



Published in final edited form as:

J Abnorm Psychol. 2010 February ; 119(1): 50–59. doi:10.1037/a0017861.

Emotion Responsivity, Social Cognition, and Functional Outcome in Schizophrenia

Jennifer R. Mathews and Deanna M. Barch

Washington University, St. Louis Missouri

Abstract

Social functioning deficits have long been a defining feature in schizophrenia, but relatively little research has examined how emotion responsivity influences functional outcome in this disorder. The goal of the current study was to begin to elucidate the relationships between emotion responsivity, social cognition, and functional outcome in schizophrenia. Participants were 40 outpatients with DSM-IV schizophrenia or schizoaffective disorder and 40 controls. Each participant was administered measures of emotion responsivity, social cognition (both emotion and social perception), and functional outcome. Individuals with schizophrenia demonstrated somewhat reduced emotion responsivity for positive and negative stimuli, as well as deficits in both social cognition and functional outcome compared to controls. Additionally, results indicated that both social perception and emotional responsivity were positively correlated with functional outcome. Importantly, the relationship of emotion responsivity to functional outcome was not mediated by social perception, and showed a significant relationship to functional outcome independent of social cognition. This finding suggests that emotion responsivity is an important factor in understanding functional outcome in schizophrenia.

Introduction

Impairments in functional outcome are a critical feature of schizophrenia that can add considerable distress to the lives of patients with this illness (American Psychiatric Association, 1994). Whether it is the inability to work, establish and maintain relationships, live independently, or care for oneself, community function is a critical aspect of living a meaningful and productive life. As such, a more comprehensive understanding of the mechanisms by which functional outcome is impaired in schizophrenia can help us in determining appropriate rehabilitative services for individuals with this disorder. There is already considerable evidence that individuals with schizophrenia experience deficits in social cognition (e.g., ability to discriminate emotions and understand meaning in a conversation) (Edwards et al., 1999; Hellewell & Whittaker, 1998; Mandal et al., 1998; Morrison et al., 1988; & Penn et al., 1997) and that these deficits are related to impaired functional outcomes (Ihnen et al., 1998; Kee et al., 2003; Poole et al., 2000). In contrast, studies examining emotion responsivity, or the ability to experience emotion in response to affective stimuli, have generally found comparable ratings among individuals with schizophrenia and controls (Kring & Moran, 2008). However, there are several studies that did find differences in emotion responsivity between individuals with schizophrenia and controls, particularly using film clips

Publisher's Disclaimer: The following manuscript is the final accepted manuscript. It has not been subjected to the final copyediting, fact-checking, and proofreading required for formal publication. It is not the definitive, publisher-authenticated version. The American Psychological Association and its Council of Editors disclaim any responsibility or liabilities for errors or omissions of this manuscript version, any version derived from this manuscript by NIH, or other third parties. The published version is available at www.apa.org/pubs/journals/abn.

(Earnst & Kring, 1999; Kring & Earnst, 1999; Kring et al., 1993; Kring and Neale, 1996; Henry et al., 2007). Emotion responsivity may have an influence on one's ability to function socially and occupationally. For instance, if individuals with schizophrenia have difficulty understanding their own internal emotions regarding an event or stimulus, they may not be able to respond to the event in an appropriate manner. The goal of the current study was to examine the relative contributions of deficits in social cognition and emotion responsivity to community function in schizophrenia, as well as the relationship between emotion responsivity and social cognition in this illness.

Emotion responsivity

Deficits in the expression of emotions have been recognized as one of the symptoms of schizophrenia as early as 1911, when Bleuler considered flat affect as a fundamental feature of the disorder. Empirical research on this topic in schizophrenia has consistently demonstrated reduced emotional expression in individuals with this disorder (Gaebel & Wolwer, 1992; Kring et al., 1993; Kring & Neale, 1996). However, research on the experience of emotion using self-reports of experience (studied by using laboratory based affective stimuli and food) in schizophrenia has not provided clear evidence for a deficit in self-reports of emotion. A review by Kring and Moran (2008) demonstrated that the majority of studies which have elicited self-reports of emotion in people with schizophrenia following the presentation of emotional stimuli (e.g., facial emotions, emotional pictures, and food) find that compared to controls, patients report experiencing similar patterns of emotion in response to both positive and negative stimuli. However, a few studies using emotional pictures found decreased experience of positive emotion (Curtis et al., 1999; Lee et al., 2006; Quirk et al., 1998). In contrast, studies examining reports of emotion experience using film clips have been more variable, with some suggesting no differences in emotional experience (Burbridge & Barch, 2007; Horan et al., 2006; Schneider et al., 1998), others suggesting differences in positive experiences of emotion (Kring et al., 1993; Henry et al., 2007), and still others suggesting increased negative experiences of emotion (Earnst & Kring, 1999; Kring & Earnst, 1999; Kring et al., 1993; Kring and Neale, 1996) in individuals with schizophrenia compared to controls. In an experience sampling study designed to explicitly examine emotional experience during daily life, Myin-Germeys et al. (2000) found that individuals with schizophrenia reported more negative emotion and less positive emotion over the course of six days compared to controls. In addition, a meta-analysis of emotional experience in individuals with schizophrenia by Cohen and Minor (2008) found that although individuals with schizophrenia displayed intact hedonic responses, they also demonstrated increased aversive emotion to positive and neutral stimuli. Cohen and Minor (2008) suggested that self-reported "anhedonia" might actually reflect "abnormal levels of negative emotion." Finally, studies examining anhedonia and reports of emotion have found anhedonia to be related to positive (e.g., Herbener et al., 2008), negative (e.g. Herbener et al. 2008), and neutral (Henry et al., 2007) emotional experience. Thus, while much of the literature on emotion responsivity in schizophrenia suggests relatively intact function, there is some evidence to suggest that experiences of positive and negative emotions may be impaired.

Social Cognition

Social cognition is a broad term that includes a number of different processes, including the abilities to recognize emotions, discriminate emotions in other people, and understand conversation. For example, Corrigan and Penn (2001) define social cognition as "the processes and functions that allow a person to understand, act on, and benefit from the interpersonal world." One major area of social cognition that has been explored in schizophrenia is the ability to correctly recognize and discriminate emotional expressions in others, referred to as *emotion perception* (Couture et al., 2006). Individuals with schizophrenia have been shown in many studies to have deficits in recognizing facial affect (both identification and discrimination) in others (Edwards et al., 1999; Hellewell & Whittaker, 1998; Mandal et al., 1998; Morrison et

al. 1988; & Penn et al., 1997; Kohler et al., 2007; Kohler et al., 2003) as well as deficits seen with more dynamic stimuli of people interacting or people expressing emotion through several channels (such as vocal and nonvocal communication) (e.g., Bellack et al., 1996; Archer et al., 1994). In reviews, Corrigan (1997) and Hellewell and Whitaker (1998) have concluded that individuals with schizophrenia tend to be more impaired in their perception of dynamic emotional displays relative to clinical and nonclinical controls.

