supported by the data because Theory of Mind and facial affect recognition (FAR) may represent distinct domains of social cognition, which each require targeted interventions to show improved skills. The items of the intervention of the present study were modeled after the items of the IIT, a measure of ToM, in which individuals with schizophrenia are taught to try to understand the perspectives of the characters across a variety of social situations (see Appendix, Figure 5 for sample intervention item). These skills are markedly different from the more elementary neurocognitive skills in sustained attention and visual scanning that are likely crucial for accurate identification of facial
affect. Also, though our training items did show cartoon characters with facial expressions, these expressions are far less precise and detailed than photographs used in a standardized measures of FAR, such as the PEAT or the Eckman 60-Faces (EK-60F) Test (Dodich et al., 2014).

5.2: Comparing Patient and Non-Psychiatric Control Variables:

5.2.1: Comparing Demographic Findings:

The only significant difference (p=0.04) that existed in comparing demographic characteristics of outpatients and non-psychiatric controls was in years of education (p=0.04), see Table 3. This is expected as onset of schizophrenia occurs in late adolescence or early adulthood and the symptoms can contribute to poor academic performance and premature exit from school (Yoshii, Watanabe, Kitamura, Sakai, & Akazawa, 2012). Further, there was the potential sampling bias of selecting non-psychiatric controls exclusively from Wesleyan University. However, there were efforts made to avoid this bias, in recruiting participants from the broader Middletown community; only four out of fifteen non-psychiatric controls were affiliated with Wesleyan University.

5.2.2: Comparing Neurocognitive Findings:

It was expected that non-psychiatric controls would score higher in nearly all neurocognitive assessments relative to outpatients, as it is well-established in the literature that neurocognitive deficits are characteristic of schizophrenia (Fioravanti, Bianchi, & Cinti, 2012). This expectation was confirmed through significant group differences on the Trail Making Task (TMT). It is notable that the two subtests of the TMT, TMT A and B, have some differences in demands of motor control and
perceptual flexibility. While TMT A involves only ordering numbers, TMT B involves both numbers and letters and thus is a set-switching task and a clearer index of executive functioning (Arbuthnott & Frank, 2000). The significant results were expected as the literature supports that persons with schizophrenia have deficits in cognitive domains of speed information processing and executive functioning relative to non-psychiatric persons (Knowles, David, & Reichenberg, 2010; Orellana & Slachevsky, 2013).

Comparing scores of patients and non-psychiatric controls on the verbal fluency task, namely the COWAT, showed expected and unexpected findings. Based on prior studies, it was expected that non-psychiatric controls would do significantly better on both sections of the verbal fluency task (Gilvarry et al., 2001). Nonetheless, there was only a significant difference between scores on the categorical task (“Animals” cued task), see Table 4. A prior study that showed a highly significant difference on the letters task in comparing patients and non-psychiatric controls, with reported a mean score of 30.08±11.08 for patients with schizophrenia (Riley et al., 2000). Comparatively, the patient sample of this study was scoring unusually high on this letters task. Perhaps, this is due to practice effects, as the patient population from Hartford Hospital may have been exposed to the verbal fluency task in the past as part other research projects and assessments. Also, it is possible that with a larger sample of patients, the current mean score would be more consistent with samples previously reported in the literature.

The non-significant findings with regard to the HVLT, and IIT were unexpected. The HVLT scores of the non-psychiatric controls were lower than
expected. In prior studies of a normative sample (n=130), a subgroup of the same age range as the current project yielded a mean T score of about 48; in contrast, the mean T score of this project’s non-psychiatric sample was 41.53 ± 16.52 (Jason Brandt, 2001). In addition, prior studies have shown a significant difference (p<0.009) in IIT scores between non-psychiatric controls and patients with schizophrenia (Sarfati et al., 1997). Nevertheless, this prior study involved over twenty subjects in both the non-psychiatric control and patient groups. Perhaps the larger sample sizes of these prior studies contributed to the significant differences in HVLT and IIT scores between patients diagnosed with schizophrenia and non-psychiatric controls.

