SOCIAL COGNITIVE DEFICITS IN SCHIZOPHRENIA, SCHIZOAFFECTIVE DISORDER, AND BIPOLAR DISORDER: SIMILARITIES AND DIFFERENCES

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Abstract

Impairments in social functioning are characteristic of several severe mental illnesses. Efforts have been made to understand the nature of these social functioning deficits. However, there is still much to learn about the role of social functioning in individuals with mental illness. This study aims to investigate one aspect of social functioning --social cognitive functioning-- for each of three clinical groups of outpatients with severe mental illness [individuals with schizophrenia (N=16), bipolar disorder (N=19), and schizoaffective disorder (N=18)], as compared to that of healthy controls (N=15). Participants were evaluated on three social cognitive assessments: 1) a traditional Theory of Mind-False Belief Task (ToM), an inferential thinking task and a measure of receptive social cognition; 2) the Movie Clips Task, a social reasoning and affect understanding task that also measures receptive social cognition; and 3) The Interpersonal Block Assembly Task (IBAT), an interpersonal communication task that measures expressive social cognition. Results indicated that all three clinical groups performed significantly worse on the IBAT as compared to the healthy control group. Only one significant clinical group versus control group difference was found on the receptive social cognition tasks

(the Movie Clips Task and the ToM Task): the bipolar disorder group performed worse than the healthy control group on the Movie Clips Task. Clinical group comparisons on the three tasks indicated that there were significant differences on the Movie Clip Task only, with individuals in the schizoaffective group performing better than individuals in the bipolar disorder group. These findings suggest that expressive social cognitive functioning is impaired in schizophrenia, schizoaffective disorder, and bipolar disorder, as compared to healthy individuals; in contrast, deficits in receptive social cognition were found for the bipolar disorder group alone, suggesting that impairments in receptive social cognitive abilities may be limited and specific to individuals with bipolar disorder.

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Social Cognitive Deficits in Schizophrenia,

Schizoaffective Disorder and Bipolar Disorder: Similarities and Differences

1. **Introduction**

Deficits in social functioning are characteristic of several severe mental illnesses (e.g., schizophrenia, schizoaffective disorder, and bipolar disorder) and result in poorer communication with others, difficulties in maintaining employment status, and a decrease in community involvement (17). Understanding the underlying mechanisms for the decline in social functioning is necessary in order to identify appropriate targets for treatment and, ultimately, to improve the quality of life for individuals with these disorders. Researchers have investigated cognitive processes believed to be related to social functioning (i.e., social cognition) to gain greater insight into its role in social impairments. Furthermore, researchers have begun to examine social cognitive performance in individuals with severe mental illness, specifically in those with schizophrenia and, more recently, in individuals with bipolar disorder.

Researchers examining social functioning impairments have also begun to examine social deficits specifically in individuals with schizoaffective disorder. In the past, schizoaffective disorder has been classified in a variety of ways. It has been classified as a variant of schizophrenia, a variant of affective disorders, or as an independent disorder. A review of existing literature reveals that, in general, individuals with schizoaffective disorder have been placed in the same group as individuals with schizophrenia and only few studies have investigated schizoaffective disorder as an independent group. In addition, there is little known about the possible similarities and differences that may exist in social cognitive performance across groups of individuals with severe mental illness. This study aims to examine social

behavior through the investigation of social cognitive performance in four groups: individuals with schizophrenia, schizoaffective disorder, bipolar disorder, and individuals with no history of psychiatric illness.

Several factors may influence an individual's social functioning skills, such as the development of social skills, symptomology associated with mental illness, social behavior prior to the onset of illness, and cognitive ability. Researchers have investigated these areas in order to gain greater insight into social functioning. Several researchers in the field of neuroscience have begun to examine what may be the underlying neural mechanisms associated with social functioning. Lee et. al. (30) and Pinkham et. al. (40) have studied the role of brain functioning in enabling social cognition and proposed that interactions between the frontal lobe and cortical regions may be a possible center for social skills development. In addition, developmental researchers have explored social behavior through the investigation of social skills acquisition and the ability to initiate and maintain successful interactions with other individuals (9). Emphasis has been place on understanding the development of the 'self' and its implications on social functioning. It was suggested by Nickerson (34) that before an individual can begin to understand another person's perspective, s/he must first understand his or her own beliefs. The individual must then adjust his or her belief system to understand the thoughts of another person. Therefore, inabilities to think flexibly about another person's thoughts and perceptions may result in social functioning impairments.

Another area of investigation focuses on changes in social behavior due to the onset of a mental illness. Studies examining individuals with severe mental illness and symptomatology have found an association between negative symptoms and social functioning. Results indicate that individuals exhibiting negative symptoms perform worse on measures of social performance

such as social role-playing tasks, self-reports of social relationships, and the ability to make inferences about another person's thoughts or feelings, as compared to individuals without negative symptoms (11, 30, 38, 44). A study by Villalta-Gil et. al. (49) reported that individuals exhibiting negative symptoms had poorer interactions with family and community members, fewer established relationships with other individuals, and poorer personal care skills than individuals without negative symptoms. In addition, empirical evidence has suggested that current social functioning may be related to social skills prior to illness. Studies investigating premorbid functioning in individuals with schizophrenia have reported an association between poorer social skills as a child (i.e., establishing friendships and positive family relationships) and deficits in social functioning after the onset of illness (3, 13, 42). Similarly, a functional outcome study conducted by Hofer et. al. (25) reported a variety of factors possibly related to social functioning including premorbid functioning and symptoms related to illness. While several factors are believed to be related to social functioning, research of individuals with mental illness suggests that both the presence of an illness and symptomatology may contribute to lower social functioning skills.

Researchers have also investigated the role of cognition when trying to explain the decline in social functioning observed in individuals with severe mental illness. Studies of cognitive functioning have reported relationships between executive functioning, problem-solving, and verbal abilities when compared to social functioning, with poorer cognitive functioning related to poorer social functioning in individuals with schizophrenia (2, 15, 29, 39). While these findings help to explain impairments in social functioning, results from a study by Pinkham et. al. (39) investigating individuals with schizophrenia and healthy controls reported that performance on cognitive tests generally accounted for only 20 to 60% of the differences

found between subjects. As suggested by Pini et al. (38), it is necessary to explore the topic of social functioning from an alternative direction in order to understand possible factors that may contribute to deficits in this area. Some researchers have proposed that performance on social cognitive measures may help to explain impairments in social functioning that are not explained by neuropsychological functioning (17, 35). Empirical evidence of this more direct linkage comes from a study of Social Cognition Enhancement Training (14) in which individuals with schizophrenia, who participated in Social Cognition Enhancement Training, demonstrated greater improvements in social functioning than those in Standard Psychiatric Rehabilitation alone.

Social cognition is, by definition, a multifaceted domain of cognitive processes that are thought to be specific to a social context and are likely related to social functioning (50). Typically, the ability to make inferences based on emotional information (emotion perception or recognition), the ability to correctly identify and respond to social interactions and social rules or knowledge (social perception), and the ability to make inferences about another person's thoughts, feelings, and intentions (Theory of Mind) have been included in the discussion of social cognition (17). Measures assessing social cognition generally evaluate an individual's response to social situations by providing social stimuli such as interactions with researchers or family members in a lab setting, videos or passages depicting social interactions, or social role-playing tasks. However, the multifaceted nature of social cognition has resulted in several definitions and a variety of measurements to assess the relevant domains. These differences make comparing results across studies difficult and hinder the understanding of social cognition in mental illness.

Reports from empirical research in this area support the necessity of a multifaceted approach to understanding the various constructs believed to be associated with social cognition. Green et. al. (22) identified five areas of focus for social cognition research: emotion processing, Theory of Mind (ToM), social perception, social knowledge, and attributional bias. Beer and Ochsner (9) defined a similar framework for the definition of social cognition, including the perception of self and others through verbal and nonverbal cues, the understanding of the intentions and behaviors of others through the reflection of personal experiences, and overall social knowledge (i.e., an understanding of social rules, skills, and strategies to successfully respond to and take part in social environments). While there are differences in the approach to studying the variety of domains associated with social cognition, there seems to be a general consensus on the areas that should be investigated. However, not all identified domains of social cognition have been equally investigated. A review of social cognition literature reveals that the areas of ToM and emotional processing have been more fully examined than the other domains. This finding highlights the need for a greater understanding of all the factors that are believed to be related to social cognitive functioning, how they are related to each other, and their implications for successful social functioning, especially in individuals with severe mental illness.

A decline in social functioning is a distinguishing feature of schizophrenia. Therefore, it is of special interest to explore the domain of social cognition in individuals with this illness. Previous studies of schizophrenia have reported impairments in various areas of social functioning. In a study by Pinkham and Penn (39), neuropsychological and social cognitive performance was examined in both participants with schizophrenia and healthy controls. Results showed that individuals with schizophrenia performed significantly worse on the following

measures: face emotion discrimination and recognition, social knowledge, traditional measures of ToM, immediate memory and executive functioning as compared to the healthy control group. In addition, performance on social cognitive measures accounted for more of the variance between the two groups than scores on the neuropsychology tasks alone. A study by Corrigan and Nelson (16) examined social cue perceptions (i.e., the presence of social stimuli such as the affect of a character, the presence of an interaction between characters, or the occurrence of dialogue) and reported that individuals with schizophrenia made more false-positive errors when asked whether or not a social cue was observed in a videotaped vignette, indicating that these individuals may misinterpret social situations. While studies support the theory of social cognitive deficits in schizophrenia, further research is necessary in this area to fully understanding the extent of these impairments.

Deficits in the ability to make inferences about another person's mental state (i.e., ToM) have been well documented in individuals with schizophrenia and by empirical evidence reported from several studies (22, 33, 36, 39, 41). Mazza et.al. (33) reported significant differences in performance on a ToM task in people with schizophrenia and healthy controls, with individuals in the schizophrenia group performing worse. Another study examined symptom dimensions within a group of individuals with schizophrenia and found people with disorganized features performed worse than paranoid, residual, undifferentiated, and schizoaffective disorder on a measure of ToM (23). It was purposed that these differences were most likely due to thought disorder and were moderately correlated with positive symptoms. Similarly, a study by Pickup and Frith (36) examined subgroups of individuals with schizophrenia and reported poorer performance on ToM tasks in persons with positive and negative symptoms than those with paranoid features, and persons with remitted symptoms

performed at the same level as healthy control participants. Conversely, Pollice et.al. (41) studied ToM and reported that positive and negative symptoms were not correlated with social cognitive performance and found scores on a ToM task to be more related to global community functioning. Bell and Mishara (10) assessed performance on a ToM task in individuals with schizophrenia at baseline and again after a six-month passage of time. Results showed a time effect in performance, where negative symptoms correlated with poorer ToM performance at baseline, but not at the six-month follow-up. While studies constantly report deficits in performance on ToM tasks as well as various other domains of social cognition, the factors that contribute to these deficits are unclear. Therefore, further research is necessary in order to understand the nature of these impairments.

In contrast to the focus on social cognition in schizophrenia, researchers have only recently begun to examine social cognition in persons with bipolar disorder. MacQueen et.al. (31) reviewed existing research on social functioning in individuals with bipolar disorder and found 30 to 60% of individuals remained impaired even between acute episodes of the disorder and showed significant differences relative to controls on measures of social functioning, employment status, and number of social contacts. With evidence of social functioning impairments during various stages of the disorder, understanding the nature of social cognitive functioning in individuals diagnosed with bipolar disorder is of great importance (12, 13, 18, 28, 31, 38, 48). Evidence of social cognitive deficits in euthymic patients with bipolar disorder has been documented by Bora et al. (12), with bipolar disorder participants performing significantly worse on measures of ToM and face affect recognition tasks than healthy controls. These findings are similar to those reported by studies investigating ToM performance in schizophrenia.

A study by Cannon et.al. (13) investigated premorbid social functioning and found that individuals with bipolar disorder and schizophrenia had impairments in sociability during adolescents. However, the individuals with bipolar disorder experienced impairments to a lesser degree than those with schizophrenia. Additionally, studies of non-social cognitive abilities have reported conflicting results when comparing schizophrenia and bipolar disorder. While some studies have reported similarities in impairments between individuals with schizophrenia and bipolar disorder on measures related to social functioning, others have reported differences in functioning with bipolar disorder groups performing better than the schizophrenia group (1, 18, 28). Therefore, it is of interest to investigate social cognition in individuals with bipolar disorder and to examine how they perform as compared to those with schizophrenia (18, 28).

Individuals with schizoaffective disorder possess several of the symptoms commonly found in individuals with mood disorder or psychosis. Generally, studies tend to group individuals with schizoaffective disorder and individuals with schizophrenia together. This is most likely due to the DSM-IV criteria for schizoaffective disorder, which classifies the illness under the heading *Schizophrenia and Other Psychotic Disorders* as oppose to *Mood Disorders* (4). However, not all clinicians and researchers subscribe to the DSM definition of schizoaffective disorder and alternative definitions have been proposed. Schizoaffective disorder has been defined as either 1) an illness 'intermediary' between schizophrenia and affective disorders, 2) a variant of schizophrenia, 3) a variant of affective disorders, or 4) an independent illness (27, 32, 48). Kraepelin viewed schizophrenia and affective disorders as two biologically distinct illnesses and did not support the notion that schizoaffective disorder originated from a combination of dysfunctions similar to both schizophrenia and affective disorders (47). However, a family study by Taylor et. al. (48) investigated the likelihood of relatives of

individuals with schizophrenia and bipolar disorder to develop one of these illnesses, and reported that probands in both groups had a similar rate of relatives with affective disorders, suggesting a common genetic factor in the origin of these disorders.

