ARE PARANOID SCHIZOPHRENIA PATIENTS REALLY MORE ACCURATE THAN OTHER PEOPLE AT RECOGNIZING SPONTANEOUS EXPRESSIONS OF NEGATIVE EMOTION? A STUDY OF THE PUTATIVE ASSOCIATION BETWEEN EMOTION RECOGNITION AND THINKING ERRORS IN PARANOIA

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by

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS.................................................................................................iv

LIST OF FIGURES........................................................................................................viii

LIST OF TABLES...........................................................................................................ix

INTRODUCTION.............................................................................................................1

REVIEW OF THE LITERATURE......................................................................................4
  The Emotional Experience.........................................................................................4
  Facial Expressions of Emotion...................................................................................5
  Emotion Recognition From Facial Expressions......................................................8
  Schizophrenia............................................................................................................12
  The Clinical Presentation of Schizophrenia.............................................................13
  Social Cognition.......................................................................................................16
  Emotion Recognition Impairments in Schizophrenia............................................16
  Facial Affect Recognition in Paranoid Patients....................................................27

PROBLEM STATEMENT AND OBJECTIVES..............................................................31
  Probabilistic Reasoning..........................................................................................33
  Attributional Style.................................................................................................34
  Theory of Mind.......................................................................................................34
  Selective Attention..................................................................................................35

RESEARCH QUESTIONS AND HYPOTHESES..........................................................37

METHOD.....................................................................................................................40
  Participants..............................................................................................................40
  Materials................................................................................................................41
  Diagnosis................................................................................................................41
  Symptom Severity..................................................................................................42
  Paranoid vs. Nonparanoid Classification...............................................................43
  Self-report of Paranoia and Suspiciousness.........................................................44
  IQ Estimates..........................................................................................................45
  Facial Recognition Task.........................................................................................46
  Emotion Recognition Task....................................................................................46
  Stimulus Discrimination Task..............................................................................49
  Preattentional Processing of Threatening Words.................................................49
  Attributional Style...................................................................................................50
Theory of Mind Task
Probabilistic Reasoning
Procedures

STATISTICAL ANALYSES

RESULTS
Participants
Characteristics of patients based on low and high paranoia/suspiciousness ratings
Research Question #1: Recognition of Positive Emotions
Research Question #2: Recognition of Negative Emotions
Research Question #3: Negative Bias
Research Question #4: Posed vs. Spontaneous Judgments

CONCLUSIONS AND DISCUSSION
Hypothesis 1
Hypothesis 2
Hypothesis 3
Hypothesis 4
Limitations
Concluding remarks

REFERENCES

APPENDIX A
APPENDIX B
APPENDIX C
APPENDIX D
APPENDIX E
LIST OF FIGURES

Figure 1a. Performance on emotion recognition task (spontaneous expressions) .......... 65
Figure 1b. Performance on emotion recognition task (posed expressions)..................... 65
Figure 2. Within-subjects comparison of accuracy scores for posed and spontaneous
expressions of negative emotions.............................................................................. 70
Figure 3. Within-group comparisons of accuracy scores for posed and spontaneous
expressions of sadness, anger, disgust, and fear ....................................................... 72
Figure 4. Breakdown of emotion labels used for neutral facial expressions................. 75
LIST OF TABLES

Table 1. Demographic and clinical characteristics of nonparanoid patients, paranoid patients, and controls ........................................................................................................ 63

Table 2. Percentage of correct responses for emotion recognition variables for nonparanoid patients, paranoid patients, and control participants .......................... 66

Table 3a. Frequency of responses for nonparanoid schizophrenia patients .................. 73
Table 3b. Frequency of responses for paranoid schizophrenia patients ...................... 73
Table 3c. Frequency of responses for nonpsychiatric control participants .................. 73

Table 4. Comparison of scores obtained on the cognitive measure for nonparanoid patients, paranoid patients, and control participants .......................................... 77

Table 5. Correlations between paranoid thinking, scores on cognitive measures, and performance on emotion recognition task – patient data only .......................... 82

Table 6. Summary of regression analysis for variables predicting accuracy scores for the recognition of spontaneous expression of negative emotions – patient data only .... 84

Table 7a. Proportions of “posed” and “genuine” labels used by group ......................... 85
Table 7b. Proportions of correctly used “posed” and “genuine” labels by group .......... 85
INTRODUCTION

The human face conveys a wealth of information. As a result of the automatic and simultaneous activation of distinct brain regions, a simple glance at a face can tell us about a person’s gender, age, identity, emotion, and other socially relevant information (Adolphs, 2002). Although these attributes constitute essential stimuli in social interactions, it can be argued that accurate recognition of others’ facial expressions of emotion is most important, as failure in this can lead to significant impairments in social functioning (Keltner, Ekman, Gonzaga, & Beer, 2003; Keltner & Kring, 1998).

Cumulative evidence indicates that schizophrenia patients, who as a group exhibit significant impairments in social functioning, show deficits in the recognition of facial expressions of emotion relative to healthy control individuals (Edwards, Jackson, & Pattison, 2002; Mandal, Pandey, & Prasad, 1998; Morrison, Bellack, & Mueser, 1988). More recent studies suggest that the degree of impairment may vary by clinical subtype. For instance, it has been found that paranoid schizophrenia patients are more accurate than nonparanoid schizophrenia patients at identifying facial expressions of negative emotion when presented photographs of carefully posed actors and actresses (posed stimuli) (Kline, Smith, & Ellis, 1992). It has also been found that paranoid schizophrenia patients are more accurate than both nonparanoid schizophrenia patients and healthy normal controls at identifying facial expressions of negative affect when presented photographs of individuals displaying candid expressions of emotion (spontaneous stimuli) (Davis & Gibson, 2000). The latter finding is quite interesting given that the
paranoid schizophrenia subtype, like all other schizophrenia subtypes, is characterized by important impairments in social functioning (American Psychiatric Association, 2000) and given that spontaneous expressions of emotion generally seem less intense and more ambiguous than posed expressions of emotion. One explanation for this finding may be that certain cognitive biases associated with psychosis lead paranoid schizophrenia patients to interpret ambiguous expressions of emotion as more negative than others. In fact, research findings suggest that schizophrenia patients with paranoia and/or persecutory delusions show heightened attentional vigilance to threat-related information (Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001; Bentall & Kaney, 1989; Bentall, Kinderman, & Kaney, 1994; Green & Phillips, 2004), have difficulty considering other people’s perspectives (Brüne, 2005b; Corcoran, Mercer, & Frith, 1995; Craig, Hatton, Craig, & Bentall, 2004; Harrington, Siegert, & McClure, 2005; Sprong, Schothorst, Vos, Hox, & van Engeland, 2007), tend to make external attributions for negative outcomes and internal attributions for positive outcomes (Bentall, 2001; Bentall et al., 1994; Kinderman & Bentall, 1997), and make decisions based on limited data (i.e., jump to conclusions) (Garety, Hemsley, & Wessely, 1991; Huq, Garety, & Hemsley, 1988). Taken together, these cognitive biases could lead to the misperception of threat in ambiguous facial expressions in others. Regrettably, no studies have attempted to explain why it is that paranoid schizophrenia patients seem to have heightened perception of spontaneous expressions of negative emotion.

The goals of the present study were twofold. First, we wished to replicate the finding that paranoid schizophrenia patients are more accurate than nonparanoid
schizophrenia patients and normal controls at identifying spontaneous expressions of negative emotion. Second, we wished to determine whether paranoid patients’ heightened sensitivity to spontaneous expressions of negative emotion is due to strong negative emotional representations in their cognitive schemata (i.e., negative bias).

It was hypothesized that paranoid schizophrenia patients would be more accurate than nonparanoid schizophrenia patients and normal controls at identifying spontaneous facial expressions of negative emotion. It was also predicted that paranoid thinking and performance on social cognitive tasks designed to demonstrate cognitive biases in terms of decision-making, attribution, and attention to threatening stimuli would predict more accurate recognition of spontaneous expressions of negative emotion. It was believed that support for this second hypothesis would provide evidence that paranoid patients’ ability to identify spontaneous expressions of negative emotions is due, at least in part, to a biased processing of threat-related information.

To test these hypotheses, 50 (24 paranoid and 26 nonparanoid) individuals with a diagnosis of schizophrenia or schizoaffective disorder and 29 healthy control individuals were interviewed and asked to complete a number of assessments including an emotion recognition task and several social cognitive tests.
REVIEW OF THE LITERATURE

The Emotional Experience

The term emotion has been conceptualized in many different ways. Theoreticians and researchers alike, however, appear to concur with the idea that an emotion consists of a physiological, evaluative, and/or expressive reaction to a personally significant external or mental event (Frijda, 1986). This definition suggests that there are at least three components to an emotional experience. An emotional experience involves physiological changes in the autonomic nervous system (e.g., changes in heart rate, blood pressure, respiration, gastrointestinal and urinary activity), endocrine system (e.g., release of certain hormones into the bloodstream such as corticosteroids), and brain activity. The bodily sensations associated with these changes may then contribute, either independently or in combination with environmental cues, to a subjective emotional experience. The cognitive interpretation of the physiological and/or environmental cues leads to labeling a given state as a specific emotion such as anger, sadness, disgust, or happiness. Finally, an emotional experience is also characterized by certain observable changes such as changes in posture or gaze patterns, the production of nonverbal emotional sounds (e.g., sighs, moans, or growls), or changes in facial muscle movements, which produce a facial expression of emotion. This third component of the emotional experience thus serves social functions.
Facial Expressions of Emotion

As implied above, the expressive component of an emotional experience serves a variety of social functions. In fact, it has been suggested that expressive emotional reactions contribute to social interactions by serving informative, evocative, and incentive functions (Keltner et al., 2003; Keltner & Kring, 1998). Facial expressions of emotion, for instance, can communicate information about the sender’s emotional state, social intentions, and mental and physical health, as well as information about the relationship between the sender and the receiver. Facial expressions of emotion can also be used to evoke emotions in others (Keltner & Kring, 1998). For example, in a review of studies on psychophysiological responses to facial emotion, Dimberg and Öhman (1996) provide data suggesting that displays of anger evoke complementary fear in others. In a review of the literature on the empathy-altruism hypothesis, Batson and Shaw (1991) present evidence that, when exposed to others’ displays of distress, people tend to feel sympathy and concern. They also suggest that displays of distress and sadness can sometimes elicit similar emotional responses in others. Expressions of emotion or the absence of emotional display can additionally be used to reinforce, punish, or inhibit social behaviors. Smiles and laughter, for example, are often used to reward many forms of desirable social behavior (Bachorowski, Smoski, & Owen, 2001). As one might imagine, the social functions of expressions of emotion require that the production and interpretation be accurate and unambiguous. Disturbances in either the production or interpretation of facial expressions of emotion can disrupt social relationships in
important ways, either by depriving the observer of valuable information or by leading to miscommunication.

Given that we are social creatures it should not be surprising that the most extensive body of research in the field of human emotions focuses on facial expressions of emotion (Oatley & Jenkins, 1992). However, despite the fact that Aristotle wrote about the social function of the face in the 4th century BC, empirical interest in facial expression of emotions only dates back approximately 135 years (Russell, 1994). The reasons for the early scientific lack of interest in facial expressions are unknown. However, Russell (1994) suggests that there was probably no need to verify empirically that facial expressions do express emotions until speculation about the universality of facial expressions of emotion emerged at the beginning of the 19th century. Although many of his contemporaries wrote about facial expressions of emotion, Charles Darwin is credited with being the first to study facial expressions empirically. Based on his observations, Darwin (1872) suggested that facial expressions of emotion were innate responses consisting of complex sets of facial muscle movements. He believed that human expressions of emotion evolved from similar expressions in other animals and drew parallels between animals and humans in their emotional reactions to events. Because he believed that facial expressions of emotion were innate, Darwin hypothesized that the ability to produce facial expressions of emotion was universal. He tested this claim by observing his own children and by collecting data from informants in different countries. He found that people from different cultures used the same patterns of facial muscle movements to express a particular emotional state, which led him to conclude that
the facial expressions of emotion are indeed universal. Darwin wrote his thoughts and observations on facial expressions in a book entitled *Expression of Emotions in Man and Animals*, which was published in 1872. He died ten years after the publication of this book. Although it took several decades after the death of Darwin for other researchers to show an interest in the universality of facial expressions of emotion, many empirical studies have since found that human beings, regardless of their cultural background, can produce and identify six emotions including anger, disgust, fear, sadness, surprise, and happiness (Ekman, 1972; Elfenbein & Ambady, 2002; Izard, 1971). More recent studies also suggest that contempt is similarly produced and categorized in different cultures, but its universality across cultures has been disputed (Ekman, O'Sullivan, & Matsumoto, 1991; Matsumoto, 1992; Russell, 1991). It should be noted that despite strong support for the universality of facial expressions of emotion, research findings also suggest that humans produce these facial expressions of emotion in their own unique ways (Ekman, 1993, 2003). Furthermore, studies on the universality of emotion expression indicate that culture, gender, and group membership strongly influence which emotions can be displayed and which must be inhibited or altered from their natural expression in social contexts (Fridlund, 1994). Hence, the expression of emotion follows display rules, which are learned at an early age (Ekman & Friesen, 1975; Fridlund, 1994).

Although the earlier studies on human emotions focused solely on the universality of emotion expression, the area of research has grown significantly over the past several decades. Recent studies, which have investigated topics ranging from the function and effects of expressions of emotion in social interactions to the neuropsychology of facial
expressions of emotion, have greatly increased our knowledge of human emotions. The bulk of the research, however, has focused on the recognition of emotion from facial expressions (Adolphs, 2002).