A number of studies have also examined the ability of individuals with schizophrenia to understand and respond to a range of social situations, referred to as *social perception* (Couture et al., 2006). For instance, Bedell et al. (1998) examined problem-solving skills in individuals with schizophrenia and healthy controls using video taped vignettes that required participants to assess various aspects of the scene, such as recognizing the existence of a problem, specifying what information led them to conclude a problem existed, defining the problem, and generating solutions to the problem. They found that individuals with schizophrenia were significantly impaired compared to controls in their ability to recognize a problem, define the problem, and generate appropriate solutions for solving the problem.

Functional Outcome

Deficits in life function have been a hallmark feature in schizophrenia, used in the DSM as one of the diagnostic criteria for this disorder. Various studies have shown that functioning (e.g. social, educational and occupational function, independent living skills) is most impaired during acute phases of the illness, but that functional impairments persist even after patients stabilize (e.g., Bellack et al., 1990). Given the evidence for severe impairments in life function in schizophrenia, it is critical to determine the contributing factors so as to develop improved treatment options for individuals with schizophrenia.

There is growing evidence suggesting that impairments in social cognition may be one factor contributing to impaired life function in schizophrenia. A recent review (Couture et al., 2006) examined the relationship of social and community function in schizophrenia to: 1) emotion perception (affect recognition and perception, including facial and vocal cues of emotion); 2) social perception (the ability to interpret and respond to social cues, and the ability to respond appropriately in social interactions); 3) theory of mind (judgments of others' mental states); and 4) attributional style (ways of explaining causes for events). This review concluded that there was relatively robust evidence for a relationship of emotion perception and social perception to social and community function in schizophrenia, but that more work was needed to understand the relationship of theory of mind and attributional style to functional outcome.

In contrast to the work on social cognition and functional outcome in schizophrenia, there has been little work on emotion responsivity in relationship to functional outcome in this illness. Research has shown a relationship between anhedonia (self-reported inability to experience pleasure) and functional outcome in schizophrenia (Blanchard et al., 1998; Herbener et al., 2007). In these studies, anhedonia was measured by responses on questionnaires about "abstract" situations and did not assess "in-the-moment" responses to affect eliciting stimuli. However, in a more recent study by Gard et al. (2007), they found that anticipatory pleasure was positively correlated with aspects of social functioning, but consummatory pleasure was unrelated, suggesting the ability to anticipate a pleasurable experience could be a stronger predictor of social functioning than the actual experience of the pleasurable event. However, it is possible that reductions in the experience of emotion could influence functional outcome, either directly, or through an influence on social cognition. For example, if one does not enjoy social experiences or work accomplishments, then one might not engage in behaviors designed to achieve social interactions or successful work experiences. In this case, deficits in emotion responsivity would have a direct influence on function outcome. As another example, if a friend gave an individual a present, but the individual did not experience a pleasant emotion for this

event, they may not respond in a socially appropriate manner to the gift giver, leading to problems in social function (e.g., few friends). In this example, the influence of emotion responsivity on functional outcome would be mediated by the influence of emotion responsivity (pleasant emotion to receipt of gift) on social cognition (response to gift giver).

The goal of the current study was to examine the relationships among emotion responsivity (emotional experience to affective stimuli), social cognition, and functional outcome in schizophrenia. To do so, we assessed the following domains among individuals with schizophrenia and demographically matched controls: 1) emotion responsivity: self-reports of positive and negative emotion experiences in response to affect eliciting stimuli; 2) social cognition: detection of facial and vocal affect in others (emotion perception) and responses to social exchanges and scenarios (social perception); and 3) functional outcome: social, occupational, educational and community function. As noted above, many studies suggest intact emotion responsivity in schizophrenia. However, if one were to find deficits in this domain in schizophrenia, the existing literature would predict that it could be with either positive or negative emotions. Further, based on the existing literature, we predicted that individuals with schizophrenia would show deficits in both emotion perception and social perception, which would be related to functional outcome. In addition, we predicted that emotion responsivity would be related to both social cognition and functional outcome in schizophrenia. Finally, we examined whether social cognition would mediate the relationship between emotion responsivity and functional outcome.

Method

Participants

Participants were 40 outpatients who met DSM-IV criteria for schizophrenia (N=30) or schizoaffective disorder (N=10) and 40 community volunteers as controls, matched to the individuals with schizophrenia on age, gender, race, handedness and parental education (see Table 1). Individuals with schizophrenia were recruited through community mental health centers, outpatient treatment programs, and group housing settings. Healthy controls were recruited through advertisements in local newspapers. Individuals with schizophrenia significantly differed from controls on education ($p<.05$), measures of intelligence (WAIS-III subtests; $p<.05$), depression scores ($p<.01$), and symptoms of schizophrenia (SAPS/SANS scores; $p<.01$). However, individuals with schizophrenia did not differ from controls on age, gender, or parental education (see Table 1). Informed consent was always obtained before an individual participated in any component of the study. Any participant with current Major Depressive Disorder, as assessed using the Structured Clinical Interview for DSM-IV (SCID-IV), was excluded, as depression could have influenced task performance. Controls were excluded if they had past or family history of any psychotic disorder. All individuals with schizophrenia were medicated at the time of participation.

To determine each participant's diagnosis, a structured clinical interview was completed by a trained Masters level interviewer, using the Structured Clinical Interview for DSM-IV (SCID-IV). The Beck Depression Inventory (BDI-II, Beck & Steere, 1987) was administered to assess levels of depression. Control participants underwent an identical diagnostic process. All individuals were assessed clinically using the Scale for the Assessment of Negative Symptoms (SANS, Andreason, 1983a) and the Scale for the Assessment of Positive Symptoms (SAPS, Andreason, 1983b). In addition, we used the vocabulary and matrix reasoning subtests from the Wechsler Adult Intelligence Scale (3rd Ed.) (WAIS-III) to assess general intellectual functioning (see Table 1).

Materials and Tasks

Emotion responsivity—In this paradigm, participants saw a sequence of stimuli (faces or pictures) presented in the center of a computer screen, and were asked to make ratings of emotional experience (positive, negative, or neutral) by pushing one of three buttons. Participants were asked to make ratings of experience by pressing 1 if they felt negative, 2 if they felt neutral, and 3 if they felt positive. For the face stimuli, we used a set of emotional faces developed by the Gur group at the University of Pennsylvania (Gur et al., 2002). These emotional faces are faces that have undergone ratings of valence and intensity of emotional expression by a group of control volunteers. Only faces with >80% agreement were retained. The face stimuli consisted of a subset of 30 faces, 10 faces from each of three categories (positive high arousal, negative high arousal, neutral). The pictures were taken from the International Affective Picture System (IAPS) (Lang et al., 1998), and consisted of 10 pictures from each of three categories (positive high arousal, negative high arousal, neutral), selected from the IAPS based on the combined female and male valence and arousal ratings for each of the three categories. The order in which participants saw faces and pictures was counterbalanced across participants. Stimuli were presented in a computer generated random order for each participant.