More recently, some studies have examined individuals with schizoaffective disorder independently from individuals with other mental illnesses. These studies have reported varying relationships across individuals with schizoaffective disorder, schizophrenia and bipolar disorder. A study by Pini et. al. (38) examined "insight into illness" and found that individuals with schizophrenia had a poorer understanding of their illness and the affects of the illness on their lives when compared to bipolar disorder, schizoaffective disorder and unipolar depression groups, who all performed at a similar level with better insight. These results suggest that individuals with schizoaffective disorder demonstrate similar levels of awareness of illness as those with bipolar disorder. Alternatively, Bellack et. al. (11) investigated social functioning in individuals with schizoaffective disorder, bipolar disorder, schizophrenia with negative symptoms, and schizophrenia without negative symptoms and found that all groups exhibited similar impairments on a social role-play task except for the schizophrenia with negative symptoms group, which was significantly more impaired. These findings suggest that negative symptoms are more related to social functioning impairments than diagnoses. Pini et. al. (37) investigated similarities and differences across individuals with schizophrenia, schizoaffective disorder, and bipolar disorder and found that measurements of negative symptoms may help to differentiate between schizophrenia and affective disorders. Findings from studies highlighted in this discussion illustrate the variety of possible relationships across individuals with schizophrenia, bipolar disorder, and schizoaffective disorder in performance on measures designed to examine social functioning.

Cognition studies have examined neuropsychological performance when comparing those with schizoaffective disorder to those with other mental illnesses. A study by Fiszdon et. al. (20) examined neurocognition and social cognition and found no differences between schizophrenia and schizoaffective disorder on measures of neurocognition. However, significant differences on a ToM task were reported, with the schizoaffective disorder group performing better than the schizophrenia group. Furthermore, a study by Goldstein et. al. (21) reported that subgroups with schizoaffective disorder and paranoid schizophrenia performed better than subgroups with undifferentiated and residual diagnoses on measures of cognition. Results from the various studies investigating social functioning impairments in individuals with schizoaffective disorder, schizophrenia, and bipolar disorders demonstrate a fluctuating relationship in functioning across the three groups.

Few studies have investigated the relationship of social functioning across these three clinical populations (11, 44). This study aims to investigate the performance of individuals with schizophrenia, bipolar disorder, and schizoaffective disorder on measures of social cognition. In addition, this study uses novel measures of receptive and expressive social cognition to explore social cognition. Receptive cognition requires participants to make inferences about the mental state of another person or character. For this study, receptive cognition is measured by the Movie Clips Task and a traditional measurement of Theory of Mind (ToM). Participants watched scenes from movies, videotaped interactions between characters, and listened to stories read by a research staff member and then answered questions regarding the social interactions they observed and heard. These tasks assessed the ability of a participant to understand what another person is thinking or feeling, and required the participants to make inferences about motivated behaviors. In addition, participants were assessed on a measure of expressive

cognition, which is the ability of an individual to interact successfully in interpersonal situations, while taking the perspective of another person, in order to create a clear and effective approach to the sharing of information. For this study, expressive cognition is measured by the Interpersonal Block Assembly Task (IBAT). For this task, the participant must communicate verbal instructions to a research staff member so that the researcher can assemble four blocks to create the block design equivalent to the one the participant was asked to describe. The IBAT requires the participant to understand the perspective of another person and assesses his or her ability to communicate effectively and corporately with another individual.

In this study, the following specific aims and hypotheses are proposed:

Specific Aim 1: To determine whether each of the three clinical groups (schizophrenia, bipolar disorder, and schizoaffective disorder) demonstrate deficits in social cognition as compared to a group of participants with no history of psychiatric illness (i.e. healthy control group).

Hypothesis 1: As compared to healthy controls, each clinical group will perform worse on measures of social cognition that assess receptive social understanding abilities (ToM and Movie Clips tasks) and expressive social skills (IBAT), adjusting for any significant group differences in sociodemographic or clinical variables.

Specific Aim 2: To determine if there are significant differences in performance on the three measures of social cognition across the three clinical groups. It is also of interest to determine whether an ordinal relationship exists in performance on social cognitive tasks across the three clinical groups. Specifically, is the 'intermediary theory' of schizoaffective disorder (i.e., positing that outcomes of schizoaffective disorder are between those of schizophrenia and bipolar disorder) supported by performance on these measures?

Hypothesis 2a: There will be a significant effect of clinical group in performance on all three measures of social cognition. Adjustments will be made for any significant group differences in sociodemographic or clinical variables.

Hypothesis 2b: Individuals with schizoaffective disorder will perform at an intermediate level between participants with schizophrenia and bipolar disorder. Individuals with schizophrenia will perform the worst on each measure of social cognition. Individuals with bipolar disorder will perform the best on each measure of social cognition.

2. **Methods**

2.1. *Participants*

Participants were drawn from a pool of individuals who were enrolled in other studies of social cognition at the Western Psychiatric Institute and Clinic (WPIC) and the VA Pittsburgh Healthcare System (VAPHS). Within the participant pool, the healthy control group tended to include more individuals at the lower end of the age range (18 to 65 years of age) as compared to the clinical groups. For this study, all participants at the lower end of the age distribution were dropped in order to balance groups on age. By dropping participants in the 18 to 27 year old subgroup (i.e., retaining participants 28 to 65 years of age), age differences across the four groups were eliminated. For this study, participants included: 16 participants with a diagnosis of schizophrenia, 19 participants with a diagnosis of bipolar disorder, 18 participants with a diagnosis of schizoaffective disorder and 15 participants were healthy controls with no history of a psychiatric illness.

Inclusion Criteria: All participants had an IQ of 70 or greater and English was their first language. For the clinical groups, all participants met DSM-IV diagnostic criteria for one of the following diagnoses: Schizophrenia, Bipolar I Disorder in partial or full remission, or Schizoaffective Disorder.

Exclusion Criteria: During prescreening, participants were excluded if they had any of the following: colorblindness, a history of substance abuse or dependence within the past 6 months. Prospective participants were also excluded if they had any pervasive developmental disorders, medical problems, or neurological disorders that would be likely to compromise diagnostic or clinical assessment.

To evaluate the severity of current mood symptoms, the bipolar disorder participants were administered the Bech– Rafaelsen Mania Scale [BRMS (8)] and the Hamilton Rating Scale for Depression [HRSD (24)]. In order to be eligible for the study, they had to score less than seven on the BRMS and less than 10 on the HRSD; indicating that symptoms of mania or depression were not present at the time of enrollment. Individuals included in the healthy control group were also administered the HRSD and a score of seven or less was required in order to be eligible for the study.

Participants with schizophrenia, bipolar disorder, and schizoaffective disorder were recruited from advertisements placed in outpatient clinics at the University of Pittsburgh Medical Center (UPMC) and VA Pittsburgh Healthcare System (VAPHS) facilities, clinician inpatient and outpatient care referrals, and referrals from other studies investigating schizophrenia and bipolar disorder. Healthy control participants were recruited from advertisements in primary care facilities at UPMC and VAPHS centers, referrals from other research groups, and from the UPMC Office of Clinical Research internet website.

In accordance with the Institutional Review Board policies of both the University of Pittsburgh and the VA Pittsburgh Healthcare System, all study participants provided written informed consent prior to their involvement in this research study.

2.2. *Assessment Procedures*

All participants were evaluated in two sessions: diagnostic and clinical assessments were conducted during the first session and social cognition assessments were conducted during the second session. Social cognition measures were coded by individuals blind to the diagnostic status of the participants.

2.2.1 *Diagnostic Assessment*

Diagnostic assessments were conducted by a licensed clinical psychologist or a trained psychology technician with over 10 years of experience in assessment research with mentally ill individuals. All participants underwent an interview focused on psychiatric, medical, social, and developmental history. Information collected from participants during this interview included a self-report of total years of education, marital status, and socioeconomic status (SES). SES was evaluated and classified using the Hollingshead Four-Factor Index (26) which calculates socioeconomic status based on a sum of weighted ordinal scores for educational and occupational achievement.

Participants who met diagnostic eligibility criteria and reported histories of mental illness were administered the Structured Clinical Interview for DSM-IV (SCID). Data collected from the SCID were utilized to determine Axis I research diagnoses and placement into one of three clinical study groups: schizophrenia, bipolar disorder, or schizoaffective disorder.

The SCID Interview for Non-Patients (SCID-NP) was used to rule out any lifetime history of major Axis I psychiatric disorders for individuals in the healthy control group.

2.2.2. *Clinical Assessments*

To evaluate the severity of current psychotic symptoms, all three clinical groups were administered the Scale for the Assessment of Positive Symptoms [SAPS (5)]. The schizophrenia and schizoaffective disorder groups were administered the Scale for the Assessment of Negative Symptoms [SANS (6)] to determine the presence of negative symptoms, which are characteristic of the disorders. The bipolar disorder group was administered the BRMS and HRSD to assess current manic and depressive symptoms. Finally, individuals included in the healthy control group were also administered the HRSD to ensure that these participants were not currently

experiencing any clinically significant symptoms of depression. All participants were administered the Peabody Picture Vocabulary Test–IIIA [PPVT (19)] as a measure of general IQ.

2.2.3. *Receptive Social Cognition Tasks*

Two tasks were used to assess receptive social cognition: the Theory of Mind–False Beliefs Task (ToM) and the Movie Clips Task.

2.2.3.a. Theory-of-Mind Task: The ToM-False Beliefs Task is a fairly well established assessment used by several researchers as a measure of a participant's ability to make inferences about another person's belief state (27, 32, 34, 36). This task consists of both first-order and second-order scenarios. The first-order scenarios assess the ability of the participant to make inferences about another person's mental state and the second-order scenarios evaluate the ability of the participant to make inferences about a character's understanding of the mental state of a second character. Two scenarios were presented for both the first- and second-order components. One scenario was a videotaped interaction between two characters played for the participant on a television and the other was a written passage read aloud by the researcher to the participant. After the presentation of each scenario, the participant was asked a memory question to ensure that s/he remembered the necessary details to make accurate inferences [following the protocol developed by Frith and colleagues (36)]. The participant was then asked to make inferences about the thoughts of a character and to explain the reasoning behind his or her said inference. A participant could receive up to a total of 9 points for each scenario if s/he answered the memory question correctly and was able to identify and explained the character's perspective accurately. If the memory question was answered incorrectly, the participant's data was not included in the analyses of ToM performance. A 'Total Score' was used to assess overall performance on ToM, summing the scores for all four scenarios.

2.2.3.b. Movie Clips Task: The Movie Clips Task is a new assessment, created in the Family and Psychosocial Functioning Research Lab at WPIC, which measures an individual's social perspective-taking, social situation understanding, inferential thinking, and affect recognition abilities. In this task, a participant is shown a series of six scenes or 'clips' from the motion picture *Ordinary People* (43). Each clip represents a scene involving two or more individuals who are involved in a social interaction. The task requires the participant to make inferences about the thoughts, feelings, intentions, and motives of a character's behaviors. The participant is asked to give a summary description of each scene and to answer several questions according to a written standard interview protocol (see Appendix) that aims to assess the ability of the participant to make inferences about the characters feelings and the social situation. Responses were audiotape recorded and later coded by trained research staff.

Five scoring categories are used to evaluate performance in each of the five domains on the Movie Clips Task: Affective Change (AC); the ability to understand shifts in mood states, Cognitive Inference (CI); the ability to understand what a character is thinking, Empathic Cognition (EC); the ability to understand what a character is feeling, Motives (M); the ability to understand a character's intentions, and Personal Empathic Cognition (PEC); the ability to relate to the characters on a personal level by making emotional responses to the social context.

Scores for each item are based on the subject's ability to identify a thought, feeling, motive, or change in affect, with higher scores given for reference to internal states of two or more characters in the same scene or for two or more internal states of one character. Scores for each item range from 0 (no report) to 4 (recognition of internal states/motives of two characters in the scene). Scores for each of the five domains are computed by summing item scores to generate five subscales. The estimated internal consistency of the Movie Clips subscales is good (Cohen's Alpha Coefficient = .85, based on the coding of 87 records). To assess the

participant's overall performance on the Movie Clips Task, a 'Total Score' was computed by summing the scores from the five subscales. Inter-rater reliability for the Total Movie Clips Score was good as indicated by the intraclass correlation coefficient (ICC) of 0.75 for five coders evaluating 87 participants. The inter-rater reliability coefficients for the five subscales of the Movie Clip task range from good to excellent, with scores between 0.63 and 0.85 for five coders on records for 87 participants.