**Emotion Recognition From Facial Expressions**

The ability to detect, discriminate and recognize emotions begins to develop at a very early age in humans (Nelson, 1987; Walker-Andrews, 1997). Although their visual system is not quite developed at birth, it has been found that newborns not only have a natural inclination to orient towards facelike stimuli, they also possess an innate ability to mimic simple facial gestures such as opening of the mouth (Meltzoff & Moore, 1983; Valenza, Simion, Macchi-Cassia, & Umilta, 1996). As their visual system develops further, researchers have found that infants begin to discriminate between basic facial expressions of emotion a few months after birth. While three month old infants can discriminate between smiling and neutral faces (Kuchuk, Vibbert, & Bornstein, 1986), four and five month old infants can additionally discriminate between facial expressions of joy and anger (LaBarbera, Izard, Vietze, & Parisi, 1976). The ability to recognize other basic expressions of emotion appears to develop during the second half of the first year (Walker-Andrews, 1997). Studies using both vocal and facial displays of emotion as stimuli suggest that, by seven months of age, infants are already able to detect correspondences between basic vocal and facial expressions of affect (Soken & Pick, 1992; Walker, 1982). Although these changes appear to occur rather early in infancy, it should be noted that the ability to recognize fully the variety of facial expressions develops gradually and does not emerge at one specific stage of development. In fact,
research findings suggest that the capacity to recognize more subtle expressions of emotion develops well into late adolescence and early adulthood (Herba & Phillips, 2004). The research on adults suggests that the ability to recognize facial expressions of emotion remains consistent across the lifespan, although a slight decrease in accuracy seems to occur as people age (Adolphs, 2002; Calder et al., 2003).

Most studies investigating people’s ability to recognize facial expressions of emotion in others rely on slight variations of a basic experimental paradigm (Edwards et al., 2002; Morrison et al., 1988; Russell, Bachorowski, & Fernandez-Dols, 2003). The procedure essentially consists of the presentation of stimuli depicting facial expressions of emotion to a receiver (the participant) who is asked to indicate which emotion is displayed in each stimulus. The variations involve differences in the type of facial stimuli used as well as in the response format used. There is no widely accepted, standardized measure of emotion recognition. Some researchers have used photographs of individuals displaying various expressions of emotion, while others have favored drawings, cartoons, or videos of facial affect (Edwards et al., 2002; Kerr & Neale, 1993; Morrison et al., 1988). As might be imagined, a number of problems are associated with the use of dissimilar stimuli. Many investigators have highlighted the difficulties that arise when trying to compare and contrast the results of emotion recognition studies that have used very different stimuli (Elfenbein & Ambady, 2002; Russell, 1994). Furthermore, some problems related to the stimuli themselves have been identified. Russell and his colleagues (1994, 2003) note that, although there is no “correct” way to express emotions, studies of facial affect recognition only use prototypes of facial
emotions as stimuli. They argue that the use of prototypical expressions of emotion compromises the ecological validity of these studies. The researchers also point out that most emotion recognition studies use as stimuli photographs of actors asked to convey emotions through their faces instead of photographs of spontaneous facial expressions of affect, which are more closely comparable to expressions encountered in everyday situations. Research on posed and spontaneous expressions of emotion does in fact support the claim that posed facial expressions of emotion lack ecological validity (Ekman, 1993; Moscovitch & Olds, 1982; Motley & Camden, 1988). Posed facial expressions of emotion have been found to be more symmetrical than spontaneous expressions (Moscovitch & Olds, 1982). They also seem to be characterized by the absence of certain facial muscle actions (Ekman, 1993). In contrast, spontaneous facial expressions of emotion have been found to be less intense and more ambiguous than posed expressions of emotion, which may be due to the fact that people almost never experience basic emotions in isolation (Ekman et al., 1987; Halberstadt, 2003). The more ambiguous nature of spontaneous expressions of emotion may explain why studies have found that individuals are more accurate when judging the emotional category of posed expressions than when judging the emotional category of spontaneous expressions (Gosselin, Kirouac, & Dore, 1995; Motley & Camden, 1988; Russell et al., 2003).

With regard to differences in the response format used in facial affect recognition studies, some investigators have preferred forcing their participants to select their responses from a short list of emotions while others have allowed their participants to use any label to describe the emotion displayed. Some researchers have criticized the forced
choice method arguing that choosing an emotion from a short list can inflate agreement and produce blatant artifacts (Russell et al., 2003). Despite the variations discussed above, the majority of studies have found that participants of different culture, age, and background agree on the emotion displayed at above chance levels (Elfenbein & Ambady, 2002; Russell, 1994). Some studies have also found that participants are better at identifying happiness and anger than other emotions such as fear, sadness, and disgust (Gosselin et al., 1995; Izard, 1971; Motley & Camden, 1988).

A number of recent studies on emotion recognition have been interested in the brain mechanisms involved in the recognition of emotion from faces. Although this area of research is still in its infancy, a number of discoveries have increased our understanding of how the brain processes facial emotions (Adolphs, 2002; Phillips, 2003; Posamentier & Abdi, 2003). It seems that many cortical and subcortical regions of the brain are involved in the perception of facial emotion. At the most basic level, it appears that the lateral fusiform gyrus, which joins the occipital and temporal lobes, is implicated in tasks involving selective attention to faces. At a higher level of processing, the superior temporal sulcus, an area on the surface of the temporal lobe, is thought to be involved in processing changeable aspects of faces such as the eyes and mouth. Finally, it seems that the amygdala and the insula, both areas of the limbic system, which are involved in emotional processing, learning, and memory, are implicated in the labeling of emotions perceived. Lesion studies provide evidence that damage to these and other related brain areas can lead to impairments in facial affect recognition. Furthermore, some psychiatric disorders, which have been found to involve abnormalities in certain
brain structures responsible for the processing of facial emotion, have been associated with disturbances in facial affect recognition. It appears that many individuals suffering from autism, depression, bipolar disorder, and schizophrenia have difficulty accurately recognizing facial expressions of emotion in others (Archer, Hay, & Young, 1992; Bolte & Poustka, 2003; Edwards et al., 2002; Leppänen, Milders, Bell, Terriere, & Hietanen, 2004; Mandal et al., 1998; Morrison et al., 1988; Phillips, Drevets, Rauch, & Lane, 2003). The bulk of the studies investigating facial affect recognition in psychiatric populations, however, has focused on schizophrenia patients, as the deficit appears to be most prominent in this group (Edwards et al., 2002). It is assumed that the deficit in affect recognition observed in schizophrenia patients is responsible, at least in part, for the interpersonal problems observed in some patients. It has also been suggested that the deficit may contribute to the formation and/or maintenance of delusions in certain patients (Johnston, Katsikitis, & Carr, 2001; Mueser et al., 1996).

**Schizophrenia**

Before reviewing the literature on the disturbances in facial emotion recognition observed in schizophrenia patients, a description of the disorder is in order.

Although it affects less than 1% of the population worldwide, schizophrenia is considered to be one of the most devastating forms of psychopathology (Jablensky, 1997). The severe and disabling nature of the illness requires that individuals with a diagnosis of schizophrenia receive numerous treatment services ranging from outpatient care to psychiatric hospitalization (Maguire, 2002). In fact, recent estimates suggest that schizophrenia is responsible for the occupation of approximately 25% of all psychiatric
beds and for approximately 50% of all admissions to state hospitals (Geller, 1992; Terkelsen & Menikoff, 1995). The illness also represents a major economic burden to society. Although the current direct and indirect costs of schizophrenia are unknown, the costs appear to rise significantly from one year to the next. In the United States alone, the total economic costs of schizophrenia increased from $32.5 billion to $44.9 billion between 1990 and 1994 (Rice, 1999; Rice & Miller, 1998).

Schizophrenia is a terrible affliction for many people. It has a devastating effect on the lives of its victims and their families, and it is associated with high social and economic costs. Research conducted over the past century has contributed to a better understanding of schizophrenia in terms of its etiology, onset, clinical presentation, treatment, course, and outcome (Green, 2001; Lezenweger, 1999; Mueser & McGurk, 2004; Sawa & Snyder, 2002; Walker, Kestler, Bollini, & Hochman, 2004). However, our current understanding of the illness is far from complete and more research is required to help improve the quality of life of individuals suffering from schizophrenia.

The Clinical Presentation of Schizophrenia

The most recent version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association, 2000) describes schizophrenia as the presence of at least two of the following symptoms, each present for a significant amount of time during a one-month period and persisting for at least six months: delusions, hallucinations, disorganized speech, grossly disorganized or catatonic behavior, and negative symptoms (e.g. affective flattening, alogia, and avolition). The
Manual’s definition of schizophrenia allows for a variety of symptoms to combine, yielding different clinical presentations of the illness (Fenton, 2000; Lezenweger, 1999; Maj, 1998). Hence patients with the same diagnosis of schizophrenia can look very different from one another in terms of their symptom presentation.

The fact that each patient presents with their own individual pattern of symptoms is in agreement with the contemporary view that schizophrenia is a heterogeneous group of disorders, and although not stated explicitly in the DSM, the use of subtypes is consistent with this view. The manual describes five schizophrenia subtypes including paranoid, disorganized, catatonic, undifferentiated, and residual. The paranoid subtype differentiates itself from the other subtypes by the presence of prominent delusions organized around a coherent theme and/or frequent auditory hallucinations and little in the way of negative or disorganized symptoms. The delusions experienced by patients with this subtype typically, although not always, involve some persecutory content. The essential features of the disorganized subtype include disorganized speech, disorganized behavior, and flat or inappropriate affect, while the fundamental feature of the catatonic subtype involves marked psychomotor disturbances including immobility, excessive motor activity, extreme negativism or mutism, peculiarities of voluntary movement, and repetition/imitation of other people’s words or movements. Schizophrenia patients are said to be of the undifferentiated subtype when their symptom pattern does not meet the criteria of any of the three subtypes described above. Finally, the residual subtype is used to describe schizophrenia patients who do not have any prominent positive psychotic symptoms (delusions, hallucinations, disorganized speech or behavior), but who either
suffer from negative symptoms (flat affect, poverty of speech, avolition) or suffer from two or more attenuated positive symptoms.

Despite the heterogeneous nature of schizophrenia, nearly all patients exhibit some degree of social/occupational difficulties, such as impairments in the ability to work, attend school, parent, attend to self-care, enjoy leisure activities, and engage in social relationships (American Psychiatric Association, 2000; Dickerson, Boronow, Ringel, & Parente, 1996; Green, 2001; Maguire, 2002; Mueser & McGurk, 2004). Patients with deficits in social functioning often have difficulty establishing normal emotional contact with others, tend to be socially withdrawn, attribute negative emotions to others, and feel persecuted (Bentall, 2001; Kay, Opler, & Lindenmayer, 1987; Keltner & Kring, 1998). Although the origins of the social problems observed in schizophrenia have yet to be explained, it has been suggested that these difficulties may be due to the acquisition of inappropriate or inadequate social skills (Lieberman, DeRisi, & Mueser, 1989), cognitive impairments in memory and vigilance (Bowen et al., 1994), brain lesions/abnormalities associated with the basic pathology of schizophrenia (Sawa & Snyder, 2002), and/or deficits in social cognition (Penn, Corrigan, Bentall, Racenstein, & Newman, 1997). While these putative factors appear to be related to each other, research has focused mainly on the social cognitive perspective (Penn, Combs, & Mohamed, 2001; Penn et al., 1997).

**Social Cognition**

Social cognition is a domain of cognition that is involved with the perception, interpretation, and processing of social information (Ostrom, 1984). Specifically, the
term refers to the mental operations involved in social interactions, including the ability and capacity to “perceive the intentions and dispositions of others” (Brothers, 1990, p.28). There are several components to social cognition, including the ability to infer other people’s thoughts, the ability to understand the roles and rules governing social interactions, and the ability to recognize facial emotions in others (Penn et al., 2001; Penn et al., 1997). Although schizophrenia patients have generally been found to display deficits in all areas of social cognition, the bulk of the research has focused on deficits in facial affect recognition (Bellack, Blanchard, & Mueser, 1996; Brüne, 2005a; Corrigan, 1997; Corrigan & Nelson, 1998; Frith & Corcoran, 1996; Mueser et al., 1996).

*Emotion Recognition Impairments in Schizophrenia*

Although research on the universality of facial expressions of emotion soared in the late 1960s and early 1970s, studies investigating psychiatric patients’ ability to accurately judge facial expressions of emotion were quite rare until the 1980s. In fact, the earliest studies using pictures of facial affect as stimuli with psychiatric populations were not interested in judgment accuracy, but were instead concerned with patients’ perceptions and reactions to the various facial expressions (Deri, 1949; Levy, Orr, & Rosenzweig, 1960; Spiegel, Gerard, Grayson, & Gengerelli, 1962).

A study conducted by Dougherty et al. (1974) is often cited as the first study of emotion recognition in schizophrenia patients. In this study, 31 female schizophrenic inpatients and 23 non-institutionalized female control participants were presented photographs of individuals depicting eight categories of “fundamental” (or universal) emotions, including interest-excitement, enjoyment-joy, surprise-startle, distress-anguish,
disgust-contempt, anger-rage, shame-humiliation, and fear-terror. The same set of pictures was presented twice. The picture set was used the first time as an emotion labeling task and the second time as an emotion recognition task. For the emotion labeling task, participants were asked to provide a label for the emotion expressed in each picture (free response) while for the emotion recognition task, participants were asked to use one of the eight categories to describe the emotion expressed in each picture (fixed response). The scores of both groups were compared and the investigators found that the participants in the control group were significantly more accurate than the schizophrenia patients on the two tasks, although the difference was less profound for the emotion labeling task. Error patterns were also investigated and it was found that both patients and controls perceived expressions of enjoyment-joy very accurately. Accuracy scores, however, were rather low in both groups for the expressions of interest-excitement, distress-anguish, and shame-humiliation. Furthermore, no systematic error patterns were found in the schizophrenia patients, whereas controls were found to be more systematic in misplacing shame-humiliation pictures in the categories of interest-excitement and disgust-contempt.