Social Cognition—To assess emotion perception (e.g., assessing emotion in others), we used the tasks created by Kerr and Neale (1993), which have good reliability and validity as measures of emotion recognition and perception in schizophrenia (Mueser et al., 1996, Kee et al., 2003, Penn 2000). These tasks were: 1) A *face emotion discrimination task* which consisted of 24 black-and-white photographs of facial emotion from Izard (Izard, 1971); 4 each of happiness, sadness, anger, fear, surprise, and shame in which participants identified whether pairs of faces were both representing the same or a different emotion by stating either same or different and 2) A *voice emotion discrimination test* which consisted of a 35-item discrimination task that used 18 neutral-content voiced sentences that expressed happiness, sadness, anger, fear, surprise, and shame in which participants identified whether a pair of voices were both representing the same or a different emotion by stating either same or different. Reliability for the combined items in the face and voice tasks for the study was an alpha of .73. There was a range of 15 for both face and voice discrimination.

To assess social perception, we used The Awareness of Social Inference Test (TASIT) (McDonald, 2002), which consisted of videotaped vignettes of common social behaviors that assess conversational inference, inferences of others' mental states, and the interpretation of emotional states of others when contextual information is provided. There are three sections in the TASIT, but we used only sections 2 and 3, as section 1 was an emotion identification task that overlapped with the Kerr and Neale tasks described above. Section 2 of the TASIT was the test of social inference minimal (SI-M) that assessed conversational understanding using cues such as tone of voice and facial expression, specifically; it tested the individual's understanding of sincere and sarcastic exchanges. There were 15-videotaped vignettes that included sincere and sarcastic exchanges (if the sarcastic exchange was not recognized, the conversation was nonsensical). After each conversation, there were four types of questions asked of the participant about what the person in the conversation: 1) Believes or knows; 2) Means by what he/she said; 3) Intends to do or act in the situation; and 4) What he/she feels. The questions were specific about the event in the film clip. For example, one question on a film clip asked "Does he believe Cal has finished his dinner?" Part 3 of the TASIT was the test of social inference enriched (SI-E) which assessed the ability to use contextual knowledge (visual and verbal) to derive meaning from the conversation. Specifically, the SI-E assessed an individual's ability to understand and differentiate lies from sarcasm. The contextual cues included cues used in part 2 (facial expression and tone of voice), but also included edited video (such as zooming into a plate of food) and prologue with a third person to reveal the

speakers true thoughts. There were 16-videotaped vignettes, and in each there was an untrue comment presented as either sarcasm (to amplify the truth) or as a lie (to minimize or conceal the truth). The same probe questions that were used in part 2 were used to assess understanding in part 3 as well. The TASIT has been used to discriminate healthy individuals from individuals with brain damage (McDonald, 2002), and has shown good reliability (McDonald, 2002). The reliability of the TASIT for this study was an alpha of .91. There was a range of 63 for the TASIT.

Functional Outcome—We used the measure developed in the MATRICS norming trial, which was the Modified Social Adjustment Scale (SAS; Subotnik et al., 1997) combined with the Modified Birchwood Social Functioning Scale (SFS; Birchwood et al., 1990), both of which were administered by an MA level student during the initial SCID interview. The SAS and the SFS assessed functioning in a variety of areas including: work, living situation, social relationships, interests/hobbies, ability to care for oneself via hygiene, money management, and severity of illness. These measures were chosen because they included items that were important for assessing functional outcome as well as being easily integrated into our interview and assessment session. Both the Birchwood and the SAS were well-validated measures of community function (Dickerson et al., 1999; Birchwood et al., 1990) that have been used with individuals who have schizophrenia. Reliability for the items in this measure for the study was an alpha of .78. The range for the nonstandardized combined functional outcome variables was 265. The composite of these measures after they were z-scored and summed was the variable used in the mediation analysis.

Results

Emotion responsivity

The data from the experience ratings were analyzed with a 3-factor ANOVA with group (schizophrenia, control) as a between-subjects factor, and stimulus (faces or pictures) and emotion (Positive, Negative, and Neutral) as within-subjects factors. There was a main effect of emotion ($F(2, 128) = 533.73, p < .001$), a group by emotion interaction ($F(2, 128) = 13.37, p < .001$), and a stimulus by emotion interaction ($F(2, 149) = 11.14, p < .001$), but no main effect of stimulus ($F(1, 78) = 2.28, p > .1$) or group ($F(1, 78) = .31, p > .5$), or a group by stimulus interaction ($F(1, 78) = .37, p > .5$). As shown in Figure 1, the main effect of emotion indicated that both individuals with schizophrenia and controls felt that (experience ratings) positive stimuli ($d = .63$) was more positive than neutral stimuli ($d = .24$) ($F(1, 78) = 399.29, p < .001$), and negative stimuli ($d = .77$) was more negative than neutral stimuli ($F(1, 78) = 302.97, p < .001$). To follow-up on the predicted group by emotion interaction, we conducted planned contrasts. Results indicated that individuals with schizophrenia experienced fewer positive feelings to positive stimuli ($F(1, 78) = 14.34, p < .001$) and fewer negative feelings to negative stimuli ($F(1, 78) = 4.33, p < .05$) than controls.

The nonpredicted stimulus by emotion interaction was followed up by a posthoc analysis. Results indicated that both individuals with schizophrenia and controls reported experiencing more negative emotion to negative pictures than to negative faces ($F(1, 78) = 13.67, p < .001$), but did not report experiencing more or less positive emotion to positive pictures and faces ($F(1, 78) = 2.07, p > .15$).

Social Cognition

An ANOVA was used to examine group differences in performance on the emotion perception tasks, with group as a between-subjects factor and stimulus (face, voice) as a within-subjects factor, with total accuracy scores as the dependent measure. As predicted, results indicated a main effect of group ($F(1, 78) = 4.55, p < .05$), with individuals with schizophrenia performing

worse than controls on both the face and voice discrimination tasks (see Table 2). There was no main effect of stimulus ($F(1, 78) = .71, p > .4$) or a stimulus by group interaction ($F(1, 78) = 1.40, p > .2$). The primary analysis for the TASIT measure was a t-test to examine group differences in the overall score (collapsing across questions and vignettes). As predicted (see Table 2), patients performed worse overall than controls on the TASIT ($T(1, 78) = 5.44, p < .001$).

To examine the relationship among the social cognition measures, we computed the correlations between the total score from the TASIT and the total accuracy scores from each of the perception tasks. Results indicated a significant positive correlation for the face and voice discrimination tasks for both individuals with schizophrenia ($r = .46, p < .01$) and controls ($r = .48, p < .01$). In contrast, the TASIT did not significantly correlate with either the face ($r = .15, p > .18$) or voice ($r = .18, p > .13$) discrimination tasks in individuals with schizophrenia. However, the TASIT correlated with the voice discrimination task in controls ($r = .30, p < .03$), though the correlation between the TASIT and the face discrimination task in controls was not significant ($r = .03, p > .4$).