2.2.4. *Expressive Social Cognition Task*

Interpersonal Block Assembly Task (IBAT): The IBAT was created in the Family and Psychosocial Studies Research Lab at WPIC and evaluates interpersonal perspective-taking by way of assessing expressive social communication skills. The participant was given three envelopes, each containing a picture of a block design, which can be created by orienting four red and white blocks. The researcher had the appropriate red and white blocks on the other side of a partition. The task required the participant to communicate with the research staff member in such a way that the researcher could assemble the four blocks to create a block design equivalent to the one the participant was given to describe, using only the verbal instructions provided by the participant. This is a difficult task that requires the participant to think about the researcher's perspective and communicate the necessary information in order to construct the block design effectively and cooperatively in each of the three trials. The IBAT interaction was audiotape recorded and later coded by trained research staff.

Thirteen performance variables are coded on a scale ranging from 1 (poor) to 5 (good): frequency of performance errors, the ability to correct mistakes, the ability to approach difficulties with new methods, the use of precise descriptors when naming a referent, the use of vague instructions when explaining how to construct the design, the quality of directional terms used, the ability to produce logical instructions, the use of compact information, the presence of

perseveration, the presence of irrelevant or off task comments, reference to a previous design, the number of designs completed correctly, and a final overall score for the participant's performance on perspective-taking. A 'Total Score' for the IBAT was computed by summing scores across all 13 scales. The internal consistency of the measure has been determined to be excellent (Cohen's Alpha Coefficient = 0. 94), for five coders evaluating 86 participants. The inter-rater reliability coefficients for the IBAT are in the acceptable range with an ICC of 0.91 for seven coders and 86 participants.

2.3. *Statistical Analysis*

2.3.1. Baseline Demographic and Clinical Comparisons: Analyses were conducted to determine whether there were any significant demographic or clinical differences 1) between each clinical group as compared to the healthy control group and 2) across the three clinical groups. For the two-group comparisons, the demographic and clinical characteristics of the participants were compared using independent sample t-tests for continuous measures, Chi-square tests for most discrete measures, and the Cochran-Armitage Trend Test for ordinal measures. For comparisons across the three clinical groups, the demographic and clinical characteristics of the participants were compared using one-way analyses of variance (ANOVA) for continuous measures, Chi-square tests for discrete measures, and the Kruskal-Wallis test for ordinal measures.

2.3.2. Hypothesis 1: Linear regressions were used to compare each clinical group to the healthy control group on each composite score of the three social cognitive tasks. An adjusted linear regression model was estimated for each of the social cognition measures using study group (dummy coded) as the independent variable and including any potentially confounding variables as covariates.

Covariates were identified from the results of cross-group comparison of baseline demographic and clinical variables (e.g., sex, IQ, marital status, years of education, etc.).

For the Movie Clips Task only: if differences on the Total Movie Clips Score were observed when comparing the healthy control group to each of the clinical groups, then linear regressions were conducted to evaluate group differences for each of the five subscales of the Movie Clips Task, adjusting for any possible covariates. If between-group differences were significant at the .05 level, results of pair-wise comparisons were reported.

2.3.3. Hypotheses 2a and 2b: To evaluate differences across the three clinical groups on the composite scores of the three social cognition tasks, three ANOVAs were performed with clinical group as the independent variable and total scores from each of the three social cognitive measures as the dependent variable. If the effect of clinical group variable was significant, then pair-wise comparisons were conducted using the Fisher's Least Significant Difference (LSD) method to determine which groups differed in performance. If differences were observed across the groups on demographic or clinical variables, then an analysis of covariance was conducted for each social cognition measure using the three clinical groups as the independent variable and any potentially confounding variables as a covariate. Covariates were identified from the cross-group comparison of baseline demographic and clinical variables (e.g., sex, IQ, marital status, years of education, etc.).

For the Movie Clips Task only: if differences were observed on the Total Movie Clips Score across the clinical groups, then one-way analyses of variance were conducted to evaluate clinical group differences for each of the five subscales of the Movie Clips Task, adjusting for any possible covariates. If across-group differences were significant at the .05 level, results of pair-wise comparisons were reported.

3. **Results**

3.1. *Demographic Characteristics* (Table 1)

Demographic features were, in general, similar across the four groups, with the exception of two variables: IQ and total years of education. The schizophrenia and bipolar disorder groups had a significantly lower mean IQ and significantly fewer years of education when compared to the healthy control group. Due to these differences, IQ and the score for total years of education were included as covariates in the analyses comparing each of these groups to the healthy control group. There were no significant differences in IQ or in total years of education between the schizoaffective disorder and healthy control groups.

The four groups did not differ in distribution by sex or race. In addition, differences did not exist in terms of parents' socioeconomic status, suggesting that study participants in all four groups were raised in households with comparable availability of opportunities. Similarly, participants did not differ in their socioeconomic status (with the exception of the schizophrenia group that reported a lower socioeconomic status when compared to the healthy control group) or marital status, suggesting similar levels of educational, occupational, and interpersonal achievement. In addition, the three clinical groups did not differ significantly (*nsd*) in any of the demographic variables.

3.2. *Clinical Characteristics* (Table 2)

There were differences across the three clinical groups in the use of antipsychotic medications and in the severity of symptoms. The use of current antipsychotic medications was equivalent for individuals in the schizophrenia and schizoaffective disorder groups (with all but one schizoaffective disorder participant currently taking antipsychotic medications). In contrast, 47.1% of individuals with bipolar disorder were currently taking antipsychotic medications.

While differences were observed across the clinical groups in the frequency of current usage of antipsychotic medications, when antipsychotic medication status (positive vs. negative) was entered into analyses as a covariate, results were not significantly different. Therefore, results of analyses are reported without antipsychotic medication status included as a covariate.

Differences in the severity of positive symptoms did exist across the clinical groups, $F = (1, 30) = 5.41$, $p < .05$, with individuals in the schizophrenia and schizoaffective disorder groups reporting significantly more severe symptoms than those in the bipolar disorder group. While these differences in symptom severity were present, positive symptoms were in the mild range, with average scores ranging between 0 (none) to 2 (mild) on a scale of 0 (none) to 5 (severe). These symptom scores suggest that the reported positive symptoms remain even after treatment and are likely to be more residual than acute in nature. Also, it suggests that admission criteria successfully excluded individuals with severe psychotic symptoms that might impair the ability of the participant to understand and follow study procedures.

Differences were also observed in the severity of negative symptoms between the schizophrenia and schizoaffective disorder groups, with individuals in the schizophrenia group having higher scores in negative symptom severity than the schizoaffective disorder group, t (30) = -2.33, $p < .05$. These differences are further investigated in a set of secondary analyses (see Section 3.5.2.).

3.3. *Hypothesis 1: Clinical Groups vs. Healthy Controls*

3.3.1. *Performance on Receptive Social Cognition Tasks*

3.3.1.a. Results for the Theory of Mind Task (ToM). On the Theory of Mind Task, only the schizophrenia group demonstrated deficits in performance as compared to the healthy control group (Table 3).

a.1. *Schizophrenia vs. Healthy Controls*. The Total ToM score for individuals with schizophrenia was lower (M = 36.6, SD = 2.8) as compared to the mean for the healthy control group (M = 39.4, SD = 3.0), β* = -.45, t (22) = -2.36, $p < .03$. However, once the scores were adjusted for the influence of IQ and total years of education, the groups no longer differed statistically, β* = -.21, t (19) = -.98, (*nsd*). An examination of the results for the first- and second-order ToM tasks revealed the following: individuals with schizophrenia performed more poorly than healthy controls on the first-order ToM tasks, with a mean score of 22.4 (SD = 1.3) as compared to the mean score for the healthy control group (M = 23.3, SD = 1.0), β* = -.38, t (27) = -2.12, $p < .05$. This difference remained after adjustments for differences in IQ and total years of education, β* = -.49, t (24) = -2.28, $p < .04$, indicating that individuals with schizophrenia had significantly lower first-order perspective-taking abilities as compared to healthy control participants. On the second-order ToM tasks, the mean score for individuals with schizophrenia was 13.9 (SD = 2.8), as compared to the mean score for the healthy control group (M = 16.1, SD = 2.3), β* = -.41, t (24) = -2.22, $p < .04$. However, once the scores were adjusted for the influence of IQ and total years of education, the groups no longer differed statistically, β* = -.09, t (21) = -.45, (*nsd*).

a.2. *Bipolar Disorder vs. Healthy Controls.* There was a trend for individuals with bipolar disorder to perform more poorly overall on the ToM Task (M = 37.2, SD = 2.7) as compared to the healthy control group (M = 39.4, SD = 3.0), β* = -.37, t (25) = -2.00, $p < .06$. However, once the scores were adjusted for the influence of IQ and total years of education, the trend for a group effect was no longer observed, β* = -.18, t (23) = -.99, (*nsd*). On the first-order ToM tasks, individuals with bipolar disorder performed more poorly than healthy controls, with a mean score of 22.2 (SD = 1.6) as compared to the mean score for the healthy control group (M = 23.3, SD = 1.0), β* = -.37, t (30) = -2.17, $p < .04$. However, the results

were no longer significant after adjustments were made for differences in IQ and in total years of education, β* = -.24, *t* (28) = -1.29, (*nsd*). On the second-order ToM tasks, there were no significant differences in the mean score for individuals with bipolar disorder (*M* = 15.0, *SD* = 2.3), as compared to the mean score for the healthy control group (*M* = 16.1, *SD* = 2.3), β* = -.25, *t* (25) = -1.27, (*nsd)*. A similar outcome was observed when scores were adjusted for the influence of IQ and total years of education, β* = -.07, *t* (23) = -.36, (*nsd*).

a.3. *Schizoaffective Disorder vs. Healthy Controls.* No differences were observed in performance on the ToM Task between the schizoaffective disorder group and the healthy control group. The mean Total ToM Score for individuals with schizoaffective disorder (*M* = 38.7, *SD* = 4.0) was similar to that for the healthy control group (*M* = 39.4, *SD* = 3.0), β* = -.11, *t* (27) = -.58, (*nsd)*. Likewise, on the first- and second-order ToM tasks there were no differences observed between the two groups. The mean score on first-order ToM tasks for individuals with schizoaffective disorder was 22.7 (*SD* = 1.6) as compared to the healthy control group mean of 23.3 (*SD* = 1.0), β* = -.22, *t* (31) = -1.22, (*nsd)*. The mean score on second-order ToM tasks for individuals with schizoaffective disorder was 15.8 (*SD* = 2.9) as compared to the healthy control group mean of 16.1 (*SD* = 2.3), β* = -.07, *t* (27) = -.35, (*nsd)*. Differences did not exist in IQ or in years of education between these two groups. For this reason, no adjustments were made during analyses.

3.3.1.b. Results for the Movie Clips Task. On the Movie Clips Task, only the bipolar disorder group showed poorer performance when compared to the healthy control group.

b.1. *Schizophrenia vs. Healthy Controls.* The Total Score for the Movie Clips Task was lower for individuals with schizophrenia (*M* = 31.0, *SD* = 6.0) as compared to the healthy control group (*M* = 36.1, *SD* = 10.9). However, statistically significant differences

did not exist, β* = -.29, *t* (28) = -1.59, (*nsd)*. When scores on the Movie Clips Task were adjusted for differences in IQ and total years of education, the observed results remained, β* = -27, *t* (25) = -1.17, (*nsd*).

b.2. *Bipolar Disorder vs. Healthy Controls.* The Total Score for the Movie Clips Task was lower in the bipolar disorder group (*M* = 27.6, *SD* = 6.0) as compared to the healthy control group (*M* = 36.1, *SD* = 10.9), β* = -.46, *t* (32) = -2.92, $p < .007$. These findings remained even after adjustments were made for differences between the groups in IQ and total years of education, β* = -.36, *t* (30) = -2.04, $p \leq .05$. This finding suggests that the bipolar disorder participants may have impairments in the ability to make inferences about another person's thoughts, feelings, and intentions.

Because a significant difference was observed between the bipolar disorder group and the healthy control group on the Total Score for the Movie Clips Task, linear regression models were computed for each of the five subscales of the task to determine on what scales the groups differ: Affective Change (AC), Cognitive Inference (CI), Empathic Cognition (EC), Motives (M), and Personal Empathic Cognition (PEC) (see Figure 3). Results indicated that individuals in the bipolar disorder group performed worse than the healthy control group on the following scales: EC (β* = -.41, *t* (30) = -2.54, $p < .02$), CI (β* = -.39, *t* (30) = -2.40, $p < .03$), and M (β* = -.40, *t* (30) = -2.45, $p \leq .02$). However, once subscale scores were adjusted for the influence of both IQ and total years of education, differences between the healthy control and bipolar disorder groups were reduced to a trend level on both the CI and EC subscales and differences were no longer observed on the M subscale (see table 4).

b.3. *Schizoaffective Disorder vs. Healthy Controls.* The Total Score for the Movie Clips Task in the schizoaffective disorder group (M = 34.9; SD = 9.8) was similar to that of the healthy control group (M = 36.1; SD = 10.9); β* = -.06; t (30) = -.334; *nsd*. Statistically significance differences were not found between the two groups.

3.3.2. *Performance on the Expressive Social Cognition Task*

Results for the IBAT. As illustrated in Figure 1 and described below, each of the three clinical groups performed significantly worse on the measure of expressive social cognition (IBAT), as compared to the healthy control group (see Table 3).