Although this first study was very informative, it was later criticized for not including male participants and for using still photographs, which do not provide situational cues. In an attempt to address these criticisms, Muzekari and Bates (1977) conducted a study using both male and female participants and both photographs and videotape scenes. Thirty two chronic schizophrenic patients (16 male and 16 female) and 32 normal control subjects (16 male and 16 female) participated in this study.
Participants were presented 24 photographs of actors displaying expressions of happiness, sadness, anger, and fear and 8 videotaped scenes including 2-5 actors depicting emotions of sadness, anger, happiness, and fear as well as loving, liking, disappointment, and cheerfulness. The videotape had no sound and each scene lasted approximately two minutes. The picture stills and videotape scenes were presented twice, allowing the researchers to investigate differences between open-ended free responses and fixed responses. With regard to the picture task, the authors replicated the earlier finding that normal subjects were more accurate than schizophrenia patients in judging facial expressions of emotion. They also replicated the finding that patients and controls had no difficulty identifying happy expressions. Finally, they observed that only patients’ responses improved when they were forced to choose an emotion from among the four categories of emotion. Regarding the videotape scenes, Muzekari and Bates found that the normal subjects were also more accurate than the schizophrenic patients at identifying the emotion depicted in each scene. Again, it was observed that patients’ responses improved when they were forced to choose a label from the list provided.

The Muzekari and Bates (1977) study strengthened the claim that, compared to normal controls, schizophrenia patients show impairments in the recognition of negative facial expressions of emotion. The results of the study also suggested that the addition of non-verbal cues through the use of videotape scenes does not improve patients’ ability to recognize facial expressions of emotion. This study, however, was not without its limitations. As Walker et al. (1980) point out, the authors did not use stringent clinical criteria to select the patients included in their schizophrenic group, nor did they make an
effort to match the control subjects to the patient group. These shortcomings may have affected the results, as the inclusion of patients with additional diagnoses or diagnoses other than schizophrenia could have potentially limited the conclusion that deficits in affect recognition are specific to schizophrenia. Furthermore, the fact that the two groups were not matched on important variables such as age, sex, and education could have artificially inflated the differences found between patients and controls. Walker and her colleagues attempted to resolve these potential confounds by only including patients who received a diagnosis of schizophrenia by both a psychiatrist and a psychologist and who manifested symptoms of thought disorder. The investigators also ensured that both their experimental group \( (n = 48) \) and their control group \( (n = 48) \) were matched on age, sex, and education level. In addition, the two groups were subdivided into three age groups (children, adolescents, and adults) to assess whether emotion recognition deficits are also present in younger patient groups. Participants in this study were presented 32 black and white pictures from Izard’s (1971) set and were asked to associate each photograph with one of the emotion labels printed on index cards (forced response design). The pictures included four examples of Izard’s eight “fundamental” emotions (joy, anger, surprise, disgust, shame, fear, sadness, and interest). It should be noted that participants were given up to four minutes per picture to identify the facial expression of emotion displayed. Overall, the results of this study suggest that schizophrenia patients of all age groups are significantly less accurate than their non-schizophrenic counterparts in identifying facial expressions of emotion.
An additional problem with the early studies described above is the absence of other psychiatric groups as controls. The use of such groups is important, as it allows researchers to draw conclusions about the specificity of a deficit to a certain condition. Hence, up until that point, it was unknown whether the impairment in emotion recognition observed in schizophrenia patients was specific to the disorder or whether it occurred in other psychiatric conditions. Pilowsky and Bassett (1980) attempted to address this issue using a rather unusual method. In this study, 10 schizophrenia inpatients, 10 neurotic inpatients, 10 alcoholic inpatients, and 11 normal controls were presented six photographs selected from a book by Ekman and Friesen (1975). After the presentation of each photograph, participants were simply asked to comment on the faces. The ambiguous nature of the task yielded interesting results. The response patterns for the schizophrenic and neurotic patients were found to be similar in some ways. Specifically, in comparison to the alcoholic and control groups, schizophrenic and neurotic patients were least likely to comment on the person’s affect. They also provided the highest mean word count in response to the photographs, especially for the faces displaying fear and anger; yet, there was also some distinctiveness in the schizophrenia patients’ response patterns in comparison to the three other groups. In particular, schizophrenia patients were least likely to make comments on the actors’ internal states, but were more likely to make some kind of connection between the actor and themselves (e.g. “He’s a cop. He’s after someone – after me probably”). Taken together, these findings suggest that, compared to other psychiatric groups, schizophrenia patients are
less able to draw inferences about other people’s internal states because they attend less to the facial displays of emotions.

Before long, studies began including other psychiatric groups as controls to shed light on the specificity of emotion recognition deficits to schizophrenia. In a study investigating the emotion recognition abilities of 17 schizophrenic inpatients, 14 inpatients diagnosed with an affective disorder (including patients with schizoaffective disorders) and 14 normal controls, Walker et al. (1984) found that the schizophrenic patients scored significantly below the affective patients and controls on certain facial emotion tasks. Furthermore, the two patient groups scored significantly lower than the controls on an emotion discrimination task in which they were presented with pairs of photographs and asked to determine whether the emotion displayed in each pair was the same or different. As a whole, the results of this study suggest that schizophrenia patients are specifically impaired in the ability to extract salient emotional cues from faces. Although additional analyses revealed that the scores of the schizoaffective and depressive disorder patients included in Walker et al.’s affective group were not significantly different from each other, it is rather unusual to include schizoaffective patients in an affective disorder group. However, studies using purer groups of affective patients suggest that depressed individuals also display emotion recognition deficits, albeit less pronounced than in individuals with schizophrenia. For instance, a study by Zuroff and Colussy (1986) compared 14 female schizophrenic inpatients to 15 female depressed inpatients and 15 female controls and found that both schizophrenic and depressed inpatients displayed facial affect recognition deficits when compared to
controls. Another study by Feinberg et al. (1986), which compared the accuracy of judgments of 20 hospitalized schizophrenic patients, 20 hospitalized depressed patients, and 20 nonhospitalized controls of both sexes on various emotion and facial recognition tasks, also found that depressed patients experienced difficulty with the emotion recognition tasks. The impairments noted in the depressed patients, however, were less marked than those observed in the schizophrenia patients. These studies, therefore, provided evidence that difficulties in making judgments regarding the emotional qualities of facial expressions are not specific to schizophrenia, although they are more marked in individuals suffering from the disorder.

The studies described above are considered part of the first generation of emotion recognition studies in schizophrenia. These studies have been criticized for using small sample sizes, chronic (socially isolated) long-stay inpatients, questionable diagnostic criteria, idiosyncratic measures with unknown psychometric properties, and varied response formats. They have also been criticized for ignoring the possible confounding effects of medication, symptoms, IQ, premorbid functioning, duration of hospitalization, and duration of stimulus presentation on performance. However, despite these shortcomings, the results of the first generation studies provided strong evidence that schizophrenia patients are significantly inferior to non-mentally-ill control individuals in the ability to decode facial expressions of emotion (Edwards et al., 2002; Mandal et al., 1998; Morrison et al., 1988). However, some questions still remained. For instance, it was unclear whether the conclusion about schizophrenia patients’ deficits in facial affect recognition would hold after addressing the limitations noted above. More importantly,
questions about the nature of the emotion recognition deficits began to arise. Researchers were now wondering whether the emotion recognition deficits observed in individuals with schizophrenia indicated a specific difficulty in face processing or whether it was part of a general cognitive deficit (Archer et al., 1992; Hooker & Park, 2002; Kerr & Neale, 1993; Mueser et al., 1996; Salem, Kring, & Kerr, 1996). Hence, the second generation of studies aimed at answering these questions.

The second generation of emotion recognition studies in schizophrenia was inspired in part by Chapman and Chapman’s (1978) seminal paper on measuring differential deficits in schizophrenia. In this paper, the authors argue that, given the fact that schizophrenia patients perform worse than normal control subjects on almost any task requiring a voluntary response, it is very difficult for investigators to demonstrate that poor performance on a task indicates a deficit of special importance in schizophrenia. Nevertheless, the authors suggest that it is possible to demonstrate a differential deficit in ability if two or more tests matched on relevant psychometric characteristics are used and if patients are shown to be more impaired on one task compared to the other(s). Based on the arguments provided in the Chapman and Chapman article, Kerr and Neale (1993) are credited for sparking the debate as to whether emotion recognition in schizophrenia reflects a generalized or differential deficit. In the introduction section of their paper, Kerr and Neale indicate that there was still little consensus at the time about the specific nature of the deficit because most of the first generation studies failed to use a differential deficit design. The authors therefore conducted this study in the hopes that it would clarify the issue. Twenty-nine unmedicated schizophrenia inpatients and 23 normal
control participants completed a battery of emotion recognition tasks in addition to a control task to rule out the possibility that schizophrenia patients have difficulty with face perception in general. Benton’s Test of Facial Recognition (BTFR), which is a neuropsychological test that consists of matching faces to a target face, was selected as the control task. Comparisons between the two groups were conducted and it was found that the schizophrenia patients performed significantly worse than the control participants on all tasks, including the control task. The effect sizes for the facial tasks were found to be approximately equal, suggesting that the patients differed from the normal subjects to the same degree on both the facial emotion tasks and the control task. In addition the BTFR correlated with all tests, further suggesting that emotion recognition deficits represent a generalized deficit in schizophrenia patients. It was therefore concluded that schizophrenia patients have a general tendency to perform poorly on all tasks and that there is no specific deficit in emotion recognition.

Many studies have since replicated Kerr and Neale’s (1993) findings, providing further support for the claim that schizophrenia patients’ low scores on facial affect recognition tasks are characteristic of a generalized deficit (Bellack et al., 1996; Hooker & Park, 2002; Mueser et al., 1996; Salem et al., 1996). However, some conflicting results have also been published. Penn et al. (2000), for instance, recently examined the nature of emotion perception deficits in schizophrenia to shed some new light on the endless debate. Thirty-nine extended care schizophrenia patients, 35 acute care schizophrenia patients, and 40 normal control subjects participated in this study. All participants completed the same facial tasks as the participants in the Kerr and Neale
study in addition to Benton’s Visual Form Discrimination test, another control task that assesses general perception. The results of this study again showed that the normal controls were significantly more accurate than the two patient groups on all tests. However, the investigators found that the emotion recognition impairments in the acutely ill patients could not be accounted for by a generalized deficit, as the patients’ performance on the emotion recognition and emotion identification tasks remained low when they controlled for performance on the two Benton control tasks. In contrast, the investigators found that the chronic patients’ poor performance on a facial emotion discrimination task, where they had to decide whether pairs of pictures depicted the same or different emotion, but not their performance on the emotion recognition task, was part of a more generalized performance deficit. Penn and his colleagues concluded that their results suggest that facial affect recognition is not explained by a general cognitive deficit.

Although the same emotion perception and control tasks were used in many of the second generation studies, the findings were somewhat inconsistent. In the end, no definite conclusions could be drawn with regard to the specific nature of the deficit. Suggestions were provided in the literature to help resolve the debate as to whether impairments in facial affect recognition reflect a general deficit or a specific deficit. For instance, it was suggested that, given the heterogeneous nature of schizophrenia, comparisons of patient subgroups be conducted (e.g., chronic vs. acute, paranoid vs. nonparanoid, medicated vs. unmedicated) (Penn et al., 2000). Recommendations about including a greater number of participants were also made given that increasing statistical
power could help demonstrate whether or not the impairments in emotion recognition in schizophrenia are more pronounced than their ability to recognize faces, as measured by the BTFR. Furthermore, it was suggested that researchers develop and use additional control tasks. As Edwards et al. (2002) point out, the BTFR, which was the only control task used in many of the second generation studies, may not have been an appropriate task since, in some cases, it seems to have been more difficult than the actual emotion tasks. Finally, it was proposed that the inclusion of both nonsocial and social cognitive tasks could help shed light on the nature of the deficit (Penn et al., 1997). Since the ability to perceive emotions accurately in others is considered a component of social cognition, and since nonsocial cognition is assumed to be a building block of social cognition, it was expected that performance on emotion recognition tasks would be correlated with performance on both nonsocial and social cognitive tasks.

The newer generation of studies has made a serious attempt to incorporate the above suggestions in their analyses. While many investigators are still determined to uncover the nature and the underlying causes of the emotion recognition deficit in schizophrenia (e.g., Bozikas, Kosmidis, Anezoulaki, Giannakou, & Karavatos, 2004; Gur et al., 2002; Kee, Kern, & Green, 1998; Kohler, Bilker, Hagendoorn, Gur, & Gur, 2000; Sachs, Steger-Wuchse, Krypsin-Exner, Gur, & Katschnig, 2004; Streit et al., 2001; Whittaker, Deakin, & Tomenson, 2001; Wolwer, Streit, Polzer, & Gaebel, 1996), many others have turned their attention to additional factors associated with the deficit. In fact, recent studies suggest that the degree of impairment in facial affect recognition may vary as a function of different variables. For instance, patients in the acute phase of the illness
have been found to be more impaired than chronic and remitted patients in recognizing facial affect (Gessler, Cutting, Frith, & Weinman, 1989; Penn et al., 2000; Weniger, Lange, E., & Irle, 2004), as are patients with predominantly negative symptoms when compared to patients with predominantly positive symptoms (Bryson, Bell, Kaplan, Greig, & Lysaker, 1998; Mandal, Jain, Haque-Nizamie, Weiss, & Schneider, 1999).