Functional outcome

To analyze group differences in functional outcome we used an ANOVA with group as a between-subjects factor and domain scores (occupational/education level, living arrangement, level of social interaction, recreational activities, and level of independence) as within-subjects factors. As predicted (see Table 3), we found a significant main effect of group ($F(1, 78) = 82.98, p < .001$), such that individuals with schizophrenia scored lower than controls in all domains (see Table 3). There was also a significant main effect of domain ($F(1, 78) = 319.93, p < .001$) and a group by domain interaction ($F(1, 78) = 34, p < .001$). Posthoc contrasts indicated that the individuals with schizophrenia scored lower than controls in all five domains (all $p < .001$), but that the magnitude of the group difference was smaller for the living domain than the other domains.

Relationship between emotion responsivity, emotion perception and social perception

As the variables for social cognition (faces/voices and the TASIT) were not highly correlated, we conducted correlations separately for ratings of face/voice scores and TASIT scores. The three main dependent variables we examined were 1) emotion responsivity as measured by self-reports of emotional experience to emotional pictures and faces; 2) emotion perception as measured by the face and voice discrimination tasks; and 3) social perception as measured by the TASIT. To create the primary dependent variable for emotion responsivity, we z-scored (after reverse scoring negative experience ratings, so that more “experienced emotion” ratings for both positive and negative items were in the same direction) and summed the following individual measures: 1) experience ratings for positive high arousal faces; 2) experience ratings for positive high arousal pictures; 3) experience ratings for negative high arousal faces; and 4) experience ratings for negative high arousal pictures. To create the primary dependent variable for emotion perception, task, we z-scored and summed the following individual measures: 1) total accuracy for emotional face perception, and 2) total accuracy for emotional voice perception. Finally, we used total accuracy on the TASIT as a dependent variable assessing social perception. Results indicated that emotion responsivity was positively correlated with social perception (TASIT) in both the individuals with schizophrenia and controls. However, emotion differentiation (face/voice task) was positively correlated with emotion responsivity in the controls, but negatively correlated in the individuals with schizophrenia (see Table 4).

Relationships of emotion responsivity and social cognition to functional outcome

A major goal of this study was to determine whether emotion responsivity as well as social cognition are related to functional outcome in schizophrenia, and if so, whether social cognition

mediates any relationship of emotion responsivity to functional outcome. As described above, we used a composite score of experience ratings for faces and pictures with both positive and negative high arousal stimuli as our measures of emotion responsivity. Our measure of functional outcome was the total score on the Birchwood/SAS measure. However, as described above, our measures of emotion perception (face/voice task) and social perception (TASIT) were not significantly correlated in the individuals with schizophrenia, and only moderately correlated in the controls. Thus, we did not combine the emotional and social perception measures into one score. As shown in Table 5, higher ratings of emotion responsivity were associated with better functional outcome among both controls and individuals with schizophrenia. Further, among both individuals with schizophrenia and controls, better social perception, but not emotional perception, was significantly associated with better functional outcome.

To examine whether social cognition mediated the relationship between emotion responsivity and functional outcome in schizophrenia, we focused on the measure of social perception, since this was the measure significantly correlated with functional outcome in the individuals with schizophrenia. We used regression techniques to address the question of mediation with the schizophrenia group and within the whole group, controlling for group status in the whole group analysis. To control for group status, we regressed group on each of the three domains (emotion responsivity, social perception, and functional outcome), saving the residuals of these regressions. We then used the saved residuals of each of the domains in the main regression analysis that examined the whole group. To examine mediation, we used the Sobel test to determine if mediation was present.

Among the individuals with schizophrenia, emotion responsivity significantly predicted functional outcome ($R^2 = .19$, $F(1,38)=9.47$, $p<.01$). With both emotion responsivity and social perception in the model ($R^2=.23$, $F(2,37)=5.7$, $p<.01$), emotion responsivity continued to significantly predict functional outcome ($\beta=.38$, $p<.05$), but social perception did not ($\beta=.20$, $p>.15$). Further, the Sobel test revealed that social perception did not mediate the relationship between emotion responsivity and functional outcome among individuals with schizophrenia (Sobel=1.11, $p>.2$).

In the entire sample, emotion responsivity significantly predicted functional outcome ($R^2 = .13$, $F=11.92$, $p<.001$). With both emotion responsivity and social perception in the model ($R^2=.23$, $F(2,79)=11.64$, $p<.001$), both emotion responsivity ($\beta=.35$, $p<.01$), and social perception ($\beta=.23$, $p<.05$) continued to significantly predict functional outcome. However, as with just the individuals with schizophrenia, the Sobel test did not indicate that social cognition mediated the relationship between emotion responsivity and function outcome (Sobel = 1.82, $p>.07$), though it approached significance.

We also examined whether medication status (typical versus atypical), gender, BDI scores, WAIS scores, or symptom severity (positive, negative, or disorganization) altered the pattern of results reported above. None of these factors influenced the pattern of results.

Discussion

The purpose of this study was to examine and differentiate the relationships of social cognition and emotion responsivity (reports of emotional experience to affective stimuli) to functional outcome in schizophrenia, particularly to answer the question -- Does social cognition mediate the relationship between emotion responsivity and functional outcome in individuals with schizophrenia? We found some evidence for reduced experiences of emotion in schizophrenia, and clear evidence for deficits in social cognition and functional outcome. Further, we found that both emotion responsivity and social cognition were related to functional outcome.

However, social cognition did not mediate the relationship of emotion responsivity to function outcome. Each of these results will be discussed in more detail below.

As described in the introduction, many studies have found intact emotion ratings in schizophrenia using a range of affective eliciting stimuli. However, even though many studies show similar patterns of emotional response in individuals with schizophrenia and controls (e.g., more positive responses to positive stimuli, etc.), a few studies have found reduced emotional responses (Curtis et al., 1999; Lee et al., 2006; Quirk et al., 1998, Bellack et al., 1992). Our results are relatively consistent with this prior literature. We found clear evidence that individuals with schizophrenia and controls showed similar patterns of emotion responsivity. Both controls and individuals with schizophrenia reported more positive affect to positive stimuli than to neutral stimuli, and more negative affect to negative stimuli than to neutral stimuli. However, we did find that individuals with schizophrenia reported less positive and negative affect to positive and negative stimuli. This suggests that although emotion responsivity is categorically intact in schizophrenia, there may be some mild reduction in emotional experience that occurs in at least some individuals with this illness. It is not entirely clear why some studies find no evidence for any reduced emotion responsivity in schizophrenia (e.g., Herbener et al., 2008; Herbener et al., 2007; Quirk et al., 2001, Schneider et al., 1995) while others, such as the current one, find some evidence for reductions (e.g., Curtis et al., 1999; Lee et al., 2006; Quirk et al., 1998). This may reflect differences in sample sizes across studies (larger studies can detect smaller effect sizes), differences in sample composition (e.g., samples with individuals experiencing more negative symptoms such as anhedonia), task sensitivity (Cohen et al., 1974), or even the ways in which individuals are asked to report on their inner experiences. Future research using large, heterogeneous samples that assess emotional responses in a variety of ways may help to answer this question. An interesting finding that both positive and negative experiences of emotion were somewhat reduced in individuals with schizophrenia may have implications for everyday functioning. For example, individuals with schizophrenia may not actively seek out positive experiences as they do not *feel* positively toward the experience (possibly anhedonic), but they may also neglect to remove themselves from negative experiences, as they do not *feel* as negatively about the experience. It may be useful in future studies to separate negative and positive stimuli in the main analysis to examine how these emotions may affect functional outcome differently.