3.3.2.a. *Schizophrenia vs. Healthy Controls.* The mean score on the IBAT for individuals with schizophrenia was lower (M = 32.5, SD = 8.6), as compared to the healthy control group mean of 46.5 (SD = 4.7), β* = -.72, t (28) = -5.40, $p < .0001$, indicating that the schizophrenia group had a lower level of expressive social cognitive functioning. The difference in performance between the schizophrenia and healthy control groups remained after adjustments were made for differences in IQ and total years of education, β* = -.47, t (25) = -3.37, $p < .003$.

3.3.2.b. *Bipolar Disorder vs. Healthy Controls*. The mean score on the IBAT for individuals with bipolar disorder was lower (M = 34.4, SD = 9.2) as compared to the healthy control group mean of 46.5 (SD = 4.7), β* = -.63, t (31) = -4.51, $p < .0001$, indicating that the bipolar group had a lower level of expressive social cognitive functioning than the healthy control group. The difference in performance between the bipolar disorder and healthy control groups remained after adjustments were made for differences in IQ and total years of education, β* = -.58, t (29) = -3.48, $p < .002$.

3.3.2.c. *Schizoaffective Disorder vs. Healthy Controls*. The mean score on the IBAT for individuals with schizoaffective disorder was lower (M = 36.3, SD = 9.9) as compared to the healthy control group average of 46.9 (SD = 4.7), β* = -.55, t (29) = -3.54, $p < .002$. These findings suggest that the schizoaffective disorder group had a lower level of expressive social cognitive functioning as compared to the healthy control group.

3.4. Hypothesis 2: Comparisons across Clinical Groups

3.4.1. Performance on Receptive Social Cognition Tasks

3.4.1.a. Results for the Theory of Mind Task (ToM). No significant differences were observed across the three clinical groups in performance on the Total ToM Score, F (2, 35) = 1.30, (*nsd)*. Likewise, no significant differences were observed for either the first-order or second-order ToM tasks: for first-order ToM tasks, F (2, 46) = .37, (*nsd*) and for the second-order ToM tasks, F (2, 37) = 1.63, (*nsd*). Since there was a difference in the severity of positive symptoms across the three clinical groups, an analysis of covariance was performed with clinical group as the independent variable and mean positive symptom scores as a covariate. The original findings remained after adjustments were made for differences in severity of positive symptoms: performance on the total ToM score, F (2, 30) = .52 (*nsd*), performance on the first-order ToM tasks, F (2, 41) = .23, (*nsd*), and the second-order ToM tasks, F (2, 32) = .78, (*nsd*).

3.4.1.b. Results for the Movie Clips Task. Significant differences were observed across the three clinical groups in the Total Score on the Movie Clips Task. Based on the finding of significant group differences on the Total Score, one-way analyses of variance were performed comparing of the three clinical groups on the five Movie Clips Subscales. Findings are reported below.

b.1. *Comparisons of Total Scores of the Movie Clips Task*: The three clinical groups differed in performance on the Movie Clips Task, $F(2, 48) = 4.27$, $p < .02$ (see Figure 2). This difference remained even after adjusting for severity of positive symptoms, $F(2, 42) = 3.62$; $p < .04$. Post-hoc pair-wise comparisons of groups showed that the schizoaffective disorder group performed significantly better than the bipolar disorder group (Fisher's LSD, $p < .02$). In addition, a trend was observed for individuals with schizoaffective disorder to perform better than those with schizophrenia (Fisher's LSD, $p < .06$). These results illustrate the following relationship across the clinical groups: individuals with schizoaffective disorder performed better than individuals with bipolar disorder. Scores for individuals with schizophrenia were intermediate between the two groups and worse than the schizoaffective disorder group at a trend level.

b.2. *Subscale Comparisons of the Movie Clips Task*: Since a significant difference in the Total Score of the Movie Clips Task was found across the clinical groups, analyses of variance were performed to evaluate group differences on the five subscales of the Movie Clips Task: Affective Change (AC), Cognitive Inference (CI), Empathic Cognition (EC), Motives (M), and Personal Empathic Cognition (PEC). Consistent with findings for the Total Score, individuals with schizoaffective disorder performed better than individuals with bipolar disorder on the following scales: Affective Change (Fisher's LSD, $p < .02$), Cognitive Inference (Fisher's LSD, $p < .01$), Motives (Fisher's LSD, $p \leq .03$), and Personal Empathic Cognition (Fisher's LSD, $p < .01$). Individuals with schizoaffective disorder performed better than individuals with schizophrenia on the following scales: Affective Change (Fisher's LSD, $p < .01$) and Cognitive Inference (Fisher's LSD, $p \leq .04$).

In addition, a significant difference was observed in performance on the Empathic Cognition subscale for schizophrenia and bipolar disorder groups, revealing that individuals with bipolar disorder performed worse (Fisher's LSD, $p \leq .04$).

b.3. *Severity of Positive Symptoms:* After severity of positive symptoms was included as covariate during these analyses, the following group effects were observed on the subscales of the Movie Clips Task. On the Affective Change subscale, individuals with schizoaffective disorder performed better than individuals with bipolar disorder (Fisher's LSD, $p < .01$) and individuals with schizophrenia (Fisher's LSD, $p < .01$). On the Cognitive Inference subscale the schizoaffective disorder group performed better than the bipolar disorder group (Fisher's LSD, $p < .04$) and the schizophrenia group (Fisher's LSD, $p \leq .04$). On the Personal Empathic Cognition subscale the schizoaffective disorder group performed better than the bipolar disorder group (Fisher's LSD, $p < .02$). The difference observed in performance in both the bipolar disorder and schizophrenia groups on the Empathic Cognition subscale was no longer significant after statistical adjustments were made for differences in positive symptom severity (see Table 5).

3.4.2. Performance on the Expressive Social Cognition Task

Results for the IBAT. As illustrated in Table 5, the three clinical groups did not differ significantly in performance on the IBAT, $F(2, 49) = .69$ (*nsd*). Performance was comparable across all three clinical groups, suggesting similar performance in expressive social cognition. After adjusting for the severity of positive symptoms, results still showed no difference in performance on the IBAT across the three clinical groups, $F(2, 43) = .69$ (*nsd*).

3.5. *Post-hoc Analyses*

3.5.1. *Schizoaffective Disorder: Subgroup Comparisons*

Analyses were conducted to determine whether differences in performance existed on each measure of social cognition between the two DSM-IV diagnostic subtypes of Schizoaffective Disorder: Depressed (n = 6) and Bipolar (n = 9) subtypes.

3.5.1.a. Results of the ToM Task: A trend for subtype group differences was observed in performance on the ToM task. The mean total score on the ToM Task for the Schizoaffective Disorder–Depressed Subtype group was lower (M = 35.6, SD = 5.6) as compared to the Schizoaffective Disorder–Bipolar Subtype group (M = 39.75, SD = 1.8), t (11) = 1.98, $p < .08$. The mean score on the ToM first-order tasks for the Schizoaffective Disorder–Depressed Subtype group was lower (M = 21.57, SD = 2.1) as compared to the Schizoaffective Disorder– Bipolar Subtype group (M = 23.22, SD = .8), t (7.25) = 1.88, $p< .09$. Finally, the mean score on the ToM second-order tasks for the Schizoaffective Disorder–Depressed Subtype group was also lower (M = 13.60, SD = 3.8) as compared to the Schizoaffective Disorder–Bipolar Subtype group (M = 16.63, SD = 1.7), t (11) = 2.01, $p < .07$. These results suggest that the Schizoaffective Disorder-Depressed Subtype subgroup performed more poorly than the schizoaffective disorder bipolar subgroup on the ToM Task. However, a larger sample is needed to determine whether a significant difference between the groups exists.

3.5.1.b. Results on the Movie Clips Task. No difference was observed between the two subgroups in performance on the Movie Clips Task. The mean score for the Schizoaffective Disorder–Depressed Subtype group (M = 31.64, SD = 8.4) was not different from that for the Schizoaffective Disorder–Bipolar Subtype group (M = 38.56, SD = 10.8), t (14) = -1.39, (nsd), suggesting that schizoaffective subtype may not impact performance on the Movie Clips Task, with high performance in both subgroups of schizoaffective disorder.

3.5.1.c. Results of the IBAT. Statistically significant differences were found between the two subgroups on the measure of expressive social cognition (IBAT). The mean score on the IBAT for the Schizoaffective Disorder–Depressed Subtype group was lower (M = 27.67, SD = 6.5) as compared to the Schizoaffective Disorder–Bipolar Subtype group (M = 39.78, SD = 8.5), t (13) = 2.94, $p < .05$, suggesting that individuals in the Schizoaffective Disorder–Bipolar group had a higher level of expressive social cognitive functioning.

3.5.2. *Influence of Negative Symptoms on Social Cognition*

Researchers have demonstrated that negative symptoms may be related to poorer social functioning (10, 11, 48). Therefore, it was within the interests of this study to determine whether negative symptoms influenced performance on social cognitive tasks and if there was a difference in severity of symptoms between the schizophrenia and schizoaffective disorder groups. Results from an independent t-test showed that differences did exist between the schizophrenia and schizoaffective disorder groups in the severity of negative symptoms, with individuals in the schizophrenia group reporting more negative symptoms than those in the schizoaffective disorder group, t (30) = -2.33, $p < .02$. Contrary to previous research, differences in the severity of negative symptoms were not correlated with the composite scores of the three social cognitive measures: ToM Task (r = -.22, p = .174), Movie Clips Task (r = -.20, p = .223), and IBAT (r = -.14, p = .441). Therefore, no further inferential statistical testing was conducted to examine the relationships between these variables. Thus, it is reasonable to conclude that the observed difference in negative symptoms did not affect performance on these measures.

3.5.3. *Influence of Head Trauma on Social Cognition*

Seventy-eight percent of individuals in the schizoaffective disorder group reported an occurrence of head trauma in their lifetime (Table 2). It was of interest to examine the relationship between the occurrence of a head injury and performance on the social cognitive tasks because it has been demonstrated that cognitive processes are related to social behavior (2, 15, 29, 39). It was also of interest to examine the relationship between a history of head injury accompanied by loss of consciousness (as an indication of more severe trauma) and functioning on measures of social cognition. Head injury was not correlated with any of the three composite scores of the social cognitive measures: ToM Task (r = -.10, p = .521), Movie Clips Task (r = .06, p = .657), and IBAT (r = .02, p = .852). Similarly, loss of consciousness was not correlated with any of the three composite scores of the social cognitive tasks: ToM Task (r = .08, p = .618), Movie Clips Task (r = .14, p = .278), IBAT (r = .07, p = .572). Therefore, no further inferential statistical tests were conducted to examine the relationships between these variables and the dependent measures.

4. **Discussion**

The aim of this study was to examine social cognitive functioning in groups of individuals with schizophrenia, bipolar disorder, and schizoaffective disorder—three severe psychiatric disorders that share some common clinical features. To do this, samples from each of these populations (clinical groups) were first compared to a sample of individuals with no history of psychiatric illness (healthy control group) on three measures of social cognitive functioning. Next, the three clinical groups were compared on each social cognition measure to determine whether there were inter-group differences in the targeted domain. It was of particular interest to address the following questions: 1) does the schizoaffective disorder group differ in performance as compared to the other clinical groups and 2) is their performance at an intermediate level, with scores worse than individuals with bipolar disorder and better than individuals with schizophrenia?

4.1. *Summary of Results for Hypothesis 1*

Differences were observed in comparisons of clinical groups to the healthy control group in performance on some of the receptive social cognition tasks. On the first-order ToM tasks, individuals with schizophrenia performed worse than the healthy control group. On the Movie Clips task, individuals with bipolar disorder performed worse than the healthy control group. Finally, performance deficits were observed for all three clinical groups (relative to healthy controls) on the expressive social cognition task (the Interpersonal Block Assembly Task, IBAT).

4.2. *Summary of Results for Hypotheses 2a and 2b*

Diagnostic group differences were observed across the three clinical groups in performance on the Movie Clips Task, with individuals in schizoaffective disorder group performing better than those in the bipolar group on the Total Score and on three of the five subscales of the task. In addition, there was a trend for poorer performance in the schizophrenia group as compared with the schizoaffective disorder group.

4.3. *Interpretation of Findings: Receptive Social Cognition (Movie Clips and ToM tasks)*

In considering the significance of the findings from the current study, it is notable that results from previous studies that focused solely on ToM tasks have tended to find performance differences in comparisons between individuals with schizophrenia as compared to healthy controls (33, 36, 39). In addition, one study by Bora et. al. (12) found differences between individuals with bipolar disorder and healthy controls. However, results from ToM tasks in this study did not tend to support the empirical evidence reported by these studies. When compared to healthy controls, individuals with schizophrenia performed significantly worse on only the first-order ToM tasks.