Another possible source of error is that non-psychiatric participants might have scored lower than expected on some cognitive assessments due to substance abuse. Substance abuse in non-psychiatric persons has been linked to cognitive deficits. Particularly such cognitive deficits have been evident in persons with chronic use of cannabis (Pope et al., 2003) as well as stimulants, such as cocaine, and opiates (Rogers & Robbins, 2001). In future research projects it would perhaps be advantageous to screen for substance use in prospective participants through collecting and testing urine samples for illicit substances.

5.3: Limitations of the Current Pilot Intervention and Future Directions:

In addition to the limited outpatient sample size, other limitations involve the benefits and drawbacks of a targeted intervention design, and the generalizability of the intervention. Social cognitive training programs can be roughly categorized as “broad-based” or “targeted” interventions (Roberts & Velligan, 2012); the current study represents a pilot test of a targeted intervention. Targeted social cognitive
Interventions focus solely on remediation of social cognitive deficits, in this case ToM deficits, at the exclusion of other domains of social cognition, social skills training and other treatment elements. This generally allows targeted interventions to be shorter in duration and less costly; however, there is evidence that broad-based interventions can produce generalization to multiple domains of social cognition and enhanced functional outcome (Mueller & Roder, 2007).

The design of the current targeted intervention aimed to represent a key, active component that may underlie improvement in social cognitive deficits observed in broader approaches. For example, Integrated Psychological Therapy (IPT) is a program that spans on average over sixteen weeks, and applies some strategies that are similar to those of the current intervention (Mueller & Roder, 2007). Specifically, a social perception subprogram of IPT involves verbally describing social situations presented as pictures and selecting labels for the pictures. This is similar to the way the current pilot project implements self-monitoring verbalization to facilitate contextualization of a comic strip picture. IPT leads to improvement in domains of emotion processing and social perception (Roder, Mueller, & Schmidt, 2011). Thus, the current intervention has the advantage of being only about thirty minutes in duration and may be similar to an active element of an effective broader training program. Nonetheless, the current study only shows potential trends of improvement in ToM abilities and there is a lack of evidence to support generalization.

Generalization may have not been observed in this study because the novel intervention may have been specific for only improving performance on the ToM
outcome measure. Similar to prior studies, the current intervention is modeled after the primary outcome measure, which in this case is the IIT. Thus the intervention may be limited in generalizability as it may only confer improvement on the IIT. A previous study of a one-session intervention targeted to facial affect recognition (FAR), effectively improved performance on the measure of FAR used during training (Penn & Combs, 2000). However the training did not generalize to improvement on another measure of FAR. Therefore, this prior study and the current project represent one-session interventions that involve training on a specific social cognitive measure, and may present potentially limited generalizability to other tasks of social cognition.

Perhaps in order to show generalization, the intervention would need to draw on stimuli that more accurately captured elements of multiple domains of social cognition. A prior study investigating an FAR treatment program, which had elements of ToM training, showed generalization to improvement on a task of ToM (Wolwer et al., 2005). The program, Training of Affect Recognition (TAR), included some tasks demanding ToM skills such as considering accompanying thoughts of persons in certain social situations. Hence, as a future direction in designing brief social cognitive training programs, perhaps more generalization will accrued if multiple social cognitive domain-specific elements are incorporated into the training stimuli.

Another future direction in designing effective social cognitive interventions for schizophrenia would be incorporating practice of social skills through live interactions with others. The current study uses stimuli of cartoons, which may show
limited applicability to improving functional outcome, namely social skills used in everyday interactions. In contrast, one element of an effective broad-based intervention, Social Cognition and Interaction Training (SCIT), is to identify a “practice partner” in order to reinforce learned social skills and apply them to different social contexts (Roberts & Penn, 2009). There is evidence that SCIT contributes to wide ranging effects including improvement on tasks of emotion, social perception, ToM and improved functional outcome in terms of self-reported social relationships and fewer incidents of aggression (Combs et al., 2007). Nonetheless, SCIT has the drawbacks of spanning up to 24 weeks and requiring two clinicians for each small group. Perhaps, the element of training of social skills followed by live practice of learned skills could be applied to a more brief intervention in the future.