Another goal of this study was to examine how individuals with schizophrenia and controls differed in their ability to discriminate emotion and understand social interactions. Consistent with prior research (Edwards et al., 1999; Hellewell & Whittaker, 1998; Mandal et al., 1998; Morrison et al. 1988; & Penn et al., 1997; Kohler et al., 2007; Kohler et al., 2003), we found that individuals with schizophrenia show deficits in both their ability to discriminate emotion in others and to understand dynamic social interactions, as has been found in several previous studies. However, the measure of social perception used in this study did not significantly correlate with the measures of emotion perception (either face or voice) in individuals with schizophrenia, but did correlate with the vocal discrimination task and trended toward correlating in the face discrimination task in controls. The fact that we did not find a significant relationship between the emotion perception tasks and the social perception task in individuals with schizophrenia suggests that the possibility that the emotion perception tasks tap into processes other than social perception that may be impaired in schizophrenia. For example, Leitman (2005) suggested that within the realm of social cognition, voice and face processing are separate constructs, with individuals with schizophrenia showing deficits in simple perceptual abilities such as pitch perception. Thus, it is possible that the emotion perception tasks did not correlate with social perception in schizophrenia because they were related more to basic deficits in auditory or visual processing (e.g., Kerr and Neale, 1993; Butler et al., 2001; Foxe et al, 2001; Rabinowicz et al., 2000; Holcomb et al., 1995). Additionally, it is also possible that emotion perception and social perception are distinct subdomains of social

cognition, leading to the possibility that a deficit could be manifest in one domain, but not the other. Future studies that examine basic measures of visual and auditory processing in relation to measures of emotional and social perception in schizophrenia would help to address this question. Another possibility is that the instruments used (i.e., the TASIT and Kerr and Neale stimuli) may be unrelated due to measurement differences, and therefore future studies may wish to utilize the emotion identification portion of the TASIT to enhance the possibility of finding a relationship between these measures.

Not surprisingly, we found that individuals with schizophrenia scored lower than controls on all domains of functional outcome, including social interaction, occupation/education, and independent living. Additionally, consistent with a growing body of research (Couture et al., 2006), we found that deficits in social perception were related to impaired functional outcome. However, we did not find that deficits in emotional perception were related to functional outcome in the current study. As noted above, it may be that our measures of emotional perception were confounded by deficits in basic visual and auditory processing that may not necessarily be related to social cognition. Several prior studies have found significant relationships between some aspects of functional outcome and emotional perception (Couture et al., 2006); however, not all aspects of functional outcome were significantly correlated with emotional perception in many of these studies. Further research is needed to more fully explain the exact relationship between the different aspects of functional outcome and emotional perception, particularly examining the different domains of functional outcome and how these relate to emotion responsivity.

A novel aspect of this study is that we also found that reduced experiences of emotion were also related to functional outcome in schizophrenia. Further, this relationship was not mediated by the relationship between emotion responsivity and social cognition, and emotion responsivity was related to functional outcome independent of social cognition. This finding could be interpreted as suggesting that if some individuals with schizophrenia show attenuated emotional responses to both positive and negative events, this could affect their ability and motivation to strive for positive events and avoid negative events. That is, if individuals with schizophrenia do not feel the same positive emotion to social interactions or living independently or working, they may not strive to achieve in these areas of functional outcome. Further, our results suggest that such factors may operate somewhat independently of deficits in social cognition, thus potentially serving as another pathway or source of reduced functional outcome in this illness. Results of the current study suggest that emotion responsivity can have implications for how one functions in the social world. Future research aimed at clarifying the relationship between emotional responsivity and social cognition may be useful in determining whether social skills training is less effective in individuals who have poor emotion responsivity.

Though basic cognition was not a specific focus of this study, it may be important for future studies to examine cognition and how it may influence deficits seen in the areas of emotion responsivity, social perception, and functional outcome.

One limitation of the current study is that our sample size was too small to conduct structural equation modeling (SEM). SEM may have provided a more sensitive test of mediation that could have allowed us to test various different models of mediation. For example, although we examined the variables of interest (emotion responsivity, social cognition, and functional outcome) in a linear mediational model, it is likely that these variables interact in a more complex manner, and could be bi-directional. A second limitation of the study was that the assessments of emotional responsivity relied on laboratory-based stimuli, which may not be the best measure of emotional experience. Likewise, our aim was to elicit emotional experience, thus a third limitation is that given the nature of the rating task, it is difficult to state

unequivocally that emotional experience was assessed. Future studies could utilize research designs aimed to assess real-life emotional experiences, such as receiving a present or eating a favorite food, along with perhaps physiological measures of emotion to corroborate self-reports. A fourth limitation of this study is that the assessment of functional outcome was based on the self-reports of the participants, which asked them to recall functional outcome over the past three months. Including reports from caretakers or using proxy measures of functional outcome in future studies may increase our ability to detect relationships of cognition and emotion responsivity to functional outcome in this illness. A fifth limitation is that we utilized a 3-point likert scale that may have reduced discriminative power in the rating task. Additionally, though we attempted to examine social perception with the use of the TASIT, a sixth limitation is that it is possible the TASIT is a task that includes both social perception and theory of mind constructs, and is not a pure social perception task. Future studies intending to examine social perception or theory of mind may consider using tasks that measure these constructs independently, such as the PONS.

In summary, the current study provided evidence that although individuals with schizophrenia show similar categorical patterns of emotion responsivity as controls, they did show some reductions in the levels of emotion responsivity. Further, we replicated previous findings of impaired social cognition and functional outcome in this illness. As expected, we found that social cognition (at least social perception) was related to functional outcome. However, we also demonstrated that reductions in emotion responsivity also predicted functional outcome in schizophrenia, and that this relationship was independent of deficits in social cognition. These results have implications for our understanding of the factors that constrain life function in schizophrenia, as they suggest that it is important to take into account the person's emotional response to putatively positive or rewarding events, in addition to their social cognitive abilities, when planning rehabilitative services designed to enhance functional outcome.