Interestingly, paranoid schizophrenia patients have been found to be less impaired than nonparanoid patients in identifying facial expressions of emotion in others (Davis & Gibson, 2000; Kline et al., 1992; Lewis & Garver, 1995).

**Facial Affect Recognition in Paranoid Patients**

LaRusso (1978) was the first to investigate paranoid patients’ ability to judge emotional states from facial expressions. In her study, 24 patients with a diagnosis of paranoid schizophrenia and 24 normal controls were asked to judge the facial expressions of persons videotaped under either genuine or simulated emotional conditions. Two videotapes were produced for the experiment. One videotape consisted of 40 stills of four individuals genuinely expecting a shock and not expecting a shock. The other videotape consisted of 40 stills of the same individuals pretending they were expecting a shock and pretending they were not expecting a shock. Half of the patients and control participants viewed and judged the genuine expressions videotape, while the other half was presented the simulated expressions videotape. After viewing each still, participants were asked to judge whether or not the person in the videotape expected a shock by pressing on either the “shock” labeled bar-press timer or the “no shock” labeled bar-press timer. Participants had up to 10 seconds to give a response. The results of this study
indicate that, for the genuine stimuli, the judgments of the paranoid patients were more accurate than those of the normal controls. Conversely, the normal controls were found to be more accurate than the paranoid patients in their judgments of the simulated stimuli. The investigator concluded that paranoid patients are more sensitive to spontaneous facial expressions of stress or relief of stress than are normal controls.

Although LaRusso’s findings are intriguing, they cannot be generalized to nonparanoid schizophrenia patients’ judgments of genuine and simulated expressions of emotion, nor can they generalize to a greater range of emotions. With these limitations in mind, Kline and his colleagues (1992) set out to investigate how both paranoid and nonparanoid schizophrenia patients process facial expressions of both positive and negative emotions. To do this, they compared the judgments of 14 paranoid schizophrenia patients to 13 nonparanoid schizophrenia patients and 15 normal controls on a facial affect task. The task consisted of viewing photographs of carefully posed actors from the Ekman and Friesen (1976) slides, then indicating how friendly the person appeared, and finally circling the label that best described the emotion expressed in the picture. The investigators found that, although the three groups did not differ on friendliness ratings of the photographs and in labeling positive emotions, the nonparanoid patients’ judgments of negative facial affect were significantly less accurate than those of the paranoid patients and control subjects. They concluded that paranoid and nonparanoid patients process emotional information in very different ways. They note, however, that their results could not allow them to speculate as to why the two subgroups treat affective information differently.
Lewis and Garber (1995) carried out a similar study, but in addition, investigated the effects of medication on affect recognition in both paranoid and nonparanoid schizophrenia patients. Using a repeated measures design, 10 normal controls, 10 paranoid, and 8 nonparanoid schizophrenia patients were asked to complete a facial affect recognition task. The task consisted of viewing a series of photographs from the Ekman and Friesen (1976) slides and checking the emotion word that best described the expression displayed in each photograph. Patients and controls were tested twice over a two week period. Patients were unmedicated at baseline, but were receiving antipsychotic drug treatment at the time of the second session. The investigators found that, in comparison to the normal controls’ performance, patients showed significant impairment in facial affect recognition on both testing occasions. Patients with paranoid schizophrenia, however, were found to be significantly less impaired than nonparanoid patients on both occasions. The authors do not offer any explanation as to why the paranoid patients in their sample outperformed the nonparanoid patients, but conclude that antipsychotic medications do not appear to be related to improvements in the ability to recognize expressions of emotion in others, suggesting a trait-like effect.

Davis and Gibson (2000) are the last researchers known to have investigated differences between paranoid and nonparanoid patients in terms of facial emotion recognition. Inspired by LaRusso’s (1978) finding that paranoid patients and controls interpret posed expressions of emotion differently than spontaneous facial emotions, the authors created their own vignettes depicting spontaneous and posed facial expressions of happiness, sadness, anger, disgust, surprise, and fear. The vignettes, which were
videotaped, were then presented to four groups of individuals: a paranoid schizophrenic group, a nonparanoid schizophrenic group, a depressed group, and a nonpsychiatric control group. After viewing each vignette for approximately two seconds, participants had to indicate verbally which emotion best described how the person in the vignette was feeling by selecting one of the six emotions listed on a card. The investigators found that the control individuals were significantly more accurate than the three patient groups in identifying *posed* expressions of surprise and negative emotions (sadness, anger, fear, and disgust). However, for the *spontaneous* expressions of surprise and negative emotions, paranoid schizophrenia patients were found to be significantly more accurate than the three other groups. In explaining their results, the authors argue that the paranoid patients’ greater sensitivity to spontaneous facial expressions of negative emotion may have actually led them to develop paranoid delusions in the first place. Hence, they suggest that greater sensitivity to spontaneous expressions of negative affect may lead to the development of paranoid cognitions.

Despite substantial methodological differences among the four studies described in this section, all suggest that paranoid patients are significantly less impaired than nonparanoid patients in the identification of facial emotion in others. Furthermore, the two studies that used spontaneous expressions of emotion even suggest that paranoid patients are more accurate than normal controls in identifying genuine expressions of negative affect in others (Davis & Gibson, 2000; LaRusso, 1978).
The fact that paranoid schizophrenia patients have not only been found to be more accurate than nonparanoid schizophrenia patients at recognizing posed and spontaneous facial expressions of negative emotion, but also more accurate than normal controls at identifying spontaneous expressions of negative emotion, is very interesting considering that paranoid schizophrenia patients, just like patients of all other schizophrenia subtypes, tend to be socially impaired (American Psychiatric Association, 2000; Corrigan, 1997). These findings are also interesting given that the type of stimulus used, posed or spontaneous, seems to make a difference.

As discussed earlier, schizophrenia patients have been found to have severe impairments in social functioning. These impairments include a difficulty establishing normal emotional contact with others, a tendency to attribute negative emotions to others, and a tendency to feel persecuted. Although it would be reasonable to assume that these impairments in social functioning might lead to the misperception of emotion in others, this assumption does not seem to hold for paranoid schizophrenia patients, because compared to nonparanoid schizophrenia patients, they do not seem to be impaired in the recognition of negative emotions. Consequently, there must be other factors that explain why paranoid schizophrenia patients are more accurate at recognizing facial expressions of negative emotion than others, especially spontaneous expressions of negative emotion. Spontaneous expressions of emotion, as mentioned earlier, tend to be perceived as less intense and more ambiguous than posed expressions of emotion (Ekman et al., 1987;
Halberstadt, 2003). Recent research findings suggest that certain individuals have a tendency to interpret ambiguous information as threatening. This negative interpretation bias appears to be specific to individuals suffering from certain anxiety disorders as well as schizophrenia patients with paranoia/persecutory delusions (Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Green & Phillips, 2004; Maher, 1988). Hence, given that paranoid schizophrenia patients have a tendency to misinterpret ambiguous information as threatening, this may explain why they show heightened perception of spontaneous expressions of negative emotion.

There is an accumulation of evidence suggesting that schizophrenia patients with paranoid/persecutory delusions exhibit biased processing of threat-related information (Bentall et al., 2001; Garety & Freeman, 1999; Green & Phillips, 2004). Research findings suggest that patients with paranoid/persecutory delusions require less information when making judgments (i.e., “jump to conclusions”) (Garety et al., 1991; Huq et al., 1988), tend to make external attributions for negative outcomes and internal attributions for positive outcomes (i.e., exaggerated self-serving bias) (Kinderman & Bentall, 1997), are impaired in their ability to infer other people’s mental states, a task involving much ambiguity (Craig et al., 2004; Frith, 2004; Frith & Corcoran, 1996), and are slower at naming the color of threat-related words on a Stroop task (Bentall & Kaney, 1989; Fear, Sharp, & Healy, 1996).
Probabilistic Reasoning

Using a task assessing probabilistic reasoning, a number of researchers have demonstrated that patients with paranoid/persecutory delusions seek less information to reach a decision than nonparanoid patients and control individuals (Garety et al., 1991). The probabilistic reasoning task, which is based on Bayes’ theorem, involves the use of pairs of jars containing a particular ratio of beads of two different colors. For example, jar X may contain 75 blue beads and 25 yellow beads, and jar Y may contain 75 yellow beads and 25 blue. Subjects are shown the two jars and are informed of the proportion of beads contained in each jar. The jars are then removed from view and subjects are informed that beads will be chosen from only one of the two jars and that either jar is equally likely to be chosen (50X:50Y). Beads are drawn sequentially and are always replaced. Subjects are asked to decide whether the beads are being drawn from jar X or jar Y. On this task, paranoid schizophrenia patients have been found to require significantly fewer draws than others before reaching a decision (Brankovic & Paunovic, 1999; Garety et al., 1991; Huq et al., 1988; Young & Bentall, 1997). This phenomenon, which has been termed the “jumping to conclusion” bias (Garety et al., 1991), has also been observed in nonschizophrenic individuals who have delusions or who are prone to delusions (Garety & Freeman, 1999). It has been argued that this bias occurs because individuals with delusions are intolerant of ambiguity (Garety et al., 1991; Maher, 1988). This bias has been used to explain how delusions are formed and maintained.
Attributional Style

Attributional biases are also believed to contribute to the formation and maintenance of delusions (Bentall et al., 2001; Bentall et al., 1994). Schizophrenia patients with paranoid/persecutory delusions seem to have an exaggerated self-serving bias relative to nonparanoid schizophrenia patients and controls (Garety & Freeman, 1999). Specifically, studies investigating attributional style in schizophrenia have found that paranoid patients tend to blame others for negative outcomes and to take credit for positive outcomes (Bentall, Kaney, & Dewey, 1991; Kinderman & Bentall, 1997; Martin & Penn, 2002). It has been argued that this self-serving bias serves a protective function for patients with paranoid/persecutory delusions, as it is only triggered when there is perceived external threat to the self (Bentall et al., 2001; Bentall & Kinderman, 1999). There have also been suggestions that paranoid patients’ misperception of the world as a threatening place leads them to blame others for negative events (Penn et al., 1997).

Theory of Mind

Another type of inferential abnormality observed in paranoid schizophrenia patients concerns the ability to mentalize the beliefs, thoughts, and intentions of others (theory of mind). Although a relatively new area of research in schizophrenia, recent studies have shown that schizophrenia patients with persecutory delusions are impaired in the ability to represent other people’s mental states (Corcoran et al., 1995; Craig et al., 2004; Frith & Corcoran, 1996). As one might imagine, the ability to take someone else’s perspective plays an important role in social interactions (Baron-Cohen, 1995). Some have implied that the frequently ambiguous nature of ordinary social interactions can
cause paranoid schizophrenia patients to misinterpret other people’s behavior or intentions, leading to the formation and maintenance of delusions (Frith, 1994; Garety & Freeman, 1999).

Selective Attention

Finally, studies using the emotional Stroop paradigm further provide evidence that paranoid schizophrenia patients selectively attend to threat-related stimuli (Bentall & Kaney, 1989; Fear et al., 1996). The emotional Stroop task is a measure of preattentive processing of words. This task is comprised of lists of words including neutral words, strings of Os, and depression-, anxiety-, and threat-related words, printed in different colors. Participants are asked to ignore the meaning of the words and to name the ink color of words as quickly as possible. Slow color naming is believed to be indicative of a strong response competition between reading and color naming and suggests selective attention to the words. Using the emotional Stroop task to investigate information processing in schizophrenia patients suffering from persecutory delusions, Bentall and Kaney (1989) and Fear et al. (1996) found that, compared to depressed and normal participants, the paranoid patients in their studies were significantly slower in naming the ink color of threat-related words. This finding suggests that schizophrenia patients with persecutory delusions are more vigilant to threatening information (Green & Phillips, 2004).

Collectively, the biases discussed above suggest that a number of cognitive biases associated with psychosis may be involved in the misperception of ambiguous information as threatening, which in turn may lead to the formation and maintenance of
paranoid/persecutory delusions. These biases could potentially explain why paranoid schizophrenia patients show heightened accuracy in perception of spontaneous expressions of negative emotion as negative. Regrettably, no studies have yet attempted to explain this finding.

The goals of the present study were twofold. First, we wished to replicate the finding that paranoid schizophrenia patients are more accurate than nonparanoid schizophrenia patients and normal controls at identifying spontaneous expressions of negative emotion. Second, we wished to test whether the cognitive biases that have been found in paranoid schizophrenia patients might be responsible for their heightened sensitivity to spontaneous expressions of negative emotion.
The present study addressed the following research questions:

1. Positive expressions of emotion
   a. *Are paranoid and nonparanoid schizophrenia patients less accurate than normal controls at identifying posed and genuine expressions of positive emotions (i.e., happiness)?*

   It was hypothesized that we would replicate earlier findings that paranoid and nonparanoid patients do not significantly differ from normal controls in their ability to identify posed and genuine expressions of positive emotion.