A number of factors may help to explain the difference between results from this study and other research in this area. To consider one possible explanation, it is necessary to take into account the nature of first- and second-order ToM tasks. A first-order ToM task measures the ability of the participant to make inferences about another person's mental state and is relatively less complicated than the second-order ToM task, which measures the ability of the participant to make inferences about a character's understanding of the mental state of another character. In this study, differences were observed between the schizophrenia and healthy control groups on both the first- and second-order ToM tasks prior to adjustments for differences in IQ and total

years of education, with the schizophrenia group performing worse. However, once adjustments were made, the difference on the first-order tasks remained while the difference on second-order ToM tasks were no longer observed. These results indicate that IQ and years of education account for more variance in the model of second-order ToM task performance (as contrasted with the model of first-order ToM performance) than the diagnosis of schizophrenia. These findings suggest that IQ and years of education may have a greater impact in performance on the more complex ToM measure (the second-order tasks) due to the skills that are necessary to think abstractly about what an individual is thinking about a second individual. Therefore, it is possible that underlying deficits exist in ToM abilities. However, since our samples are not matched on IQ and years of education, statistical adjustment was used to evaluate the potentially confounding effects of these variables in the analyses and differences were no longer observed. The proposed relationship between ToM and IQ and years of education is supported by Mazza et.al. (33). Results from this study demonstrated impairments in performance on both first– and second– order ToM in individuals with schizophrenia when compared to a healthy control group with similar scores in IQ and comparable years of education.

A second reason why the findings for the ToM tasks differed from some of the previous studies may be explained by the sample size in this study. The number of individuals included in each group may have been too small to demonstrate differences across the groups on the ToM Task [schizophrenia group (N=16), bipolar disorder group (N = 19), schizoaffective disorder group (N = 17), healthy control group N = 15)]. Lastly, the participants in our study may have a higher level of social functioning on average than the larger population of individuals with severe mental illness. It could be argued that since individuals were self-selected to participate in this study, they demonstrated social functioning skills when contacting the lab to volunteer in the study, schedule appointments to meet with the research staff, and actively participant in the

research battery. Therefore, individuals in this study are most likely individuals who possess a certain degree of social functioning skills and as a result, may be a relatively more socially adept subgroup of individuals with severe mental illness.

As predicted for Hypothesis 1, the bipolar disorder group performed worse than the healthy control group on the overall score for the Movie Clips Task, a task considered to reflect receptive social cognitive abilities involved in the interpretation of the emotions and behaviors of other people. A trend for differences between these two groups was also reflected on two of the five subscales of this task. However, hypothesized differences in performance on the Movie Clips Task were not observed in comparisons of the healthy control group to either the schizophrenia or schizoaffective disorder groups.

As predicted for Hypothesis 2, there was significant variance across clinical groups (individuals with schizophrenia, bipolar disorder, and schizoaffective disorder) in their performance on the Movie Clips Task. Unexpectedly, individuals in the schizoaffective disorder group performed better than those in the bipolar disorder group overall and on three of the five subscales even after adjusting for positive symptoms. Individuals with schizophrenia performed intermediate between those with bipolar disorder (who performed the worst) and those with schizoaffective disorder (who performed the best). Although differences were observed in the predicted direction between the schizophrenia group and the schizoaffective disorder group on two of the Movie Clips Subscales, these findings were the only differences between these two groups observed on any of the social cognition task.

There are a few possible explanations for why the bipolar disorder group performed significantly worse than both the healthy control group and schizoaffective group on the Movie Clips Task. First, the social stimuli that are associated with the Movie Clips Task are affect-oriented, and much more so than the ToM or IBAT tasks. For the Movie Clips Tasks,

participants are specifically asked to interpret the mood state of another individual. This involves understanding the character's emotions, changes in affect, and reasons behind certain behaviors. In addition, questions involve interpretations of the participant's emotional reaction to social stimuli. Given these relatively unique features of the Movie Clips Task, it is possible that the bipolar disorder group performed worse than healthy control and the schizoaffective disorder groups on this task because they may have impairments in affect or emotion recognition. Second, individuals enrolled in the bipolar group in this study may have poorer functioning then the general population of individuals with bipolar disorder. However, it is notable that in terms of other indicators of lifetime functional achievement (years of education, marital status and socioeconomic status) the bipolar group was no worse off than the other clinical groups.

Finally, it is possible that medication effects account for deficits on these social cognition tasks. Differences in the use of antipsychotic medication were observed across the three clinical groups, with individuals in the schizophrenia and schizoaffective disorder groups having a higher percentage of individuals currently taking antipsychotic medications. Analyses were conducted to adjust for this potentially confounding variable and showed that when the use of antipsychotic medication was included as a covariate, no novel differences were observed and the previous findings remained. Lithium carbonate is known to negatively impact motor function and memory. Therefore, it was of interest to determine if the use of lithium confounded results observed in the bipolar disorder group. Within group independent t-tests were performed comparing individuals with bipolar disorder who were currently taking lithium to those with bipolar disorder who were not currently taking lithium on each of the social cognition tasks. Results from these analyses were similar to those for antipsychotic medications; no differences were found in performance on the three social cognitive tasks between the two subgroups of the

bipolar disorder group. Lastly, information on the use of antidepressant medication was not uniformly available for all subjects at the time of this report. It is likely that any effects of antidepressants on cognition are mediated by medication effects on symptom relief. It would be of interest to investigate the effects of antidepressants and mood stabilizers (e.g. depakote) on social cognitive performance in a future study.

4.4. *Interpretation of Findings: Expressive Social Cognition (IBAT)*

The Movie Clips and ToM tasks evaluate receptive social interpretation skills. These tasks require an individual to pay close attention to social stimuli (i.e., videotaped interactions or story passages) and make inferences regarding these social stimulus events, with reference to the social context. In contrast, the IBAT is a measure of both social interpretation skills and the ability to work cooperatively with another person to communicate information in a clear and concise manner. The IBAT also requires the individual to interact in an interpersonal social situation. For this task, the participant must make inferences about a research staff member (similar to those associated with receptive social cognitive tasks), while simultaneously modifying his or her own thoughts in order to engage in a comprehendible instructional conversation. Ultimately, the researcher must produce a desired outcome (the orientation of a block design), using only the verbal instructions of the study participant. Due to the complex framework of this task, it is assumed that the IBAT requires the participant to operate using additional cognitive processes, as compared to the receptive cognitive tasks, and therefore, the IBAT may measure a higher level of social understanding. The IBAT also provides an interactive social situation that is similar to real-world problem solving scenarios (e.g., employee interactions or interpersonal relationships). Theoretically, this task may be more related to real world functioning than pencil-and-paper or computerized assessments.

Performance on the IBAT was impaired for each of the clinical groups relative to the healthy control sample (results for tests of Hypothesis 1). However, no differences were found across the clinical groups in their performance on the IBAT (results for Hypothesis 2). Thus, performance on the IBAT was impaired for all groups with a severe mental illness—irrespective of diagnosis. This finding held even when the contribution of the severity of positive symptoms was taken into account. Therefore, the presence of a severe mental illness may have a greater impact on expressive social cognition than does specific diagnosis or psychotic symptom severity.

There are several possible explanations for the observed impairments in expressive social cognition. First, individuals with severe mental illness may have impairments in perspective-taking abilities, which result in poorer performance on the expressive social cognitive tasks. However, findings from this study would suggest that the receptive social cognitive abilities of the participants included in each clinical group were not greatly impaired on tasks measuring receptive social cognition once confounding variables are taken into consideration, with the exception of poorer performance in the bipolar disorder group on the Movie Clips Task.

Second, individuals with severe mental illness may have the necessary social perspective taking skills, but may have impairments in the ability to think flexibly about another person's perspective, which results in poorer expressive social cognitive functioning performance. Although an individual may be able to make accurate inferences about the mental state of another person (as on a Theory of Mind task), they may not be as able to understand the perspective of another individual in a task that requires regular "updating" of a person's perspective and flexibility in the interpretation of inferences. For example, on the Interactive Block Assembly Task, the research participant may have difficulty adjusting personal perspectives to produce a clear set of instructions that are easy for the researcher to understand.

Such difficulties could contribute to repeated requests for clarification and ultimately a poorer performance on this task. A somewhat related observation has been put forth by Nickerson (34), who hypothesized that a person must first understand and make adjustments to his/her own mental state in order to understand the perspective of another individual.

Similarly, it is possible that the individuals included in the clinical groups had difficulty modifying their own point of view to produce instructions that are easy for another person to follow. For example, if one set of instructions left the researcher confused or unsure of the orientation of a block, the participant must alter his or her original set of instructions to include clearer information relative to the researcher's perspective. Lower scores on the IBAT are assigned to individuals if they are unable to have a flexible perspective-taking style. Therefore, it is possible to tentatively conclude that individuals in all three clinical groups are impaired in the area of expressive social cognition due to impairments in the ability to think flexibly about another person's perspective.

4.5. *Interpretation of Ordinal Relationship of the Clinical Groups*

The hypothesis that the schizoaffective disorder group would perform at a level intermediate between the schizophrenia and bipolar disorder groups was not supported by this study. In part, this may be attributed to the complexity of the hypothesis (in terms of order effects) and the relatively small sample sizes for the three groups. It would be of interest, therefore, to conduct a study with larger sample sizes to test for differences in order across all three groups.

It is of interest that the schizoaffective disorder group *did* perform better than the schizophrenia group on two of the receptive social cognition subscales of the Movie Clips Task. In addition, the schizoaffective disorder group did not perform significantly worse than the

schizophrenia group on any of the social cognitive tasks. These findings are consistent with literature in this area, which suggests that individuals with schizoaffective disorder perform either similar to or better than individuals with schizophrenia on social cognitive tasks (11, 20, 46)

In addition, social cognition is defined as a multi-faceted domain. Therefore, deficits in social cognition may not be uniform across all diagnostic groups. For example, individuals with severe mood disorder (i.e., bipolar disorder) may have more severe impairments on affect recognition and interpretation of affective-related phenomena, whereas individuals with non-affective psychoses may be less impaired on tasks of this nature. In contrast, individuals with psychosis may have more severe impairments on tasks that are related to inferential reasoning (e.g., ToM tasks). Assessments of social perspective taking require the participant to reflect on a highly controlled social situation and use abstract reasoning when trying to understand the social event. These events are often less emotionally charged, reflect inferential thinking abilities, and reflect the ability to think critically about the thoughts of another person. Individuals with psychosis may be more impaired in social cognitive domains of this nature.

Finally, due to the complexity of the IBAT, which requires both interpretive abilities and social engagement abilities, poorer performance in each of the clinical groups as compared to the healthy control group may reflect impairments in various domains of social functioning, which vary uniquely across each clinical group. For example, individuals in the schizophrenia group may be more impaired on the IBAT due to inabilities think abstractly about another person's perspective and individuals in the bipolar disorder group may have impairments in the ability to verbally communicate thoughts and emotions or have difficulties working cooperatively in an interpersonal situation. Both of the impairments provided in this example measure different domains of social cognition and both result in a lower overall performance on the IBAT.

This model would support the findings of this study, with poorer performance when compared to healthy controls (hypothesis 1) and minor differences in poor performance across comparisons of the three clinical groups (hypothesis 2).

4.6. *Study Limitations*

There are a few limitations in this study. A significant difference was found in IQ between the healthy control group when compared to both the schizophrenia and bipolar disorder groups. However, this finding is not surprising since the measurement of IQ focused on current functioning, rather than pre-morbid IQ. When conducting research that compares performance between groups that are selected on the basis of a clinical condition, a problem often occurs when there are significant differences on variables that may affect the key outcomes of the study. In order to determine that such differences between groups are not driving the differences in results, one must consider the use of statistical adjustment for these differences. However, there is a theoretical problem when attempting to adjust for differences in IQ in clinical research involving healthy control participants. Lower IQ scores may be a component of the mental illness. If lower IQ scores are associated with the presence of a mental illness, it is questionable whether an attempt should be made to selectively recruit subjects to be matched—e.g. to recruit 'higher-functioning' clinical groups to match the healthy controls or, alternatively, to recruit 'lower functioning' healthy controls to match the clinical groups. In either case, the selective recruitment of samples may result in samples that do not adequately reflect the true characteristics of the clinical population (or, alternatively, the healthy control population). For this reason, in this study, participants were not matched on IQ. Instead, adjustments were made during analyses to take into consideration the impact of IQ differences and both pre-and post-adjustment results were reported. Ultimately, interpretations of the findings need be made in

light of the fact that chronic psychiatric disorder tends to reduce IQ and may negatively influence tested intelligence (IQ) even during the premorbid stage of development. Thus, there is a strong argument that either statistical adjustment or planned subject selection to match for IQ may eliminate important variance in the domains that are a focus of study. For this reason, interpretation of findings based solely on the results of the adjusted analyses is at risk of underestimating true differences that exist among clinical groups or between clinical and healthy control groups.

Another limitation in this study is the small sample size. Few individuals were included in each group. There are two implications of a small sample size for evaluation of findings. First, if real differences do exist, detection of any effect is limited by the size of the sample. In this study, trends ($p < .10$) in the observed means were reported for several of the analyses. Second, if the sample size had been larger, it is possible that differences between the groups would be observed. Therefore, for the primary outcome analyses only when trend-level results were found, analyses were conducted using Cohen's d to determine the estimated group size necessary to detect group differences. A trend for poorer performance on the Movie Clips Task was observed with the schizophrenia group performing worse than the healthy control group. A moderate effect size was observed with a Cohen's d value of 0.57; power analysis indicated that for this effect size, a cell size of 50 individuals would be required to detect a true difference at a ($p < .05$ two-tailed) level of significance. In addition, in the comparison of the bipolar disorder and healthy control groups, the effect size for the ToM Total Score (Cohen's d = 0.73), indicates that a cell size of 31 individuals would be needed to find differences (at the two-tailed $p < .05$ level) between the bipolar disorder and healthy control groups on this variable. For the comparison across the three clinical groups, power analysis using the effect size obtained in this study (Cohen's d = .26) indicates that a sample size of 49 would be needed for each clinical

group to detect true differences across groups on the ToM Total Score. Finally, based on the effect size (Cohen's d = .47) for the observed differences in performance on the Movie Clips Task, comparing the schizophrenia and schizoaffective disorder groups, 57 participants would be needed per cell to detect a true difference at the $p < .05$ (two-tailed test) level. These results indicate that the likelihood of observing differences across groups would increase with a larger sample size. Since it is possible that adjustments will not be needed when a larger sample is included in this study, the estimated sample sizes are based on power analyses using data from the unadjusted performance scores. Finally, when an effect size is reasonably small (Cohen's d < .30), not only is the sample size too small to detect a significant difference but it is clear that a much larger sample size is needed before testing with hopes of being able to make broader generalizations about impairments in clinical populations.