References

- Andreason, NC. Scale for the assessment of negative symptoms (SANS). University of Iowa; Iowa City: 1983a.
- Andreason, NC. The scale for the assessment of positive symptoms (SAPS). University of Iowa; Iowa City: 1983b.
- Association, AP. Diagnostic and statistical manual of major mental disorders. 4. Washington, D.C; Author: 1994.
- Archer J, Hay DC, Young AW. Movement, face processing and schizophrenia: evidence of a differential deficit in expression analysis. *British Journal of Clinical Psychology* 1994;33(Pt 4):517–528. [PubMed: 7874043]
- Beck, AT.; Steere, RA. Beck Depression Inventory Manual. San Antonio, TX: The Psychological Corporation; 1987.
- Bedell J, Lennox SS, Smith AD, Rabinowicz EF. Evaluation of problem solving and communication skills of persons with schizophrenia. *Psychiatry Research* 1998;78(3):197–206. [PubMed: 9657424]
- Bellack AS, Morrison RL, Wixted JT, Mueser KT. An analysis of social competence in schizophrenia. *British Journal of Psychiatry* 1990;156:809–818. [PubMed: 2207511]
- Bellack AS, Mueser KT, Wade J, Sayers S, Morrison RL. The ability of schizophrenics to perceive and cope with negative affect. *British Journal of Psychiatry* 1992;160:473–480. [PubMed: 1571745]
- Bellack AS, Blanchard JJ, Mueser KT. Cue availability and affect perception in schizophrenia. *Schizophrenia Bulletin* 1996;22(3):535–544. [PubMed: 8873303]
- Birchwood M, Smith J, Cochrane R, Wetton S, Copestake S. The Social Functioning Scale. The development and validation of a new scale of social adjustment for use in family intervention programmes with schizophrenic patients. *British Journal of Psychiatry* 1990;157:853–859. [PubMed: 2289094]

- Blanchard JJ, Mueser KT, Bellack AS. Anhedonia, positive and negative affect, and social functioning in schizophrenia. *Schizophrenia Bulletin* 1998;24(3):413–424. [PubMed: 9718633]
- Burbridge JA, Barch DM. Anhedonia and the experience of emotion in individuals with schizophrenia. *Journal of Abnormal Psychology* 2007;116(1):30–42. [PubMed: 17324014]
- Butler PD, Schechter I, Zemon V, Schwartz SG, Greenstein VC, Gordon J, et al. Dysfunction of early stage visual processing in schizophrenia. *American Journal of Psychiatry* 2001;158:1126–1133. [PubMed: 11431235]
- Cohen AS, Minor KS. Emotional experience in patients with schizophrenia revisited: Meta-analysis of laboratory studies. *Schizophrenia Bulletin*. In Press.
- Cohen BD, Nachmani G, Rosenberg S. Referent communication disturbances in acute schizophrenia. *Journal of Abnormal Psychology* 1974;83:1–13. [PubMed: 4812428]
- Corrigan PW, Toomey R. Interpersonal problem solving and information processing in schizophrenia. *Schizophrenia Bulletin* 1995;21(3):395–403. [PubMed: 7481570]
- Corrigan, PWP.; Penn, DL. Introduction: Framing models of social cognition and schizophrenia. In: Corrigan, PWP.; Penn, DL., editors. *Social cognition and schizophrenia*. Washington D.C: APA; 2001. p. 3-21.
- Couture SM, Penn DL, Roberts DL. The functional significance of social cognition in schizophrenia: A review. *Schizophrenia Bulletin* 2006;32:S44–S63. [PubMed: 16916889]
- CSEA-NIMH. The Center for Research in Psychophysiology. University of Florida; Gainesville: 1995. The international affective picture system (IAPS; photographic slides).
- Curtis CE, Lebow B, Lake DS, Katsanis J, Iacono WG. Acoustic startle reflex in schizophrenia patients and their first-degree relatives: evidence of normal emotional modulation. *Psychophysiology* 1999;36(4):469–475. [PubMed: 10432796]
- Dickerson F, Boronow JJ, Ringel N, Parente F. Social functioning and neurocognitive deficits in outpatients with schizophrenia: A 2-year follow-up. *Schizophrenia Research* 1999;37(1):13–20. [PubMed: 10227104]
- Earnst KS, Kring AM. Emotional responding in deficit and non-deficit schizophrenia. *Psychiatry Research* 1999;88(3):191–207. [PubMed: 10622340]
- Earnst KS, Kring AM, Kadar MA, Salem JE, Shepard DA, Loosen PT. Facial expression in schizophrenia. *Biological Psychiatry* 1996;40(6):556–558. [PubMed: 8879480]
- Edwards J, Jackson HJ, Pattison PE. Emotion recognition via facial expression and affective prosody in schizophrenia: a methodological review. *Clinical Psychology Review* 2002;22(6):789–832. [PubMed: 12214327]
- Ekman, P. *Pictures of facial affect*. Palo Alto: Consulting Psychologists Press; 1976.
- Foxe JJ, Doniger GM, Javitt DC. Early visual processing deficits in schizophrenia: Impaired P1 generation revealed by high-density electrical mapping. *Neuroreport* 2001;12:3815–3820. [PubMed: 11726801]
- Frith CD, Corcoran R. Exploring ‘theory of mind’ in people with schizophrenia. *Psychological Medicine* 1996;26(3):521–530. [PubMed: 8733211]
- Gard DE, Kring AM, Gard GM, Hran WP, Green MF. Anhedonia in schizophrenia: Distinctions between anticipatory and consummatory pleasure. *Schizophrenia Research* 2007;93:253–260. [PubMed: 17490858]
- Gaebel W, Wölwer W. Facial expression and emotional face recognition in schizophrenia and depression. *European Archives of Psychiatry and Clinical Neuroscience* 1992;242(1):46–52. [PubMed: 1390955]
- Gur RE, McGrath C, Chan RM, Schroeder L, Turner T, Turetsky BI, et al. An fMRI study of facial emotion processing in patients with schizophrenia. *American Journal of Psychiatry* 2002;159(12):1992–1999. [PubMed: 12450947]
- Hellewell, JS., et al. Affect perception and social knowledge in schizophrenia. In: Mueser, KTTN., editor. *Handbook of social functioning in schizophrenia*. Needham Heights: Allyn & Bacon; 1998. p. 197-212.
- Hempel RJ, Tulen JHM, van Beveren NJM, van Steenis HG, Mulder PGH, Hengeveld MW. Physiological responsivity to emotional pictures in schizophrenia. *Journal of Psychiatric Research* 2005;39:509–518. [PubMed: 15992560]