2. Negative expressions of emotion
   a. *Are paranoid and nonparanoid schizophrenia patients less accurate than normal controls at identifying posed expressions of negative emotions (i.e., sadness, anger, disgust, fear)?*

   It was hypothesized that we would replicate earlier findings that paranoid and nonparanoid patients are less accurate than normal controls at identifying posed expressions of negative emotion.

   b. *Are paranoid schizophrenia patients more accurate than nonparanoid patients and normal controls at identifying genuine expressions of negative emotions?*
Based on previous research findings, it was hypothesized that paranoid schizophrenia patients would be more accurate than nonparanoid schizophrenia patients and normal controls at identifying genuine expressions of negative emotions.

3. Negative bias
   a. *Are paranoid schizophrenia patients more likely than nonparanoid patients and normal controls to perceive the neutral facial expressions as negative?*

   It was hypothesized that paranoid patients would be more inclined than the nonparanoid patients and normal controls to identify the neutral expressions of emotion as expressions of negative emotion.

   b. *Does the paranoid patients’ performance on the cognitive measures differ from that of the nonparanoid patients and normal controls?*

   Based on previous research findings, it was hypothesized that paranoid patients’ scores on the cognitive measures would differ significantly from those of the nonparanoid patients and normal controls, in a direction indicative of cognitive biases in attention, attribution, judgment, and perception.

   c. *Do paranoid thinking and indications of bias on the cognitive measures predict better performance on the emotion recognition task for the genuine expressions of negative emotion?*
Based on the hypothesis that paranoid thinking is associated with a negative cognitive bias for ambiguous stimuli, it was hypothesized that paranoid thinking and biased performance on the cognitive measures would predict better performance on the emotion recognition task for the genuine negative emotions.

4. Posed versus genuine expressions of emotion
   a. *Will the three groups differ in their ability to differentiate between posed and genuine stimuli?*

   This was an exploratory analysis. An alternative to the negative bias hypothesis was that paranoid patients would be simply more sensitive to ambiguous expressions of emotion than others, which would allow them to be more accurate than others in the recognition of spontaneous expressions of emotion in others. Hence, if the negative bias hypothesis proved to be incorrect, then the paranoid schizophrenia patients would be expected to be more accurate than the nonparanoid schizophrenia patients and controls in differentiating between the posed and genuine stimuli.
METHOD

Participants

Participants in this study included individuals with a diagnosis of schizophrenia and nonpsychiatric controls. The clinical group was composed of outpatients receiving services either at Community Support Services (CSS) or at Summa’s Akron Center for Psychiatry. The control group was composed of individuals recruited from Kent State University’s support staff as well as from the general population. This study was approved by the Kent State University Institutional Review Board (#05570) and by the research ethics boards of Community Support Services and Summa Health System (RP#06064).

All patients included in the present study met DSM-IV criteria for schizophrenia or schizoaffective disorder (295.X) without any other Axis I diagnoses including alcohol/substance dependence or any signs of possible organic damage. Indications of possible organic damage included history of head injury resulting in unconsciousness or resulting in medical treatment, history of medical illness with known potential for brain damage, family history indicative of a possible heritable cognitive disturbance in the subject (e.g. Huntington’s Chorea), mental retardation, epilepsy, history of severe alcohol or drug dependence requiring rehabilitative treatment, and history or presentation consistent with delirium or dementia. Assessment of possible organic damage was based on observation, subject report, and clinical records. Patient participants were aged between 18 and 52 years, considered stabilized and capable of giving consent by their
treating therapist or psychiatrist, and fluent in English. Each patient’s diagnosis was validated by the administration of the Schedule for Affective Disorders and Schizophrenia (SADS) (Endicott & Spitzer, 1978).

Control participants were recruited through a variety of sources. About a third of the control participants responded to flyers distributed to the support staff at Kent State University while the remaining two thirds responded either to flyers posted in the community or an advertisement posted in the *Akron Beacon Journal*. Only individuals without a history of psychotic disorder (as assessed by the SADS) or neurological disease were included in the control group. Every effort was made to match the control group to the schizophrenic group on age, sex, and parents’ education.

**Materials**

A copy of all instruments used in this study can be found in Appendix E.

**Diagnosis**

The Schedule for Affective Disorders and Schizophrenia (SADS) (Endicott & Spitzer, 1978), a structured diagnostic interview, adapted for use with the DSM-IV (American Psychiatric Association, 1994), was administered to each participant by one of two graduate students trained on the measure. The interview was audiotaped with participant’s consent.

Meetings were held periodically with a clinical psychologist (Dr. Nancy Docherty) to help determine the diagnoses of certain individuals for whom the clinical presentation was complex. Dr. Docherty has extensive diagnostic experience and
attained good levels of diagnostic reliability in earlier studies (e.g., Kappa = .88 for schizophrenia) (Docherty, Serper, & Harvey, 1990).

The SADS is a widely used diagnostic instrument for clinical research purposes. The interview includes more than 200 items and takes from 1.5 to 2 hours to administer. Final ratings are made on a six-point Likert-type scale. The SADS has been shown to have good inter-rater and test-retest reliability (Endicott & Spitzer, 1978). Furthermore, validity studies have found that SADS diagnoses correspond with external measures of depression, anxiety, and psychosis (Coryell et al., 1994; Johnson, Margo, & Stern, 1986).

Symptom Severity

The Expanded Brief Psychiatric Rating Scale (BPRS) (Lukoff, Nuechterlein, & Ventura, 1986), a widely used instrument in schizophrenia research, was used to measure the severity of symptoms in the patient group. The BPRS consists of 24 items, each rated using a 1 (not present) to 7 (extremely severe) scale. Ratings were based on the totality of symptom information pertaining to the previous two weeks. Acceptable levels of inter-rater reliability between the two interviewers were attained using 11 audiotaped interviews (average ICC = 0.778 for BPRS items that could be rated without visual cues – i.e., items 1-12 and items 14-16; ICC = .787 for suspiciousness).

Much of the psychometric data available for the BPRS pertains to its original version, the 18-item BPRS (Overall & Gorham, 1962). However, the BPRS has been found to have good reliability and validity (Burlingame et al., 2005; Burlingame et al., 2006).
Paranoid vs. Nonparanoid Classification

Although previous studies have used DSM criteria to classify patients into paranoid and nonparanoid groups, this classification system was inadequate for the purposes of this study. The DSM-IV paranoid schizophrenia subtype is characterized by a preoccupation with one or more delusions organized around a coherent theme and/or frequent auditory hallucinations (American Psychiatric Association, 2000). In addition, disturbances in affect, volition, and speech, which are often observed in schizophrenia patients, are relatively mild and secondary in patients with the paranoid subtype. A major shortcoming with the classification of schizophrenia patients according to DSM criteria is that this approach does not distinguish between types of delusion experienced. Delusions, which are usually defined as false personal beliefs that are firmly held in spite of what almost everyone else believes and regardless of what usually constitutes unquestionable and obvious proof or evidence to the contrary, can in fact vary greatly in theme (American Psychiatric Association, 2000). Some patients may have delusions of grandeur, while others may have delusions of persecution, reference, somatic delusions, or religious delusions. Persecutory/paranoid delusions, however, are the most common type of delusion encountered in individuals suffering from schizophrenia. Individuals with these delusions believe that they are being conspired against, cheated, spied on, followed, poisoned or drugged, maliciously maligned, harassed, or obstructed in the pursuit of long-term goals (American Psychiatric Association, 2000). As implied above, the DSM paranoid subtype is over-inclusive and overlooks the content of the delusions.
experienced. The use of such a classification system creates a more heterogeneous group, which could potentially decrease the rigor of experimental work.

For the reasons outlined above, scores on the BPRS item 9 (suspiciousness) were used to divide our sample into paranoid and nonparanoid groups. Patients with a score of at least 3 points (mild) on this item were placed in our paranoid group while patients with a score of 1 (not present) or 2 (very mild) were placed in our nonparanoid group. It was anticipated that this approach would produce more homogeneous patient groups with respect to paranoid ideation compared to the use of DSM subtypes.

**Self-report of Paranoia and Suspiciousness**

Although specifically developed to assess the presence of paranoia and suspiciousness in non-psychiatrically-ill populations, both the healthy controls and schizophrenia patients included in this study were asked to complete the Paranoia/Suspiciousness Questionnaire (PSQ), a 47-item self-report measure (Rawlings & Freeman, 1996). The PSQ is comprised of five subscales: interpersonal suspiciousness/hostility (12 items), negative mood/withdrawal (7 items), anger/impulsiveness (9 items), mistrust/wariness (6 items), and perceived hardship/resentment (7 items).

The PSQ was used to compare the degree of paranoia and suspiciousness experienced in both groups. For each item, respondents were asked whether the statement applied to them by circling “yes” or “no”. Items endorsed in the positive direction were given a score of 1. Positively endorsed items were then summed to yield the various subscale scores.
The PSQ is relatively new and only the developers of the scale have investigated its psychometric properties (Rawlings & Freeman, 1996). The scale has been shown to have satisfactory reliability. The developers of the scale have found that the scale has high internal consistency (Cronbach’s alpha = .87). The PSQ’s subscales were also found to have adequate internal consistency (Cronbach’s alpha ranging from .65 to .77). Rawlings and Freeman also reported that scores on the PSQ tend to be stable over time (3-month test-retest = .82 for the full questionnaire while 3-month test-retest ranged between .59 and .82 for the five subscales). Although the scale appears to have good face validity, there are no reports of its validity in the literature.

IQ Estimates

The Shipley Institute of Living Scale (SILS) (Zachary, 1986) was administered to estimate participants’ overall intellectual functioning. The SILS consists of two subtests, one measuring verbal abilities and the other measuring abstract reasoning. The vocabulary subtest, which is comprised of 40 multiple-choice questions, requires the respondent to choose which of four words is closest in meaning to a target word. The abstraction subtest consists of 20 sequences of numbers, letters, or words. The respondent is asked to complete the final omitted element in each sequence. Subtest scores were summed and subsequently converted to estimate WAIS-R IQ scores (Zachary, 1985).
Facial Recognition Task

All participants completed the short form of the Benton Test of Facial Recognition (BTFR) (Benton, VanAllen, Hamsher, & Levin, 1978) to control for the possibility that poor performance on affect recognition is part of a global impairment in face recognition (Kerr & Neale, 1993). The BTFR is a neuropsychological test of visuospatial processes that consists of black and white photographs of unfamiliar male and female faces. The short form version consists of 13 trials. For the first six trials, respondents are presented a single frontal view photograph of a face, which is the target face, and are asked to determine which one face from an array of six faces below matches the target face. Three male and three female faces are presented for matching. For the next seven trials, respondents are again presented a target face, which consists of a single frontal view photograph, and are asked to identify which three faces from an array of six photographs of faces taken from different angles and lighting conditions match the target face. Three male and four female faces are presented. Responses were recorded on a record sheet and were later summed. Scores were then converted into long-form scores, which can range from 25 to 54. Scores between 41 and 54 are in the normal range, scores between 39 and 40 are considered borderline, scores between 37 and 38 suggest moderate impairment, and scores below 37 suggest severe impairment. There is very little data available on the reliability and validity of the test.

Emotion Recognition Task

All participants were asked to complete a facial emotion recognition task developed by the research team. The task consists of 48 color photographs presented on
a computer screen. Each photograph depicts a facial expression, including neutral, happiness, sadness, anger, fear, and disgust. There are eight examples of neutral expressions as well as eight examples of each emotion (four posed and four genuine). Two practice photographs (one of posed disgust and one of genuine happiness) were presented at the beginning of the task to ensure that participants fully understood the task. Each photograph was presented for five seconds with a five second interval between photographs, during which a black screen appeared. Respondents were asked to verbally identify the emotion displayed in each still. Responses were recorded by the investigator on a record sheet. An accuracy score (ranging from 0 – 4) was later calculated for each participant for each of the 11 conditions (posed and genuine facial expressions of the five emotions and neutral expressions). These scores were then converted into percentages to yield percentage accuracy scores.

The still photographs were created using Davis and Gibson’s (2000) method. With the approval of the Kent State University’s Institutional Review Board, still photographs of 12 (8 female and 4 male) undergraduate students enrolled in different sections of a General Psychology course were obtained. Participants were told that they were taking part in a study investigating physiological and psychological responses associated with various emotions. For the collection of genuine expressions of emotion, participants were unknowingly photographed with a digital camera through a one-way mirror while completing different emotion-arousing tasks. After the completion of these tasks, participants were fully debriefed about the purpose of the study and were asked if they would be willing to stay five more minutes to pose various expressions of emotion.
All participants agreed to pose the various expressions of emotion and all gave permission for their stills to be used in a future study on the recognition of posed and genuine expressions of emotion.

More than 1,000 still photographs of the participants were taken. Of these, approximately 200 still photographs clearly depicting neutral and emotional facial expressions were chosen by the principal investigator to validate the stills collected. A validation study of the still photographs was then conducted. In this study, 15 undergraduate students were presented 100 photographs depicting posed expressions of emotion while another 15 undergraduate students were presented 100 photographs depicting genuine expressions of emotion. Photographs were presented on a laptop computer screen for 10 seconds with a 10 second interval between each photograph. Judges were asked to identify the emotion displayed in each photograph. Judges were given a card listing seven emotions (happy, surprise, sad, anger, fear, disgust, and neutral) and were asked to respond verbally after the presentation of each photograph. The 48 photographs (4 posed of each emotion, 4 genuine of each emotion, and 8 neutral) with the highest inter-judge consistency (ranging from 15% to 100%) were initially selected. However, because consistency for surprise was low, a decision was made to remove these photographs from the stimulus set. The experimental stimuli therefore consist of 48 photographs. Examples of photographs used are presented in Appendix A. Appendix B presents the inter-judge consistency ratings for the final set of photographs.
**Stimulus Discrimination Task**

For the posed versus spontaneous discrimination task, the set of facial stimuli was presented a second time. Participants were informed that some of the photographs displayed posed facial expressions while others displayed spontaneous facial expressions. For each photograph, participants were asked to indicate verbally whether they believed the expression was spontaneous or posed. All responses were recorded by the investigator on a record sheet.