Finally, participants from this study were largely self-selected. Therefore, there is the potential for a self-selection bias in individuals included in each of the study groups. As a result, the study groups may not be a true representation of individuals with severe mental illness. In addition, there may be a bias in social functioning skills. In order to participate in this study, prospective participants had to actively look for information on research studies, contact our lab, schedule appointment times, and interact with a research staff member. Therefore, it is likely that in order to participate in this study these individuals held a high level of successful social functioning skills. However, it is possible that individuals included in this sample are more representative of individuals with severe mental illness who are functioning in everyday society. This recruitment strategy contributes to the enrollment of individuals with severe mental illness who actively participate in society and therefore, it is possible to generalize results from this study to other individuals with severe mental illness who are also functioning in a social community.

Differences were found across the clinical groups in performance on one task that measures receptive social cognition (i.e. the ability to make inferences about another person's thoughts beliefs, and behaviors), with those in the schizoaffective disorder group performing better than individuals with bipolar disorder on measures that target recognition of changes in affect and inferences regarding the thoughts and feelings of others. These results demonstrate differences between individuals with schizoaffective disorder and those with other severe mental illness. Therefore, it may be of interest to examine individuals with schizoaffective disorder independently from other diagnoses, especially when comparing social cognitive performance.

In conclusion, findings from this study suggest that people with severe mental illness demonstrate impairments in expressive social cognition (i.e. the ability to interact successfully in interpersonal situations, while taking the perspective of another person, in order to create a clear and effective approach to the sharing of information). Impairments on more complex measures of social cognition supports the need for further research on social cognitive impairments in individuals with severe mental illness and the continuation of treatment strategies focusing on social cognitive enhancement training.

References

1. Addington, J., & Addington, D. (1997). Attentional vulnerability indicators in schizophrenia and bipolar disorder. *Schizophrenia Research*, 23, 197-204.

2. Addington, J., McCleary, L., & Munroe-Blum, H. (1998). Relationship between cognitive and social dysfunction in schizophrenia. *Schizophrenia Research*, 34, 59-66.

3. Allen, D.N., Frantom, L.V., Strauss, G.P., & van Kammen, D.P. (2005). Differential patterns of premorbid academic and social deterioration in patients with schizophrenia. *Schizophrenia Research*, 75, 389-397.

4. American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders, (4th edition), American Psychiatric Association, Washington, DC.

5. Andreasen, N.C. (1984). The scale for the assessment of positive symptoms (SAPS). Iowa City, IA: The University of Iowa.

6. Andreasen, N.C. (1983). The scale for the assessment of negative symptoms (SANS). Iowa City, IA: The University of Iowa.

7. Beatty, W.W., Jocic, Z., Monson, N., & Katzung, V.M. (1994). Problem solving by schizophrenic and schizoaffective patients on the Wisconsin and California card sorting tests. *American Psychological Association, Inc,* 8, 49-54.

8. Bech, P., Rafaelsen, O.J., Kramp, P., & Bolwig, T.G. (1978). The mania rating scale: Scale construction and inter-observer agreement. *Neuropharmacology,* 17, 430 – 431.

9. Beer, J.S., & Ochsner, K.N. (2006). Social cognition: A multi level analysis. *Brain Research*, 1079, 98-105.

10. Bell, M.D., & Mishara, A.L. (2006). Does negative symptom change relate to neurocognitive change in schizophrenia? Implications for targeted treatments. *Schizophrenia Research*, 81, 17-27.

11. Bellack, A.S., Morrison, R.L., Mueser, K.T., & Wade, J. (1989). Social competence in schizoaffective disorder, bipolar disorder, and negative and non-negative schizophrenia. *Schizophrenia Research*, 2, 391-401.

12. Bora, E., Vahip, S., Gonul, A.S., Akdeniz, F., Alkan, M., Ogut, M., et al. (2005). Evidence for theory of mind deficits in euthymic patients with bipolar disorder. *Acta Psychiatr Scand,* 112, 110 – 116.

13. Cannon, M., Jones, P., Gilvarry, C., Rifkin, L., McKenzie, K., Foerster, A., et al. (1997). Premorbid social functioning in schizophrenia and bipolar disorder: Similarities and differences. *American Journal of Psychiatry*, 154, 1544 – 1550.

14. Choi, K.H., & Kwon, J.H. (2006). Social cognition enhancement training for schizophrenia: A preliminary randomized controlled trial. *Community Mental Health Journal*, 42, 177- 187.

15. Cohen, A.S., Forbes, C.B., Mann, M.C., & Blanchard, J.J. (2006). Specific cognitive deficits and differential domains of social functioning impairment in schizophrenia. *Schizophrenia Research,* 81, 227 – 238.

16. Corrigan, P.W., & Nelson, D. R. (1998). Factors that affect social cue recognition in schizophrenia. *Psychiatry Research, 78, 189 – 196.*

17. Couture, S.M., Penn, D.L., & Roberts, D.L. (2006). The functional significance of social cognition in schizophrenia: A review. *Schizophrenia Bulletin*, 32, S44 – S63.

18. Dickerson, F.B., Sommerville, J., Origoni, A.E., Ringel, N.B., & Parente, F. (2001). Outpatients with schizophrenia and bipolar I disorder: Do they differ in their cognitive and social functioning? *Psychiatry Research*, 102, 21 – 27.

19. Dunn, L.M., & Dunn, L.M. (1997). *Peabody Picture Vocabulary Test – Third Edition.* Circle Pines, MN: American Guidance Services.

20. Fiszdon, J.M., Richardson, R., Greig, T., & Bell, M.D. (2007). A comparison of basic and social cognition between schizophrenia and schizoaffective disorder. *Schizophrenia Research*, 91, 117-121.

21. Goldstein, G., Shemansky, W.J., & Allen, D.N. (2005). Cognitive function in schizoaffective disorder and clinical subtypes of schizophrenia. *Archives of Clinical Neuropsychology*, 20, 153 – 159.

22. Green, M.F., Olivier, B., Crawley, J.N., Penn, D.L., & Silverstein, S. (2005). Social cognition in schizophrenia: Recommendations from the measurement and treatment research to improve cognition in schizophrenia new approaches conference. *Schizophrenia Bulletin,* 31, 882 – 887.

23. Greig, T.C., Bryson, G.J., & Bell, M.D. (2004). Theory of mind performance in schizophrenia: Diagnostic, symptom, and neuropsychological correlates. *The Journal of Nervous and Mental Disease,* 192, 12 – 18.

24. Hamilton, M. (1960). A rating scale for depressions. *Journal of Neurological Neurosurgical Psychiatry*, 23, 56 – 62.

25. Hofer, A., Rettenbacher, M.A., Widschwendter, C.G., Kemmler, G., Hummer, M., & Fleischhacker, W.W. (2006). Correlates of subjective and functional outcomes in outpatient clinic attendees with schizophrenia and schizoaffective disorder. *European Archives of Psychiatry and Clinical Neuroscience,* 256, 246 – 255.

26. Hollingshead, A.B. (1975). Four Factor Index of Social Status. New Haven. CT: Yale University Department of Sociology.

27. Kendell, R.E. (1986). The Relationship of schizoaffective illness to schizophrenic and affective disorders. In Marneros, A., & Tsuang, M.T. (Eds.), *Schizoaffective Psychosis* (pp. 18 – 30). Germany: Springer-Verlag Berlin Heidelberg.

28. Krabbendam, L., Arts, B., van Os, J., & Aleman, A. (2005). Cognitive functioning in patients with schizophrenia and bipolar disorder: A quantitative review. *Schizophrenia Research*, 80, 137 – 149.

29. Lancaster, R.S., Evans, J.D., Bond, G.R., & Lysaker, P.H. (2003). Social cognition and neurocognitive deficits in schizophrenia. *The Journal of Nervous and Mental Disease,* 191, 295 – 299.

30. Lee, K.H., Farrow, T.F.D., Spence, S.A., & Woodruff, P.W.R. (2004). Social cognition, brain networks and schizophrenia. *Psychological Medicine*, 34, 391 – 400.

31. MacQueen, G.M., Young, L.T., & Joffe, R.T. (2001). A review of psychosocial outcome in patients with bipolar disorder. *Acta Psychiatr Scand*, 103, 163 – 170.

32. Marneros, A., Rohde, A., Deister, A., & Risse, A. (1986). Features of schizoaffective disorder: The "cases-in-between." In Marneros, A., & Tsuang, M.T. (Eds.), *Schizoaffective Psychosis* (pp. 143 – 154). Germany: Springer-Verlag Berlin Heidelberg.

33. Mazza, M., De Risio, A., Surian, L., Roncone, R., & Casacchia, M. (2001). Selective impairments of theory of mind in people with schizophrenia. *Schizophrenia Research*, 47, 299 – 308.

34. Nickerson, R.S. (1999). How we know – and sometimes misjudge – what others know: Imputing one's own knowledge on others. *Psychological Bulletin*, 125, 737 – 759.

35. Penn, D.L., Corrigan, P.W., Bentall, R.P., Racenstein, J.M., & Newman, L. (1997). Social cognition in schizophrenia. *Psychological Bulletin,* 121, 114 – 132.

36. Pickup, G.J., & Frith, C.D. (2001). Theory of mind impairments in schizophrenia: Symptomatology, severity and specificity. *Psychological Medicine*, 31, 207 – 220.

37. Pini, S., de Queiroz, V., Dell'Osso, L., Abelli, M., Mastrocinque, C., Saettoni, M., et al. (2004). Cross – sectional similarities and differences between schizophrenia, schizoaffective disorder, and mania or mixed mania with mood-incongruent psychiatric features. *European Psychiatry*, 19, 8 – 14.

38. Pini, S., Cassano, G.B., Dell'Osso, L., & Amador, X.F. (2001). Insight into illness in schizophrenia, schizoaffective disorder, and mood disorders with psychiatric features. *American Journal of Psychiatry*, 158, 122 – 125.

39. Pinkham, A.E., & Penn, D.L. (2006). Neurocognitive and social cognitive predictors of interpersonal skill in schizophrenia. *Psychiatry Research*, 143, 167 – 178.

40. Pinkham, A.E., Penn, D.L., Perkins, D.O., & Lieberman, J. (2003). Implications for the neural basis of social cognition for the study of schizophrenia. *American Journal of Psychiatry*, 160, 815 – 824.

41. Pollice, R., Roncone, R., Falloon, I.R.H., Mazza, M., De Risio, A., Necozione, S., et al. (2002). Is theory of mind in schizophrenia more strongly associated with clinical and social functioning than the neurocognitive deficits? *Psychopathology*, 35, 280 – 288.

42. Schenkel, L.S., Spaulding, W.D., & Silverstein, S.M. (2005). Poor premorbid social functioning and theory of mind deficit in schizophrenia: Evidence of reduced context processing? *Journal of Psychiatric Research*, 39, 499 – 508.

43. Schwary, R.L. (Producer), & Redford, R. (Director). (1981). *Ordinary People* [Motion Picture], United States: Paramount Pictures.

44. Shean, G., Murphy, A., & Meyer, J. (2005). Social cognition and symptom dimensions. *The Journal of Nervous and Mental Disease,* 193, 751 – 755.

45. Smith, T.E., Hull, J.W., Huppert, J.D., & Silverstein, S.M. (2002). Recovery from psychosis in schizophrenia and schizoaffective disorder: Symptoms and neurocognitive rate-limiters from the development of social behavior. *Schizophrenia Research*, 55, 229 – 237.

46. Stip, E., Sepehry, A.A., Prouteau, A., Briand, C., Nicole, L., Lalonde, P., et al. (2005). Cognitive discernible factors between schizophrenia and schizoaffective disorder. *Brain and Cognition*, 59, 292 – 295.

47. Tsuang, M.T., & Marneros, A. (1986). Schizoaffective psychosis: Questions and answers. In Marneros, A., & Tsuang, M.T. (Eds.), *Schizoaffective Psychosis* (pp. 1 – 7). Germany: Springer-Verlag Berlin Heidelberg.

48. Taylor, M.A., Berenbaum, S.A., Jampala, V.C., & Cloninger, C.R. (1993). Are schizophrenia and affective disorder related? Preliminary data from a family study. *American Journal of Psychiatry*, 150, 278 – 285.