- Henry JD, Green MJ, de Lucia A, Restuccia C, McDonald S, O'Donnell M. Emotion dysregulation in schizophrenia: reduced amplification of emotional expression is associated with emotional blunting. *Schizophrenia Research* 2007;95:197–204. [PubMed: 17630254]
- Herbener ES, Rosen C, Khine T, Sweeney JA. Failure of positive but not negative emotional valence to enhance memory in schizophrenia. *Journal of Abnormal Psychology* 2007;116(1):43–55. [PubMed: 17324015]
- Herbener ES, Song W, Khine TT, Sweeney JA. What aspects of emotional functioning are impaired in schizophrenia? *Schizophrenia Research*. 2008
- Holcomb HH, Ritzl EK, Medoff DR, Nevitt J, Gordon B, Tamminga CA. Tone discrimination performance in schizophrenia patients and normal volunteers: Impact of stimulus presentation levels and frequency differences. *Psychiatry Research* 1995;57:75–82. [PubMed: 7568562]
- Horan WP, Green MF, Kring AM, Nuechterlein KH. Does anhedonia in schizophrenia reflect faulty memory for subjectively experienced emotions? *Journal of Abnormal Psychology* 2006;115:496–508. [PubMed: 16866590]
- Ihnen GH, Penn DL, Corrigan PW, Martin J. Social perception and social skill in schizophrenia. *Psychiatry Research* 1998;80(3):275–286. [PubMed: 9796943]
- Izard, CE. *The face of emotion*. New York: Appleton-Century-Crofts; 1971.
- Kee KS, Green MF, Mintz J, Brekke JS. Is emotion processing a predictor of functional outcome in schizophrenia? *Schizophrenia Bulletin* 2003;29(3):487–497. [PubMed: 14609242]
- Kerr SL, Neale JM. Emotion perception in schizophrenia: specific deficit or further evidence of generalized poor performance? *Journal of Abnormal Psychology* 1993;102(2):312–318. [PubMed: 8315144]
- Kohler CG, Turner TH, Bilker WB, Brensinger C, Siegel S, Kanes S, Gur RE, Gur RC. Facial emotion recognition in schizophrenia: Intensity effects and error patterns. *American Journal of Psychiatry* 2003;160:1768–1774. [PubMed: 14514489]
- Kohler CG, Barrett FS, Gur RC, Turetsky BI, Moberg PJ. Association between facial emotion recognition and odor identification in schizophrenia. *Journal of Neuropsychiatry and Clinical Neuroscience* 2007;19(2):128–131.
- Kring AM, Moran EK. Emotional response deficits in schizophrenia: Insights from affective science. *Schizophrenia Bulletin* 2008;34 (5):819–834. [PubMed: 18579556]
- Kring AM, Earnst KS. Stability of emotional responding in schizophrenia. *Behav Ther* 1999;30:373–388.
- Kring AM, Neale JM. Do schizophrenic patients show a disjunctive relationship among expressive, experiential, and psychophysiological components of emotion? *Journal of Abnormal Psychology* 1996;105(2):249–257. [PubMed: 8723006]
- Kring AM, Kerr SL, Smith DA, Neale JM. Flat affect in schizophrenia does not reflect diminished participative experience of emotion. *Journal of Abnormal Psychology* 1993;102(4):507–517. [PubMed: 8282918]
- Lang, PJ.; Bradley, MM.; Cuthbert, BN. *International affective picture system (IAPS): Technical manual and affective ratings*. The Center for Research in Psychophysiology, University of Florida; Gainesville: 1998.
- Lang PJ, Bradley MM, Cuthbert BN. Emotion, attention, and the startle reflex. *Psychological Review* 1990;97(3):377–395. [PubMed: 2200076]
- Lee E, Kim JJ, Namkoong K, et al. Aberrantly flattened responsivity to emotional pictures in paranoid schizophrenia. *Psychiatry Research* 2006;143:135–145. [PubMed: 16884781]
- Leitman DI, Foxe JJ, Butler PD, Saperstein A, Revheim N, Javitt DC. Sensory contributions to impaired prosodic processing in schizophrenia. *Biological Psychiatry* 2005;58:56–61. [PubMed: 15992523]
- Mandal MK, Pandey R, Prasad AB. Facial expressions of emotions and schizophrenia: a review. *Schizophrenia Bulletin* 1998;24(3):399–412. [PubMed: 9718632]
- McDonald, S.; Flanagan, S.; Rollins, J. *The Awareness of Social Inference Test*. Suffolk: England: Thames Valley Test Company Limited; 2002.
- Morrison RL, Bellack AS, Mueser KT. Deficits in facial-affect recognition and schizophrenia. *Schizophrenia Bulletin* 1988;14(1):67–83. [PubMed: 3291095]

- Mueser KT, Doonan R, Penn DL, Blanchard JJ, Bellack AS, Nishith P, et al. Emotion recognition and social competence in chronic schizophrenia. *Journal of Abnormal Psychology* 1996;105(2):271–275. [PubMed: 8723008]
- Myin-Germeys I, Delespaul PA, deVries MW. Schizophrenia patients are more emotionally active than is assumed based on their behavior. *Schizophrenia Bulletin* 2000;26:847–854. [PubMed: 11087017]
- Penn DL, Corrigan PW, Bentall RP, Racenstein JM, Newman L. Social cognition in schizophrenia. *Psychological Bulletin* 1997;121(1):114–132. [PubMed: 9000894]
- Penn DL, Spaulding W, Reed D, Sullivan M. The relationship of social cognition to ward behavior in chronic schizophrenia. *Schizophrenia Research* 1996;20(3):327–335. [PubMed: 8827860]
- Poole JH, Tobias FC, Vinogradov S. The functional relevance of affect recognition errors in schizophrenia. *Journal of International Neuropsychological Society* 2000;6(6):649–658.
- Quirk SW, Strauss ME. Visual exploration of emotion eliciting images by patients with schizophrenia. *Journal of Nervous and Mental Disorders* 2001;189(11):757–765.
- Quirk SW, Strauss ME, Sloan DM. Emotional response as a function of symptoms in schizophrenia. *Schizophrenia Research* 1998;32(1):31–39. [PubMed: 9690332]
- Rabinowicz EF, Silipo G, Goldman R, Javitt DC. Auditory sensory dysfunction in schizophrenia: Imprecision or distractibility? *Archives of General Psychiatry* 2000;57:1149–1155. [PubMed: 11115328]
- Schneider F, Weiss U, Kessler C, et al. Differential amygdala activation in schizophrenia during sadness. *Schizophrenia Research* 1998;34:133–142. [PubMed: 9850979]
- Schneider F, Gur RC, Gur RE, Shtasel DL. Emotional processing in schizophrenia: Neurobehavioral probes in relation to psychopathology. *Schizophrenia Research* 1995;17:67–75. [PubMed: 8541252]
- Subotnik KL, Nuechterlein KH, Asarnow RF, Fogelson DL, Goldstein MJ, Talovic SA. Depressive symptoms in the early course of schizophrenia: Relationship to familial psychiatric illness. *American Journal of Psychiatry* 1997;154(11):1551–1556. [PubMed: 9356563]

Appendix A: Instruction Given to Participants for the Emotion Responsivity Task

Picture Rating Instructions for Valence

“In this part of the study, I am going to show you some pictures. Some of the pictures will be positive, some will be negative, and some will be neutral. I want you to decide how you personally feel about the pictures, and then to make a response based on how the picture makes you feel. What I want you to do is to press the button with your pointer finger every time you decide a picture is positive. Press the button with your middle finger every time you decide a picture is neutral. Press the button with your ring finger every time you decide a picture is negative.”

Face Rating Instructions for Valence

“In this part of the study, I am going to show you some faces. Some of the faces will be positive, some will be negative, and some will be neutral. I want you to decide how you personally feel about the faces, and then to make a response based on how the face makes you feel. What I want you to do is to press the button with your pointer finger every time you decide a face is positive. Press the button with your middle finger every time you decide a face is neutral. Press the button with your ring finger every time you decide a face is negative.”