**Preattentional Processing of Threatening Words**

All participants completed Bentall and Kaney’s (1989) version of the emotional Stroop test to investigate preattentional processing of words referring to threatening themes. The test involves lists of words printed in a variety of ink colors. For each word, respondents were asked to ignore the meaning of the words and to only name the color of the ink in which the word is printed as quickly as possible. Response times in seconds were recorded for each word list. Slow color naming is believed to be reflective of a strong response competition between reading and color naming and suggests selective attention to the words.

The version of the emotional Stroop used in this study consisted of four lists of words (threat-related words such as “deceit” and “spy”, depression-related words such as “failure” and “sad”, anxiety-related words such as “panic” and “terror”, and neutral words such as “bud” and “recipe”), and a list of meaningless strings of Os.
At this time, no psychometric data are available for this test. However, previous studies have found that schizophrenia patients with persecutory delusions show slowed color naming for the threat-related words in comparison to neutral words (Bentall & Kaney, 1989; Fear et al., 1996). This response pattern was found to be unique to the schizophrenia patients with persecutory delusions.

**Attributional Style**

The Internal, Personal, and Situational Attributions Questionnaire (IPSAQ) (Kinderman & Bentall, 1997) was used to assess causal locus. The IPSAQ is a 32-item questionnaire that describes 16 positive and 16 negative social situations in the second person singular. For each item, respondents were asked to write down the main cause of the event/situation and were also asked to categorize the cause as being either internal (something to do with themselves), personal (something to do with another person or persons), or situational (something to do with chance circumstances). Three positive event attribution (internal, personal, and situational) and three negative event attribution (internal, personal, and situational) subscale scores were then generated. Two cognitive bias scores were derived from these six subscale scores. Externalizing Bias (EB) was calculated by subtracting the number of internal attributions for negative events from the number of internal attributions for the positive events. A high EB score indicates a strong self-serving bias (the tendency to take credit for positive events and to blame others or circumstances for negative events). Personalizing Bias (PB) was calculated by dividing the number of personal attributions by the sum of both personal and situational
attributions for negative events. A high PB score indicates the tendency to use personal rather than situational attributions for negative events.

Kinderman and Bentall (1997) have investigated the psychometric properties of their questionnaire. They report that the IPSAQ’s six subscales have acceptable levels of internal reliability (Cronbach’s alpha ranging from .60 to .75). No data on the stability of scores over time or on inter-scorer reliability are currently available. In terms of the questionnaire’s validity, the authors note that the validity of their attribution classification is supported by the differential associations between different attribution types and variables measured with the Paranoia Scale (PS), the Attribution Scale Questionnaire (ASQ) and the Beck Depression Inventory (BDI).

Theory of Mind Task

A novel theory of mind (ToM) task developed by Brüne (2003, 2005) was used to assess each participant’s ability to understand other people’s mental states. The ToM task is comprised of six cartoon picture stories. These cartoons depict three types of stories: (1) two scenarios where two characters cooperate with each other, (2) two scenarios where one character deceives a second character, and (3) two scenarios where two characters cooperate to deceive a third character. Each picture story consists of four cards. The cards were presented face down in a randomly mixed fashion. Respondents were asked to turn the cards over and to order them in a logical sequence of events. Two points were given for each of the first and last cards if correctly sequenced, and one point was given for correct sequencing of each of the middle cards. The score for each picture
story ranged from 0 to 6, for a maximum score of 36 for all six stories. Responses and time required to complete each picture story were recorded on a response sheet.

After completing each picture story task, respondents were given a ToM questionnaire, which tested respondents’ ability to appreciate the mental states of the characters involved in the cartoon stories. The ToM questionnaire was comprised of 23 questions. Each correct response on the questionnaire was worth one point, with a maximum total score of 23 points. Scores on the ToM sequencing task and questionnaire were then summed for a maximum total score of 59.

It should be noted that no psychometric data are available at this time for this ToM task. However, previous studies have found that schizophrenia patients are impaired on this ToM task relative to control subjects (Brüne, 2005a; Brüne & Bodenstein, 2005). Specifically, patients have been found to make more errors in sequencing the picture stories, are slower in sequencing the picture stories, and perform more poorly on the ToM questionnaire. Furthermore, schizophrenia patients’ performance on this ToM task has been found to correlate with intelligence, executive functioning, and proverb understanding.

Probabilistic Reasoning

All participants completed a probabilistic reasoning task (Garety et al., 1991; Huq et al., 1988). The stimulus material for this task consisted of two pairs of jars. Each pair of jars contained an equal number of colored beads (100 beads), but in opposite proportions (85:15). Hence, jar A contained 85 blue beads and 15 clear beads while jar B contained 85 clear beads and 15 blue beads. The other pair of jars (jars X and Y)
contained the same proportion of beads, except that the beads were of different color (orange and green). The “draws to decision” condition was used in this study. In this condition, participants were shown jars A and B and were informed of the proportion of blue and clear beads in each jar before the jars were removed from view. Participants were then informed that beads would be drawn from one jar (either A or B), that they would be shown the beads, and that finally the beads would be returned to their jar of origin, one at a time. Participants were given two cards, a YES card displaying the message “please draw another bead” and a NO card displaying the message “no more draws, I have decided”, and were asked to indicate after each draw if they could decide with certainty from which jar the beads were being drawn. Subjects were instructed to point to the YES card if they wanted the investigator to draw another bead. They were told to point to the NO card when they reached their decision. There was no limit on the number of beads that could be drawn and the procedure was repeated a second time with the second pair of jars (jars X and Y). Responses were be recorded by the investigator on a record sheet.

It should be noted that the psychometric properties of this task have not yet been investigated. Previous studies, however, have found that schizophrenia patients, especially deluded patients, are quicker in reaching decisions than control participants (Garety et al., 1991; Huq et al., 1988; Moritz & Woodward, 2005). The results of a recent study by Garety and her colleagues (2005) also suggest that probabilistic reasoning is negatively associated with belief flexibility (i.e. ability to change one’s beliefs when
presented alternatives), but not with emotional disturbance as measured by the Beck Depression Inventory and the Beck Anxiety Inventory.

**Procedures**

Two approaches were taken to recruit schizophrenia patients receiving services at CSS. First, patients who had participated in previous studies conducted by lab members were contacted by telephone by the last lab member who interviewed them and were given information about the present study. Those expressing an interest in participating in the study were subsequently contacted by telephone by one of the two investigators working on the project. During this telephone conversation, patients were given more specific information about the study, were asked screening questions to ensure they met research criteria, and were given an appointment to meet at CSS. Second, recruitment flyers and posters were placed in the waiting room at CSS. Patients interested in participating in the study were asked to contact the P.I. by telephone. During the initial telephone contact, patients were given further information about the present study, were asked screening questions to ensure they met inclusion criteria, and were given an appointment to meet at CSS.

Additionally, psychiatrists and a psychiatric nurse working at Summa’s Akron Center for Psychiatry were given information about the current study. They were asked to share this information with patients identified as suitable to participate in this project. Patients interested in participating in the study were asked to contact the P.I. directly by telephone. During the telephone contact, patients were screened to ensure they met
inclusion criteria and were given an appointment if they were deemed suitable for this study.

The schizophrenia patients were assessed individually in two sessions, on separate days, at CSS or at St. Thomas Hospital in Akron, which is part of Summa Heath System. Informed consent was obtained at the outset of the study protocol. Releases of information forms were also completed to allow the investigators to contact each patient’s case manager and review their records to verify psychiatric diagnosis. During the first meeting, patients were administered the SADS, which was subsequently used to validate diagnoses, establish symptom severity (BPRS), and determine schizophrenia subtype (BPRS). Patients also completed the SILS and were asked questions pertaining to their psychiatric history, medication use, and demographics. During the second session, which was scheduled no more than two weeks after the first meeting, patients were asked to complete the social cognitive measures (IPSAQ, emotional Stroop, probabilistic reasoning task, and theory of mind task), as well as the facial recognition task and the emotion recognition task. Each testing session lasted between 1½ and 2 hours and patients received $20 at the completion of each session.

The healthy normal control participants were recruited through advertisements aimed at the support staff employed at Kent State University as well as through newspaper advertisements and flyers posted in the community. Individuals interested in obtaining more information about the study were asked to contact one of the two investigators. Those interested in participating in the study were screened over the
telephone to ensure they met inclusion criteria and that they matched the patient groups. An appointment was scheduled with those interested in participating in the study.

The assessment procedure for the normal control participants was similar to that of the schizophrenia patients. Control participants, however, were interviewed and tested in one single session, which lasted between 2-3 hours. Control subjects were given $40 at the end of the session.
STATISTICAL ANALYSES

The following statistical analyses were performed to answer our research questions:

1. Positive expressions of emotion
   a. *Are paranoid and nonparanoid schizophrenia patients less accurate than normal controls at identifying posed and genuine expressions of positive emotions (i.e., happiness)?*

   To answer this question, the three groups’ (paranoid patients, nonparanoid patients, and control participants) percentage accuracy scores for posed and genuine expressions of happiness were compared using one-way analysis of variance (ANOVA).

2. Negative expressions of emotion
   a. *Are paranoid and nonparanoid schizophrenia patients less accurate than normal controls at identifying posed expressions of negative emotions (i.e., sadness, anger, disgust, fear)?*

   b. *Are paranoid schizophrenia patients more accurate than nonparanoid patients and normal controls at identifying genuine expressions of negative emotions?*

   To answer these two questions, one-way ANOVAs were performed to compare the three groups’ percentage accuracy scores for posed and genuine expressions of negative emotions.
3. Negative bias
   
   a. *Are paranoid schizophrenia patients more likely to perceive the neutral facial expressions as more negative than the nonparanoid patients and normal controls?*
      
      To answer this question, a repeated-measures ANOVA was performed to compare the responses of the three groups for the neutral facial expressions.

   b. *Will the paranoid patients’ performance on the cognitive measures differ from that of the nonparanoid patients and normal controls?*
      
      A series of one-way ANOVAs was performed to answer this question.

   c. *Do paranoid thinking and indications of bias on the cognitive measures predict better performance on the emotion recognition task for the genuine negative emotions?*
      
      To answer this question, Pearson correlations were performed between the paranoid thinking variable, cognitive variables, and performance on the emotion recognition task for the genuine negative emotions. A linear regression analysis was then performed. Scores on the Paranoia/Suspiciousness Questionnaire as well as scores on the cognitive measures were entered into the regression equation to predict accurate recognition of genuine negative expressions of emotion.

4. Posed versus genuine expressions of emotion
   
   a. *Will the three groups differ in their ability to differentiate between posed*
and genuine stimuli?

For this exploratory analysis, a repeated measures analysis was conducted. It should be noted that we were well aware that the experimentwise type I error rate increases with the number of statistical analyses conducted within a study. However, given that this study evaluated specific pre-defined hypotheses, Bonferroni corrections were not applied (Tabachnick & Fidell, 2001). Therefore, as indicated above, the alpha level of each test was set at 0.05.
RESULTS

Participants

Sixty-two individuals receiving outpatient psychiatric services at either CSS or Summa Health System, and 29 individuals from the community and university staff without a history of major mental illness agreed to complete the study protocol.

Among the patient volunteers, 11 were excluded from the study because they failed to meet inclusion criteria. Specifically, two carried a primary psychiatric diagnosis other than schizophrenia, one had a legal guardian, two had a history of head injury causing loss of consciousness, and six had a significant history of alcohol or inhalant drug abuse which may have caused brain damage. Additionally, the data of one patient were excluded because this individual failed to complete most of the study assessments. The final patient sample therefore consisted of 50 (33 male and 17 female) individuals with a current DSM-IV (American Psychiatric Association, 2000) diagnosis of schizophrenia \( (n = 28) \) or schizoaffective disorder \( (n = 22) \). In terms of the racial distribution of the patient sample, 48\% \( (n = 26) \) were African American, 46\% \( (n = 24) \) were Caucasian, and 6\% \( (n = 3) \) were Hispanic. Patients ranged in age from 24 to 52 \( (M = 42.2 \text{ years}, SD = 6.8 \text{ years}) \) and had completed an average of 12.2 years of education \( \text{range 8-18, } SD = 1.8 \). Mean IQ for the patient sample, based on the Shipley Institute for Living Scale, was 85.2 \( (SD = 12.9) \). Patients’ scores on the Benton Test of Facial Recognition were well within the normal range, indicating that they did not have any difficulties recognizing faces of strangers.
Patients’ overall level of psychological, social, and occupational functioning at the time of testing was moderate with GAF scores ranging from 40 to 76 ($M = 59, SD = 8.1$). Patients were, on average, only mildly symptomatic. Total scores on the 24-item Brief Psychiatric Rating Scale (BPRS) ranged from 27 to 68 on a possible score of 168 ($M = 44, SD = 10.2$). All patients were prescribed at least one antipsychotic medication (range 1-3); 10% ($n = 5$) were only prescribed typical antipsychotic medication, 76% ($n = 38$) were only prescribed atypical antipsychotic medication, and 14% ($n = 7$) were prescribed a combination of typical and atypical antipsychotic medication. Patients’ mean age at onset of the disorder was $20.3$ ($SD = 6.6$ years), the mean length of illness was $21.6$ years ($SD = 6.7$ years), and the mean number of hospital admissions for psychiatric reasons was $9.4$ ($SD = 8.8$).