49. Villalta–Gil, V., Vilaplana, M., Ochoa, S., Haro, J.M., Dolz, M., Usall, J., et al. (2006). Neurocognitive performance and negative symptoms: Are they equal in explaining disability in schizophrenia outpatients? *Schizophrenia Research*, 87, 246 – 253.

50. Yager, J.A. & Ehmann, T.S. (2006). Untangling social function and social cognition: A review of concepts and measurements. *Psychiatry*, 69, 47 – 68.

Table 1

Demographic Data for Schizophrenia, Bipolar Disorder, Schizoaffective, and Healthy Control Groups

	Schizophrenia Group (n = 16)	**Bipolar Disorder Group (n = 19)**	**Schizoaffective Disorder Group (n = 18)**	**Healthy Control group (n = 15)**	*Statistical Comparison across the 3 Clinical Groups	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F(df)	p-value
Age (in years)	47.63 (8.8)	46.47 (7.0)	44.44 (8.8)	42.27 (10.3)	.60 (2, 50)	.521
IQ	89.69 (9.8) [a]	91.79 (10.5) [b]	98.5 (16.6)	101.13 (9.1)	2.28 (2,50)	.113
Education (in years)	13.53 (2.4) [c]	13.63 (2.9) [d]	14.11 (2.9)	15.93 (2.9)	.23 (2, 49)	.799
	%	%	%	%	X^2 df	p-value
% **Male**	56.3	52.6	66.7	53.3	.80 1	.671
% **Minority**	50	47.4	50	33.3	.03 1	.983
% Ever Married	66.7	78.9	44.4	78.6	4.84 1	.089
					Kruskal - Wallas Trend Test	
^ **Subject SES**	% [e]	%	%	%		
I	0	5.3	11.1	13.3	3.53 1	.172
II	25	42.1	50	60		
III	43.8	26.3	22.2	13.3		
IV	18.8	21.1	16.7	6.7		
V	6.3	5.3	0	6.7		
^ **Parent SES**	%	%	%	%		
I	0	0	5.6	6.7	1.98 1	.372
II	6.3	10.5	16.7	6.7		
III	37.5	47.4	50	20		
IV	18.8	21.1	16.7	40		
V	12.5	5.3	5.6	20		

^ Hollingshead Four Factor Index of Social Status: Level I represents lowest social position and V represents highest (25)

***** Test statistic for comparisons of the three clinical groups for hypothesis 2

a. Schizophrenia < Healthy Control, t (29) = -3.37, p = .002
b. Bipolar Disorder < Healthy Control, t (32) = -2.73, p = .010
c. Schizophrenia < Healthy Control, t (28) = -2.48, p = .019
d. Bipolar Disorder < Healthy Control, t (32) = -2.31, p = .028
e. Schizophrenia < Healthy Control, z = -1.99, p = .046

Table 2

Clinical Assessment Data for Schizophrenia, Schizoaffective, Bipolar Disorder, and Healthy Control Groups

	Schizophrenia Group (n = 16)	**Bipolar Disorder Group (n = 19)**	**Schizoaffective Disorder Group (n = 18)**	**Healthy Control group (n = 15)**	*Statistical Comparison across the 3 Clinical Groups		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)			
Positive Symptoms	.95 (.9)	.39 (.4)	1.10 (.8)	N/A	F (2, 50) = 4.12; ***p* = .023***		
Negative Symptoms	1.97 (.7)	N/A	2.56 (.6)	N/A	*t* (30) = -2.33; ***p* = .027***		
	%	**%**	**%**	**%**	X^2	Df	p-value
% **With Head Injury** (% loss of Consciousness)	46.7 (26.7)	47.4 (36.8)	78.6 [a] (35.7)	35.7 (15.4)	4.00 (.44)	1	.135 (.802)
% **Currently Taking Antipsychotic Medication**	100	47.1	93.8	N/A	15.60	2	**.001****

* = Significant at the .05 alpha-level ** = Significant at the .01 alpha-level

a. Healthy Controls < Schizoaffective Disorder, X^2 (1) = 5.35, p = .022*

Note: N/A = Not Applicable because the measurement was not administered to the group

Table 3

Performance on Social Cognitive Measures for Healthy Control Group vs. Each Clinical Group

	Schizophrenia Group (n = 16)		Bipolar Disorder Group (n = 19)		Schizoaffective Disorder Group (n = 18)		Healthy Control group (n = 15)	
	Mean t ^ t-stat(df)	SD p-value	Mean t ^ t-stat(df)	SD p-value	Mean t t-stat(df)	SD p-value	Mean	SD
IBAT	32.53 -3.37 (25)	8.6 **.003****	34.42 -3.48 (29)	9.2 **.002****	36.32 -3.54(29)	9.9 **.001****	46.54	4.7
ToM: Composite	36.60 -.98 (19)	2.8 .340	37.23 .99 (23)	2.7 .330	38.67 -.577(27)	4.0 .569	39.43	3.0
ToM: First-order	22.36 -2.28 (24)	1.3 **.032***	22.24 -1.29 (28)	1.6 .208	23.35 -1.22 (31)	1. .230	23.27	1.0
ToM: Second-order	13.92 -.451 (21)	2.8 .656	15.00 -.36 (23)	2.3 .726	15.80 -.351(27)	2.9 .728	16.14	2.3
Movie Clips Composite Score	31.04 -1.17 (25)	6.0 .253	27.60 -2.04 (30)	6.0 **.052***	34.91 -.33 (30)	9.8 .741	36.13	10.9

* = significant at .05 alpha-level for control group vs. clinical group comparison
** = significant at .01 alpha-level for control group vs. clinical group comparison

t = t-statistics are the comparison of the control group to the clinical group
^ = t-statistic of tests using values adjusted for IQ and total years for education

Table 4

Performance on the Movie Clips Subscales: Bipolar vs. Healthy Controls

	Bipolar Disorder Group (n = 19)		Healthy Control Group (n = 15)		Test Statistic Comparing the Bipolar Group to the Healthy Control Group				
					Unadjusted		Adjusted for IQ and years of education		
	Mean	SD	Mean	SD	t (df)	*p*-value	t (df)	*p*-value	^ Post-hoc
Total Movie Clips Score:	27.60	6.0	36.13	10.9	-2.92 (32)	.006	-2.04 (30)	.050*	HC > BD
Affective Change	.89	.8	1.40	1.5	-1.24 (32)	.223	-.83 (30)	.412	
Cognitive Inference	9.84	1.7	12.00	3.5	-2.37 (32)	.024	-1.80	.082	Trend: HC > BD
Empathic Cognition	10.50	3.1	13.63	4.1	-2.54 (32)	.016	-1.92	.064	Trend: HC > BD
Motives	3.58	1.6	5.2	2.2	-2.45 (32)	.020	-1.20 (30)	.240	
Personal Empathic Cognition	2.79	1.5	3.9	2.0	-1.90	.067	-1.48	.149	

* = significant at .05 alpha-level ** = significant at .01 alpha-level

^ Post-hoc results are based on Fisher's Least Significant Difference Test, $p < .05$

Note: HC = Healthy Control and BD = Bipolar Disorder

Table 5

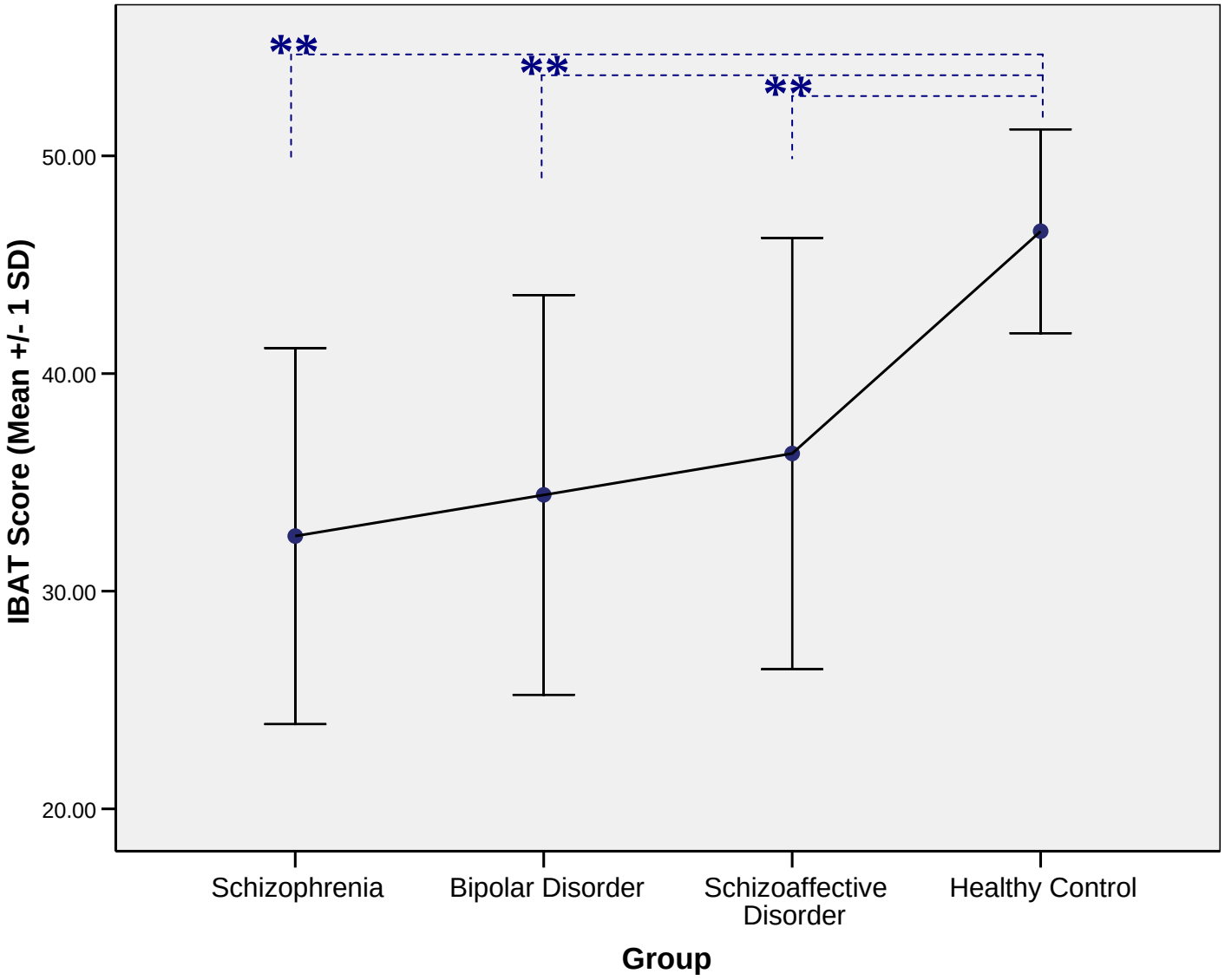
Performance on Social Cognition Measures across the Clinical Groups

	Schizophrenia Group (n = 16)		Bipolar Disorder Group (n = 19)		Schizoaffective Disorder Group (n = 18)		Test Statistic Comparing the Three Clinical Groups				
							Unadjusted		Adjusted for severity of Positive Symptoms		
	Mean	SD	Mean	SD	Mean	SD	F(df)	*p*-value	F(df)	*p*-value	^ Post-hoc
IBAT	32.53	8.6	34.42	9.2	36.32	9.9	.69(2,49)	.506	.69(2,43)	.513	No significant difference
Total ToM Score:	36.60	2.8	37.23	2.7	38.67	4.0	1.30(2,35)	.286	.52(2,30)	.598	
ToM: First-order	22.36	1.3	22.24	1.6	22.67	1.6	.37(2,46)	.690	.23(2,41)	.792	
ToM: Second-order	13.92	2.8	15.00	2.3	15.80	2.9	1.63(2,37)	.211	.78(2,32)	.465	No significant difference
Total Movie Clips Score:	31.04	6.0	27.60	6.0	34.91	9.8	4.27(2,48)	.020	3.62(2,42)	.035*	SA > BD
Affective Change	.67	1.0	.89	.8	1.76	1.1	5.78(2,48)	.006	9.45(2,42)	.000**	SA > SZ & BD
Cognitive Inference	10.30	1.6	9.84	1.7	11.94	3.1	4.39(2,48)	.017	3.22(2.42)	.050*	SA > SZ & BD
Empathic Cognition	12.77	3.0	10.50	3.1	11.94	3.2	2.33(2,48)	.108	1.04(2,42)	.363	
Motives	4.20	1.9	3.58	1.6	5.15	2.67	2.52(2,48)	.091	2.55(2,42)	.090	
Personal Empathic Cognition	3.10	1.4	2.79	1.5	4.12	1.5	4.03(2,48)	.024	3.59(2,42)	.036*	SA > BD