Social cognitive deficits in schizophrenia are not fixed characteristics of the disease and are appropriate targets for remediation. This is supported by imaging studies, as there is evidence that regions of interest show neural plasticity following social cognitive interventions. In a recent fMRI study, patients with schizophrenia that received both auditory based cognitive training and social cognition training improved on a task of facial emotion recognition and showed increased activity in the bilateral amygdala, the right putamen and right medial prefrontal cortex (Hooker et al., 2013). These regions represent neural systems that support social cognitive processes.

In general, the field of social cognitive remediation for schizophrenia shows promise as an area for future treatment research. Collectively, evidence of improved social cognition in schizophrenia from pilot projects of interventions, treatment
programs and imaging studies suggest that social cognitive deficits can be effectively enhanced by psychological remediation techniques.
6. References:


7. Appendix:

This script below is used with the seven intervention items for patients randomly assigned to the intervention condition:

“Let me tell you a little about this task before we go any further. There are three options you may choose to complete the comic strip, A, B or C, [point to options] but only one is the correct answer. The correct option is the one that completes the story based on the desires and intentions of the main character, and the two other options are incorrect. For each comic you will try to understand the intentions of the character and therefore which option properly completes the story. One of the incorrect answers depicts an everyday action and has no link in the context of the story. Another incorrect answer looks similar to the last picture of the comic but is unrelated to the story.

If you see a comic about a man going grocery shopping, will you complete the story with a picture of the man fixing a bicycle? Good. [Correct and explain if necessary].

If you see a comic in which the final picture has a man sitting and watching TV, will you complete the story with the man sitting and building a dollhouse? Good. [Correct if necessary].

If you see a story about a woman cooking, will you complete the story with a picture of the woman serving a meal? Good. [Correct and explain if necessary].”

Remember that every story will be different but the correct answer will always be the one that completes the story based on the intentions of the character. Also, recall that throughout the test I cannot tell you the correct answer. Ok, before we get started tell me what you are going to do. Good. [Correct and explain if necessary].”

During completion of the 7 novel items, a self-monitoring strategy will be implemented. After each item the subject will be asked two questions in succession: 1) “How did you decide which picture complete the comic?” and 2) “How will you approach the next comic?” If the response indicates a lack of understanding (even if the right card is chosen) the decision rules are reviewed in a manner similar to the initial instructions.

Figure 3: Script used for outpatients diagnosed with schizophrenia who were randomly assigned to the experimental condition.
Figure 4: One of 28 items of the Inference Intention Task (IIT) (Sarfati et al., 1997); the IIT was the primary outcome measure of the current research project.

Figure 5: One of 7 novel intervention items created for training purposes of outpatients who were randomly assigned to the experimental condition.
Below is a questionnaire that will be administered in order to screen that participants meet adequate criterion for this research project. The questionnaire below will be asked before administration of any testing is conducted. This questionnaire may be administered in person or over the phone.

1) Have you ever been treated, in the form of psychotherapy and/or medication, for a psychiatric illness?

________________________________________________________________

2) What current medication are you taking? Are you currently taking any psychiatric medications?

________________________________________________________________

3) Have you ever sustained a head injury, such as a concussion leading to a loss of consciousness of 30 minutes or more?

________________________________________________________________

4) Do you have a current medical illness or chronic condition?

________________________________________________________________

5) Do you have a family history of schizophrenia or other psychotic disorders?

________________________________________________________________

1 Only participants who report history of learning disability, psychotic and/or developmental disorder will be excluded. Persons diagnosed with other psychiatric disorders, such as an anxiety disorder will qualify to participate.

Figure 6: Questionnaire administered to prospective non-psychiatric controls to screen for eligibility prior to participation.
Social Cognition Study

Participants will be compensated $25!!!

- Participants should be between ages of 18 and 55
- Total testing time is only about 2 hours in one session!
- Sessions held in the Psychology Department of Wesleyan University
- $25 cash compensation after completion

Interested? Contact Rachel O.
Email: Cogpsychstudy2013@yahoo.com
Phone: 860-685-2074

Figure 7: Flyer posted in Middletown, CT community to recruit non-psychiatric controls to participate in the research project.