All 29 (17 male and 12 female) nonpsychiatric control participants assessed for this study met inclusion criteria. Fifty-eight percent ($n = 17$) were Caucasian, 37.9% ($n = 11$) were African American, and 3.4% ($n = 1$) were Hispanic. Control participants ranged in age from 21 to 50 years ($M = 39.7, SD = 8.9$). All but one had a high school degree, with education level ranging from 11 to 18 years ($M = 13.9, SD = 1.6$). Mean IQ for the group was $98.4$ ($SD = 11.7$). Overall, controls’ psychological, social, and occupational functioning was good with GAF scores ranging from 74 to 85 ($M = 80.4, SD = 3.3$).

The patient and control groups did not significantly differ from each other in terms of age, gender, racial distribution, and parental education. Controls, however, were significantly more educated, had higher IQ scores, and were functioning better than
patients \( t(78) = 4.3, p < .001; t(77) = 4.5, p < .001, \) and \( t(78) = 13.6, p < .001 \) respectively.

**Characteristics of patients based on low and high paranoia/suspiciousness ratings**

The patient group was divided into two groups according to scores on the paranoia/suspiciousness item of the BPRS (item 9). The nonparanoid group was comprised of the 26 patients who were given a score of 1 (not present) or 2 (very mild) while the paranoid group consisted of the 24 patients who were given a score of 3 (mild) and above. Participants’ demographic and patients’ clinical characteristics are presented in Table 1. One-way ANOVAs revealed that the patient groups and controls did not significantly differ from each other in terms of age, parental education, and facial recognition (Benton Test of Facial Recognition). Controls, however, obtained much lower scores on the Paranoia/Suspiciousness Questionnaire, completed more years of education, obtained higher IQ estimates, and were functioning at a significantly higher level than the two patient groups \( F(2,76) = 32.8, p < .001; F(2, 76) = 9.3, p < .001; F(2, 76) = 10.1, p < .001; F(2, 76) = 110.0, p < .001 \) respectively. Comparisons between the two patient groups revealed that, although paranoid and nonparanoid patients did not differ in terms of age of onset of the illness, duration of illness, and number of lifetime psychiatric hospitalizations, the patients in the paranoid group were significantly more symptomatic and functioning at a lower level than the patients in the nonparanoid group \( t(48) = 3.1, p = .003 \) for BPRS total score; \( t(48) = -3.0, p = .005 \) for GAF score. Not surprisingly, paranoid patients also obtained significantly higher scores on the PSQ \( t(48) = 4.4, p < .001 \).
Table 1. Demographic and clinical characteristics of nonparanoid patients, paranoid patients, and controls

<table>
<thead>
<tr>
<th></th>
<th>Nonparanoid Patients</th>
<th>Paranoid Patients</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>26</td>
<td>24</td>
<td>n = 29</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>65.4</td>
<td>66.7</td>
<td>58.6</td>
</tr>
<tr>
<td>Ethnicity (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>57.7</td>
<td>33.3</td>
<td>58.6</td>
</tr>
<tr>
<td>African American</td>
<td>42.3</td>
<td>54.2</td>
<td>37.9</td>
</tr>
<tr>
<td>Hispanic</td>
<td>--</td>
<td>12.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Age (years)</td>
<td>42.4 ± 8.1</td>
<td>42.1 ± 5.4</td>
<td>39.7 ± 9</td>
</tr>
<tr>
<td>Education (years)</td>
<td>12.3 ± 2</td>
<td>12.1 ± 1.6</td>
<td>13.9 ± 1.6</td>
</tr>
<tr>
<td>Father’s education (years)</td>
<td>12.1 ± 3.5</td>
<td>10.8 ± 3.2</td>
<td>12.6 ± 3.2</td>
</tr>
<tr>
<td>Mother’s education (years)</td>
<td>12.4 ± 2.6</td>
<td>11.0 ± 2.7</td>
<td>12.9 ± 2.6</td>
</tr>
<tr>
<td>GAFa</td>
<td>62.1 ± 7.2</td>
<td>55.8 ± 7.9</td>
<td>80.4 ± 3.3</td>
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<tr>
<td>IQ (Shipley estimate)</td>
<td>85.3 ± 13.1</td>
<td>85.2 ± 13.0</td>
<td>95.4 ± 11.7</td>
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<tr>
<td>Benton Facial Recognition Testb</td>
<td>45.7 ± 11.5</td>
<td>45.5 ± 3.6</td>
<td>48.3 ± 3.7</td>
</tr>
<tr>
<td>Paranoia/Suspiciousness Questionnairec</td>
<td>17.1 ± 10.0</td>
<td>29.1 ± 9.0</td>
<td>8.5 ± 8.6</td>
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<tr>
<td>Age at onset (years)</td>
<td>20.8 ± 5.7</td>
<td>19.7 ± 7.6</td>
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<tr>
<td>Length of illness (years)</td>
<td>21.6 ± 7.1</td>
<td>21.5 ± 6.4</td>
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<tr>
<td>Psychiatric hospitalizations</td>
<td>8.3 ± 9.0</td>
<td>10.6 ± 8.7</td>
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<tr>
<td>BPRS totald</td>
<td>40.0 ± 7.6</td>
<td>48.3 ± 10.8</td>
<td>-</td>
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</table>

a GAF scores range from 0 to 90
b Benton scores range from 25 - 54
c PSQ scores range from 0 - 47
d BPRS scores range from 24 - 168
Research Question #1: Recognition of Positive Emotions

The percentage of correct responses of schizophrenia patients and control participants for posed and spontaneous expressions of positive emotion (i.e., happiness) was first examined. As can be seen in Figures 1a and 1b, as well as Table 2, patients and controls accurately recognized all posed and spontaneous pictures of positive expressions of emotion. The absence of variance for the positive emotion variables precluded the performance of comparative analyses.

The results suggest that patients and controls were perfectly able to recognize facial expressions of happiness, regardless of whether the facial expression displayed posed or spontaneous positive emotion.

Research Question #2: Recognition of Negative Emotions

Before comparing participants’ emotion recognition accuracy scores, an analysis was conducted to determine whether they responded randomly or with accuracy better than chance. A comparison of participants’ accuracy scores for the 16 posed expressions of negative emotions with the accuracy expected by pure chance (M = 3.2 or 16 × 1/5) revealed a significant difference in favor of participants’ accuracy [M = 5.9, t(25) = 5.7, p < .05 for nonparanoid patients; M = 6.5, t(23) = 8.1, p < .05 for paranoid patients, and M = 8.7, t(28) = 13.5, p < .05 for controls]. Participants’ accuracy scores for the 16 spontaneous expressions of negative emotions were also found to be above chance level [M = 7.7, t(25) = 8.8, p < .05 for nonparanoid patients; M = 8.0, t(23) = 11.2, p < .05 for paranoid patients; and M = 9.8, t(28) = 18.7, p < .05 for controls]. Hence, it appears that
Fig. 1a, Performance on emotion recognition task (spontaneous expressions)

![Graph showing performance on emotion recognition task (spontaneous stimuli)](image1a)

Fig. 1b, Performance on emotion recognition task (posed expressions)

![Graph showing performance on emotion recognition task (posed stimuli)](image1b)
Table 2. Percentage of correct responses for emotion recognition variables for nonparanoid patients, paranoid patients, and control participants

<table>
<thead>
<tr>
<th>Stimulus Type</th>
<th>Nonparanoid Patients</th>
<th>Paranoid Patients</th>
<th>Controls</th>
<th>F (df = 2)</th>
<th>Post-hoc comparisons</th>
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<tbody>
<tr>
<td></td>
<td>n = 26</td>
<td>n = 24</td>
<td>n = 29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posed Positive</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Spontaneous Positive</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Posed Negative</td>
<td>37 (15)</td>
<td>41 (12)</td>
<td>54 (16)</td>
<td>7.6**</td>
<td>nonpar, par &lt; ctrl</td>
</tr>
<tr>
<td>Sadness</td>
<td>55 (31)</td>
<td>60 (28)</td>
<td>66 (30)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>34 (23)</td>
<td>48 (24)</td>
<td>59 (24)</td>
<td>8.0**</td>
<td>nonpar &lt; par &lt; ctrl</td>
</tr>
<tr>
<td>Disgust</td>
<td>42 (32)</td>
<td>37 (23)</td>
<td>59 (21)</td>
<td>4.9**</td>
<td>par &lt; nonpar &lt; ctrl</td>
</tr>
<tr>
<td>Fear</td>
<td>17 (20)</td>
<td>17 (20)</td>
<td>31 (26)</td>
<td>3.5*</td>
<td>nonpar, par &lt; ctrl</td>
</tr>
<tr>
<td>Spontaneous Negative</td>
<td>48 (15)</td>
<td>50 (13)</td>
<td>61 (12)</td>
<td>12.4**</td>
<td>nonpar, par &lt; ctrl</td>
</tr>
<tr>
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<td>59 (31)</td>
<td>76 (25)</td>
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<td></td>
</tr>
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<td>47 (22)</td>
<td>52 (23)</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Disgust</td>
<td>39 (25)</td>
<td>43 (27)</td>
<td>50 (20)</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td>45 (32)</td>
<td>57 (27)</td>
<td>68 (22)</td>
<td>4.9**</td>
<td>nonpar &lt; ctrl</td>
</tr>
<tr>
<td>Neutral as Positive</td>
<td>36 (25)</td>
<td>27 (23)</td>
<td>28 (24)</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Neutral as Negative</td>
<td>51 (28)</td>
<td>60 (30)</td>
<td>69 (27)</td>
<td>2.7</td>
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<tr>
<td>Posed</td>
<td>48 (20)</td>
<td>46 (13)</td>
<td>54 (15)</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>59 (17)</td>
<td>67 (12)</td>
<td>60 (9)</td>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05. **p < .01.
participants were motivated to perform well on the emotion recognition task and achieved accuracy scores well above chance level.

The percentage of correct responses of schizophrenia patients and control participants for the recognition of negative emotions (combination of sadness, anger, disgust, and fear) was then examined. The data met the assumptions of analysis of variance. As can be seen in Table 2, the results of the one-way ANOVAs revealed that paranoid and nonparanoid schizophrenia patients were significantly less accurate than control participants at recognizing posed and spontaneous expressions of negative emotions. The magnitude of the difference for both conditions was large ($\Omega^2 = .206$ for posed; $\Omega^2 = .143$ for spontaneous) (Kirk, 1996).

Pearson correlations were computed to examine the relationship between accuracy scores for the recognition of negative emotion and demographic variables in each group. Overall, recognition of posed expressions of negative emotion was not associated with any of the demographic variables. Recognition of spontaneous expressions of negative emotion, however, correlated with IQ in each group ($r = .470$, p = .015 for nonparanoid group; $r = .413$, p = .045 for paranoid group; and $r = .380$, p = .042 for control group). Individuals with higher IQ estimates were therefore more likely to obtain higher accuracy scores for the recognition of spontaneous expressions of negative emotion. Student’s $t$-tests were also performed to examine whether gender and race played a role in the recognition of negative emotions. The results of the analyses revealed that gender did not have any effect on emotion recognition abilities in our participant groups. However, among the nonparanoid group, Caucasian patients obtained
significantly higher accuracy scores for the recognition of spontaneous expressions of negative emotions than African American patients ($t(24) = 2.274, p = .032$).

Given that IQ estimates correlated significantly with the recognition of spontaneous expressions of emotion, group comparisons were performed once again, but this time controlling for IQ. The results of the ANCOVA suggested that, after controlling for IQ, accuracy scores for nonparanoid patients, paranoid patients, and control participants no longer significantly differed [$F(2) = 1.983, p = .145$].

Although race had an influence on the recognition of spontaneous expressions of negative emotion in the nonparanoid group, no attempt was made to control for race because the groups did not differ much in terms of race. Furthermore, because of the small samples size, group by race comparisons could not be performed. It would be interesting to explore the effect of race on emotion recognition in a larger sample.

Group comparisons of the percentages of correct responses for each specific negative emotion were also conducted (see Table 2). The results of the one-way ANOVAs revealed that nonparanoid and paranoid patients were less accurate than controls at recognizing posed expressions of anger and fear. The results of the analyses also revealed that paranoid patients were less accurate than nonparanoid patients, who in turn were less accurate than control participants, at recognizing posed expressions of disgust. Finally, nonparanoid patients were found to be less accurate than control participants at recognizing spontaneous expressions of fear.

Pearson correlations were performed between accuracy scores for each posed and spontaneous negative emotions and demographic variables. In terms of specific posed
expressions of negative emotions, the only significant correlations found were between
the recognition of sad expressions and IQ ($r = .372, p = .047$) and between the
recognition of sad expressions and age ($r = -.414, p = .026$) in the control group.

Regarding specific spontaneous expressions of negative emotion, IQ was found to be
significantly correlated with the recognition of disgust ($r = .471, p = .015$) and fear ($r =
.474, p = .014$) in the nonparanoid patient group. None of the demographic variables was
found to be associated with paranoid patients’ ability to recognize specific expressions of
negative emotions. Student’s t-tests revealed that Caucasian nonparanoid schizophrenia
patients obtained significantly higher accuracy scores for the recognition of spontaneous
expressions of sad expressions than African American nonparanoid patients [$t(24) =
2.255, p = .034$]. Comparisons also revealed that African American control participants
obtained significantly higher accuracy scores for the recognition of posed expressions of
anger than Caucasian control participants [$t(26) = 2.106, p = .045$]. For the reasons listed
above, no additional analyses were performed to control for race. Gender did not have
any effect on participants’ ability to recognize specific expressions of negative emotion.