* = significant at .05 alpha-level ** = significant at .01 alpha-level

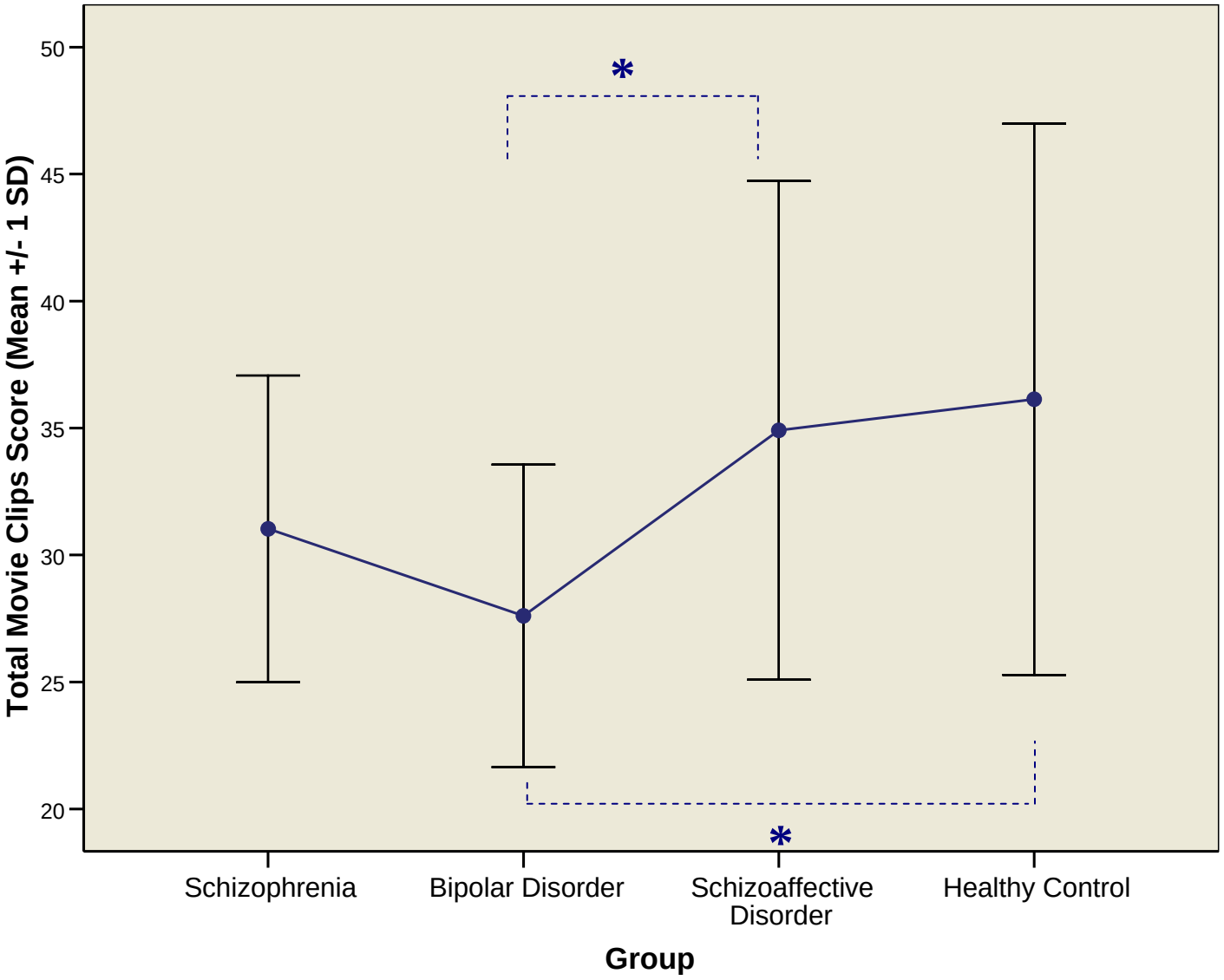
^ Post-hoc results are based on Fisher's Least Significant Difference Method, $p < .05$

Note: SZ = Schizophrenia, BD = Bipolar Disorder, SA = Schizoaffective Disorder



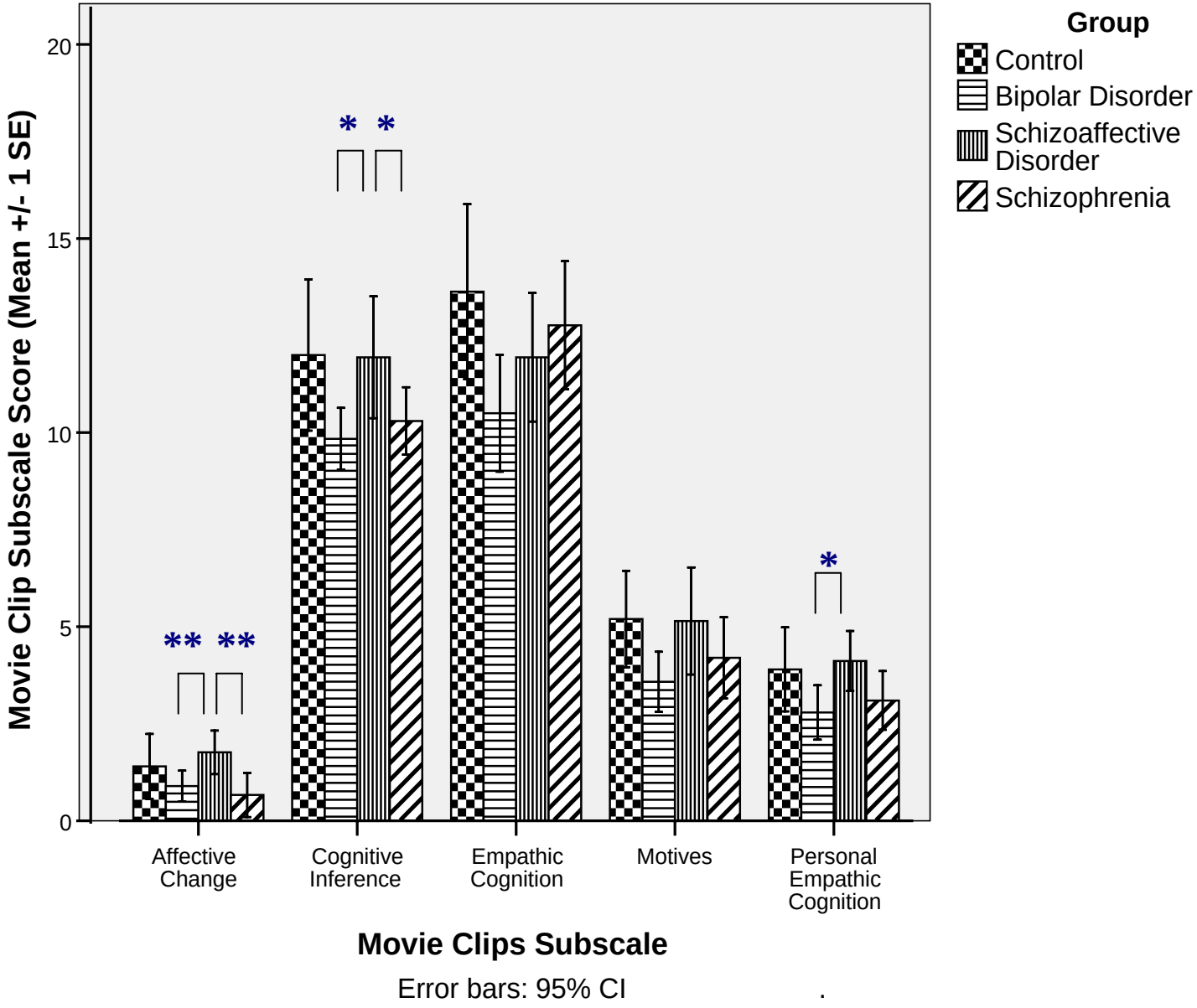
* = Significant at the .05 alpha-level

** = Significant at the .01 alpha-level

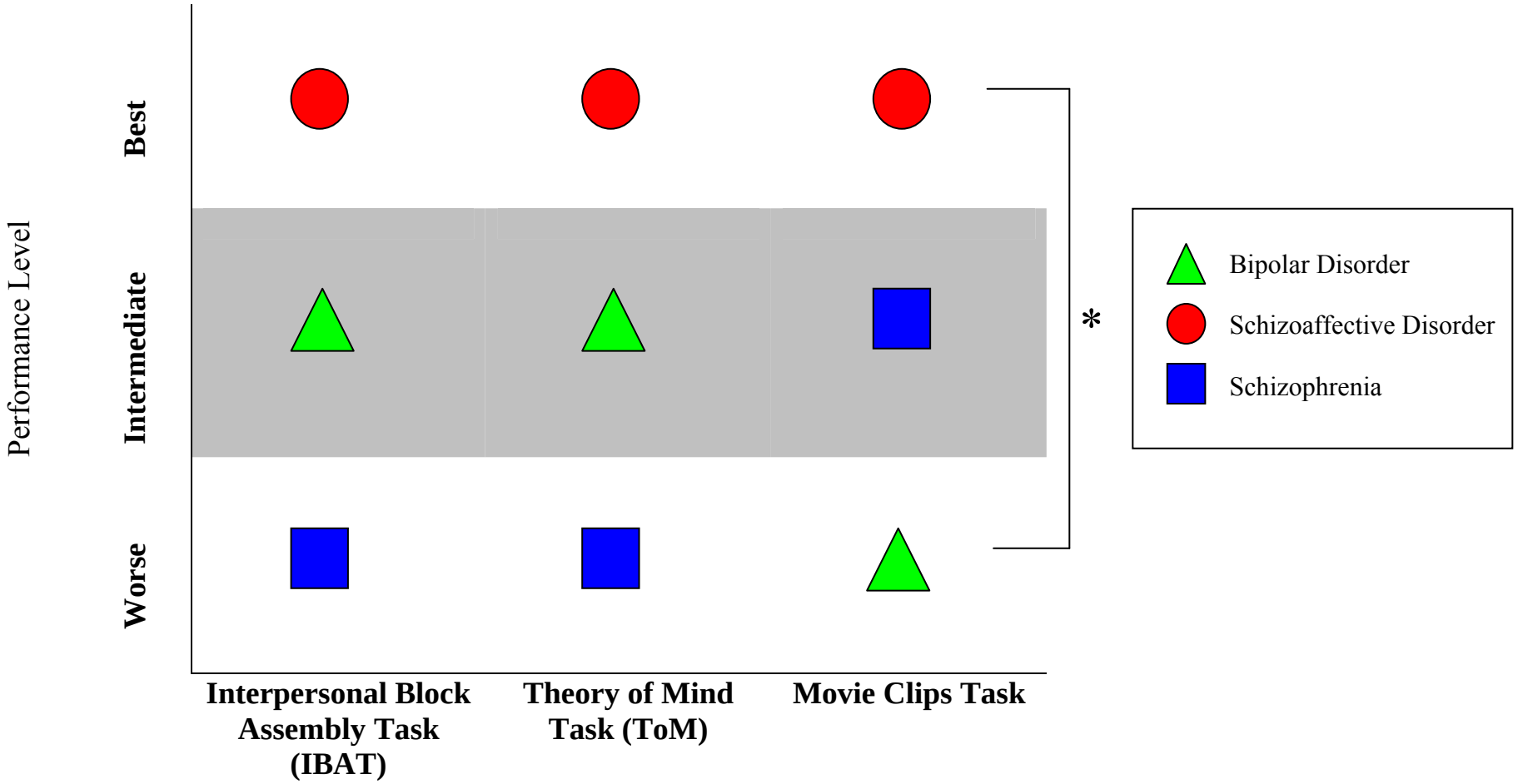


* = Significant at the .05 alpha-level

** = Significant at the .01 alpha -level



* = Significant at the .05 alpha-level ** = Significant at the .01 alpha -level



* = significant at .05 alpha level ** = significant at .01 alpha level

Appendix

Standard Interview Protocol for the Movie Clips Task

Ordinary People

1) (Breakfast Scene)
    1. Scene Summary
    2. What do you think Conrad is feeling while he is lying in bed at the beginning of this scene? **EC**
    3. What do you think Conrad is feeling when he is at the breakfast table? **EC**
    4. How do you think Conrad feels towards the end of the scene when his dad is talking to him? **EC**
    5. Do you notice any changes in how Conrad feels in this scene? **AC**
    6. How would you describe Conrad's relationship with each of his parents? **CI**
    7. How do you think the mother feels toward Conrad in this scene? **EC**
    8. Why do you think Conrad's dad said "Great" after Conrad said he was getting picked up? **M**
    9. What do you think Conrad's dad was thinking when he said that? **CI**

2) (Conrad calls his therapist to schedule an appointment.)
    1. Scene Summary
    2. How do you feel about the therapist's response to Conrad's attempt to be seen by the therapist? **PEC**
    3. How does Conrad react to how the therapist responds? **CI**

3) (Scene with Conrad and his coach)
    1. Scene Summary
    2. Did you have any feelings while watching this scene? What were these feelings? **PEC**

4) (Beth is sitting in the room of Buck, her deceased son and Conrad catches her off guard.)
    1. Scene Summary
    2. How do you think each of these characters are feeling throughout this scene? **EC**
    3. How would you describe the way Conrad and his mom were talking to each other? **CI**

5) (Family pictures are taken at the with Conrad's grandparents.)
    1. Scene Summary
    2. When Conrad yells at his father is he mad at his father? If so, why? If not, then why was he yelling at his father? **CI**

6) (Conrad talks to Genine after choir)
    1. Story Summary
    2. Why does Conrad turn around, begin to take off his coat, and put it back on again? **M**
    3. How do you think Conrad feels while he is talking to Genine? Why do you think that? **EC**

Note: Bolded letters at the end of each question indicate the Movie Clips Subscale the question is assessing.