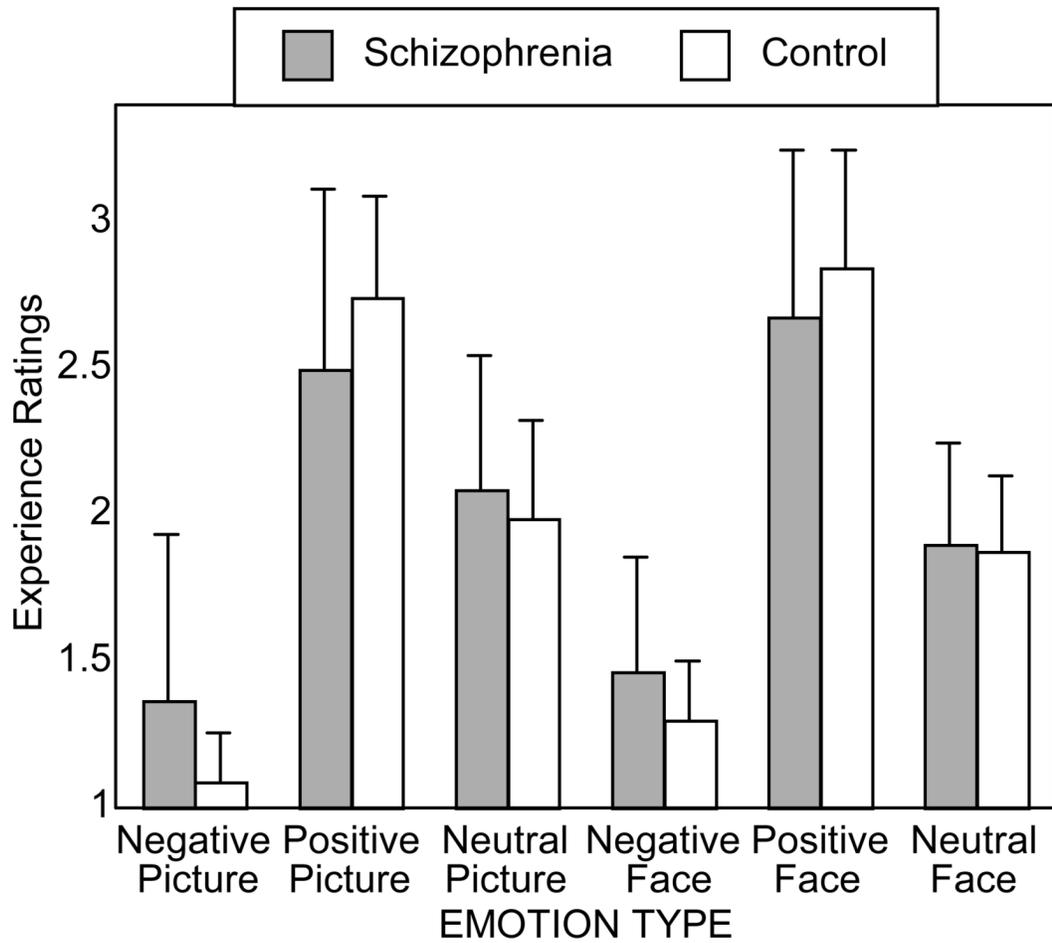


Figure 1.

Experience Ratings

* Note: 1=negative, 2=neutral, and 3=positive for the classification of emotional stimuli.

Table 1

Demographic Information

Demographics	Individuals with Schizophrenia (N=40)		Controls (N=40)	
	Mean	SD	Mean	SD
Age	36.80 years	8.99	36.30 years	10.47
Sex (% Male)	65.00 %		62.50%	
Race (% Caucasian)	47.50%		50.00 %	
Marital Status (% Single)	77.50 %		52.50 %	
Employment Status (% Unemployed)	62.50 %		7.50 %	
Education	13.05* years	2.27	15.25 years	3.97
Parental Education	14.06 years	3.02	12.98 years	2.64
Age of Onset	19.04 years	6.63		
Age of First Hospitalization	21.77 years	5.33		
Number of Hospitalizations	4.95	5.54		
WAIS-III Vocabulary Scaled Score	8.85*	3.70	11.26	3.66
WAIS-III Matrix Reasoning Scaled Score	9.38**	3.18	12.48	3.30
% Taking Antipsychotics	100%			
% Taking Typical Antipsychotics	7.3%			
% Taking Atypical Antipsychotics	90.2%			
% Taking Both Typical and Atypicals	2.4%			
% Taking Antidepressants	63.4%			
% Taking Mood Stabilizers	4.9%			
% Taking Anti-Cholinergics	19.5%			
BDI	15.40**	9.76	5.36	7.02
SAPS Global Positive Symptoms	3.63**	2.74	.03	.18
SAPS Global Disorganization Symptoms	2.03**	1.87	.19	.47
SANS Global Negative Symptoms	7.30**	3.72	1.03	1.26

*
p<.05,**
p<.001

Table 2

Social Cognition

Measures	Controls		Individuals with Schizophrenia		Effect Size (<i>d</i>)
	Mean	SD	Mean	SD	
TASIT	108.30	8.34	93.18	15.50	1.21
Voice Discrimination	26.60	3.10	24.90	4.03	.47
Face Discrimination	25.85	2.69	25.03	2.43	.32

Table 3

Functional Outcome

Measures	Controls		Individuals with Schizophrenia		Effect Size (<i>d</i>)
	Mean	SD	Mean	SD	
Occupation/Education	68.40	28.42	28.38	26.20	1.46
Living Arrangement	6.85	.66	5.93	1.20	.95
Social Interaction	50.73	10.48	32.38	11.17	1.69
Recreation	26.05	6.33	19.65	5.06	1.12
Independence	72.15	4.10	65.23	7.24	1.18

Table 4

Correlations in Both Groups

		Controls									
	Measures	Occupation/Ed	Living	Social Interaction	Recreation	Independence	Face/Voice	TASIT	Emot. Ratings		
Individuals with Schizophrenia	Occupation/Ed	1	-.05	.26	.105	.36*	.14	.60**	.20		
	Living	.17	1	.18	.20	.10	.29	.16	.58**		
	Social Interact	.52**	-.04	1	.58**	.42*	.12	.22	.32*		
	Recreation	.20	-.05	.35*	1	.32*	-.03	.11	.18		
	Independence	.13	.30	.25	.36*	1	-.12	.36*	.11		
	Face/Voice	-.13	.21	-.20	.16	.02	1	.23	.39*		
	TASIT	.32*	.45**	.03	.16	.004	.20	1	.40**		
	Emot. Ratings	.47**	.05	.30	.39*	.26	-.31*	.35*	1		

* $p < .05$,

** $p < .01$

* Note: Correlations above the diagonal are Controls and below are Individuals with Schizophrenia.

Table 5

Correlations with Functional Outcome

Measures	Controls	Individuals with Schizophrenia
Emot. Ratings	.42**	.45**
Social Cognition: Face/Voice	-.007	-.022
Social Cognition: TASIT	.44**	.32*

*
 $p < .05$,

**
 $p < .01$

* Note: The functional outcome variable is a composite of the five areas assessed: Occupation/Education, Living Arrangement, Social Interaction, Recreation, and Independence.