A repeated measures analysis was conducted to examine individual differences in
accuracy scores for the recognition of posed and spontaneous expressions of emotion.
The results of the analysis revealed a significant within-group main effect [$F(1) = 35.7, p
< .001$], with all three groups achieving higher accuracy scores for the recognition of
spontaneous expressions of negative emotions (see Figure 2). The effect size was large
(Cohen’s $f = .684$) (Cohen, 1988).
Repeated measures analyses were also performed to examine individual differences in accuracy scores for the recognition of posed and spontaneous expressions of each type of negative emotion. The results of the analyses revealed significant within-group main effects for sadness and fear \( F(1) = 5.5, p = .021 \) for sadness; \( F(1) = 112.1, p < .001 \), but no significant differences for anger and disgust. Hence, participants achieved higher recognition accuracy scores for spontaneous expressions of sadness and

Fig. 2, Within-subjects comparison of accuracy scores for posed and spontaneous expressions of negative emotions
fear, but achieved similar scores for posed and spontaneous expressions of anger and disgust (see Figures 3a – 3d).

Finally, patterns of error rates were examined. For both posed and spontaneous expressions of emotion, all three groups exhibited a generally comparable nonrandom pattern of errors (see Table 3). Specifically, error patterns for posed expressions were as follows: sad was most commonly misrecognized as disgust, anger was misclassified as disgust, disgust was misrecognized as happy, and fear was misclassified as happy and disgust. Error patterns for spontaneous expressions of emotion were fairly similar to those found for posed expressions: sad was most commonly misclassified as disgust, anger was misrecognized as happy and disgust, disgust was misclassified as happy and sad, and fear was misrecognized as disgust.

*Research Question # 3: Negative bias*

A repeated-measures analysis was performed to determine whether paranoid patients were more inclined than nonparanoid patients and control participants to use negative emotion labels to rate the neutral facial expressions. The within-group effect was found to be significant \(F(1) = 38, p < .001\), but the between group-effect and the interaction term were not significant. The three groups were significantly more likely to use a negative emotion label to describe the neutral facial expressions than to use the positive emotion label. The magnitude of the difference between both conditions was large (Cohen’s \(f = .707\)) (Cohen, 1988). Figure 4 presents the distributions of the
Fig. 3. Within-group comparisons of accuracy scores for posed and spontaneous expressions of sadness, anger, disgust, and fear

3a. Sad

3b. Anger

c. Disgust

3d. Fear
Table 3a. Frequency of responses for nonparanoid schizophrenia patients

<table>
<thead>
<tr>
<th>Response</th>
<th>Option</th>
<th>Happy</th>
<th>Sad</th>
<th>Anger</th>
<th>Disgust</th>
<th>Fear</th>
<th>Happy</th>
<th>Sad</th>
<th>Anger</th>
<th>Disgust</th>
<th>Fear</th>
<th>Neutral</th>
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<tbody>
<tr>
<td></td>
<td>Happy</td>
<td>104</td>
<td>4</td>
<td>5</td>
<td>33</td>
<td>41</td>
<td>104</td>
<td>0</td>
<td>27</td>
<td>21</td>
<td>14</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
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<td>57</td>
<td>19</td>
<td>6</td>
<td>12</td>
<td>0</td>
<td>74</td>
<td>11</td>
<td>24</td>
<td>12</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Anger</td>
<td>0</td>
<td>5</td>
<td>34</td>
<td>6</td>
<td>9</td>
<td>0</td>
<td>11</td>
<td>39</td>
<td>11</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Disgust</td>
<td>0</td>
<td>31</td>
<td>48</td>
<td>44</td>
<td>21</td>
<td>0</td>
<td>11</td>
<td>20</td>
<td>30</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Fear</td>
<td>0</td>
<td>7</td>
<td>29</td>
<td>15</td>
<td>19</td>
<td>0</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>47</td>
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</table>

Table 3b. Frequency of responses for paranoid schizophrenia patients

<table>
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<th>Response</th>
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<th>Sad</th>
<th>Anger</th>
<th>Disgust</th>
<th>Fear</th>
<th>Happy</th>
<th>Sad</th>
<th>Anger</th>
<th>Disgust</th>
<th>Fear</th>
<th>Neutral</th>
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<tbody>
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<td>36</td>
<td>41</td>
<td>96</td>
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<td>55</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>0</td>
<td>61</td>
<td>10</td>
<td>5</td>
<td>14</td>
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<td>19</td>
<td>7</td>
<td>51</td>
</tr>
<tr>
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<td>Anger</td>
<td>0</td>
<td>3</td>
<td>47</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>7</td>
<td>40</td>
<td>11</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Disgust</td>
<td>0</td>
<td>24</td>
<td>32</td>
<td>36</td>
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<td>41</td>
<td>17</td>
<td>38</td>
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<tr>
<td></td>
<td>Fear</td>
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<td>7</td>
<td>1</td>
<td>14</td>
<td>16</td>
<td>0</td>
<td>5</td>
<td>12</td>
<td>4</td>
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Table 3c. Frequency of responses for nonpsychiatric control participants

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<th></th>
<th></th>
<th></th>
<th></th>
<th>Spontaneous</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Happy</td>
<td>Sad</td>
<td>Anger</td>
<td>Disgust</td>
<td>Fear</td>
<td>Happy</td>
<td>Sad</td>
<td>Anger</td>
<td>Disgust</td>
<td>Fear</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Happy</td>
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<td>37</td>
<td>116</td>
<td>1</td>
<td>15</td>
<td>22</td>
<td>8</td>
<td>64</td>
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<tr>
<td>Sad</td>
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<td>7</td>
<td>0</td>
<td>86</td>
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<td>17</td>
<td>3</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>0</td>
<td>7</td>
<td>69</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>59</td>
<td>12</td>
<td>10</td>
<td>25</td>
<td></td>
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</tr>
<tr>
<td>Disgust</td>
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<td>23</td>
<td>32</td>
<td>69</td>
<td>35</td>
<td>0</td>
<td>21</td>
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<td>58</td>
<td>16</td>
<td>46</td>
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</tr>
<tr>
<td>Fear</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>8</td>
<td>36</td>
<td>0</td>
<td>3</td>
<td>15</td>
<td>7</td>
<td>78</td>
<td>39</td>
<td></td>
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</tr>
</tbody>
</table>
Fig. 4, Breakdown of emotion labels used for neutral facial expressions

Nonparanoid patients (n = 26)

- Happy: 39%
- Sad: 18%
- Angry: 10%
- Disgusted: 19%
- Fearful: 14%

Paranoid patients (n = 24)

- Happy: 29%
- Sad: 27%
- Angry: 7%
- Disgusted: 20%
- Fearful: 17%

Control Participants (n = 29)

- Happy: 27%
- Sad: 25%
- Angry: 11%
- Disgusted: 20%
emotion labels used to describe the neutral facial expressions for each group. These results suggest therefore that paranoid schizophrenia patients were not more likely than the other two groups to use a negative emotion label to rate the neutral facial expressions.

Table 4 presents groups’ mean scores on the various cognitive measures. Although the cognitive data were normally distributed, the homoscedasticity assumption was violated in some cases. Levene’s test of homogeneity of variance suggested that group variances for performance on the theory of mind task, the probabilistic reasoning task, and certain emotional Stroop word lists were significantly different from one another. Scores on these various measures were transformed to resolve the heteroscedasticity problem. The transformed scores, however, did not affect the results. Because the transformations were associated with the loss of some data, it was therefore decided to retain the results obtained from the nontransformed data.

One-way ANOVAs were conducted to compare the three groups’ scores on the four cognitive measures. Results of these comparisons are presented in Table 4. As can be seen in the table, paranoid schizophrenia patients requested fewer draws than nonparanoid patients and control participants when completing the probabilistic reasoning task. The differences, however, did not reach statistical significance. In terms of the types of attributions made by participants on the IPSAQ, the results of the analyses suggest that participants made similar types of attributions. The only significant differences obtained were for personal attributions for negative events, and for personal
Table 4. Comparison of scores obtained on the cognitive measure for nonparanoid patients, paranoid patients, and control participants

<table>
<thead>
<tr>
<th></th>
<th>Nonparanoid Patients</th>
<th>Paranoid Patients</th>
<th>Controls n = 29</th>
<th>F (df = 2)</th>
<th>Post-hoc comparisons</th>
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<td>Prob. reasoning</td>
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<td></td>
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</tr>
<tr>
<td># draws (A&amp;B)</td>
<td>3.9 (4.3)</td>
<td>2.8 (2.2)</td>
<td>3.4 (1.8)</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td># draws (X&amp;Y)</td>
<td>3.3 (4.5)</td>
<td>2.3 (1.8)</td>
<td>3.4 (2.3)</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>IPSAQ</td>
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<td></td>
</tr>
<tr>
<td>Positive Events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>8.0 (3.1)</td>
<td>7.4 (3.1)</td>
<td>8.7 (2.6)</td>
<td>1.32</td>
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</tr>
<tr>
<td>Personal</td>
<td>2.7 (2.2)</td>
<td>3.8 (2.1)</td>
<td>3.1 (2.1)</td>
<td>1.67</td>
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</tr>
<tr>
<td>Situational</td>
<td>5.3 (2.8)</td>
<td>4.5 (3.1)</td>
<td>4.0 (2.4)</td>
<td>1.42</td>
<td></td>
</tr>
<tr>
<td>Negative Events</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Internal</td>
<td>5.8 (3.6)</td>
<td>4.5 (2.8)</td>
<td>5.6 (3.1)</td>
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<tr>
<td>Personal</td>
<td>4.4 (2.9)</td>
<td>7.0 (3.7)</td>
<td>5.4 (2.6)</td>
<td>4.41**</td>
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</tr>
<tr>
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<td>4.4 (2.8)</td>
<td>4.9 (3.1)</td>
<td>1.16</td>
<td></td>
</tr>
<tr>
<td>Positive + Negative</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>13.8 (5.6)</td>
<td>12.0 (4.2)</td>
<td>14.3 (4.5)</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>Personal</td>
<td>7.1 (3.8)</td>
<td>10.7 (4.6)</td>
<td>8.5 (3.5)</td>
<td>5.31**</td>
<td>Nonpar &lt; par</td>
</tr>
<tr>
<td>Situational</td>
<td>11.0 (5.6)</td>
<td>8.9 (5.4)</td>
<td>8.9 (4.3)</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Externalizing Bias</td>
<td>2.1 (3.8)</td>
<td>2.9 (4.2)</td>
<td>3.1 (3.5)</td>
<td>.48</td>
<td></td>
</tr>
<tr>
<td>Personalizing Bias</td>
<td>.43 (.26)</td>
<td>.60 (.23)</td>
<td>.54 (.27)</td>
<td>2.77</td>
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</tr>
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</table>
Table 4. (Cont.) Comparison of scores obtained on the cognitive measure for nonparanoid patients, paranoid patients, and control participants (cont.)

<table>
<thead>
<tr>
<th></th>
<th>Nonparanoid Patients</th>
<th>Paranoid Patients</th>
<th>Controls n = 29</th>
<th>F (df = 2)</th>
<th>Post-hoc comparisons</th>
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<tbody>
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<td><strong>TOM (% correct)</strong></td>
<td></td>
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<td>Sequencing</td>
<td>70.9 (24.9)</td>
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<td>86.4 (15.9)</td>
<td>8.68**</td>
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<tr>
<td>Sum Score</td>
<td>73.0 (20.5)</td>
<td>72.7 (13.0)</td>
<td>87.1 (11.9)</td>
<td>7.71**</td>
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<td><strong>Emotional Stroop</strong></td>
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<tr>
<td>Neutral (secs)</td>
<td>47.4 (11.6)</td>
<td>47.6 (10.8)</td>
<td>36.9 (7.8)</td>
<td>10.10**</td>
<td>Par, nonpar &lt; ctrl</td>
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<tr>
<td>Depression (secs)</td>
<td>47.9 (13.8)</td>
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<td>36.5 (8.2)</td>
<td>8.23**</td>
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<td>34.2 (6.7)</td>
<td>12.73**</td>
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<td>Anxiety (secs)</td>
<td>46.0 (10.43)</td>
<td>46.7 (11.3)</td>
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<td>String of Os (secs)</td>
<td>36.9 (8.0)</td>
<td>37.1 (8.23)</td>
<td>28.6 (4.6)</td>
<td>13.56**</td>
<td>Par, nonpar &lt; ctrl</td>
</tr>
<tr>
<td><strong>Stroop interference</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.52 (7.2)</td>
<td>.95 (8.7)</td>
<td>-.34 (4.1)</td>
<td>.25</td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>-2.2 (4.6)</td>
<td>-1.3 (4.4)</td>
<td>-2.6 (3.6)</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>-1.3 (4.8)</td>
<td>-.91 (6.3)</td>
<td>-.62 (4.5)</td>
<td>.12</td>
<td></td>
</tr>
</tbody>
</table>

**p < .01
attributions for negative and positive events combined. Post hoc analyses indicated that paranoid schizophrenia patients made more personal attributions than nonparanoid patients for negative events and for the combination of negative and positive events. The two cognitive bias scores for the IPSAQ, Externalizing Bias (EB) and Personalizing Bias (PB), were also calculated and compared. The results of the analyses indicated that there were no significant differences between groups in the degree of EB and PB. Regarding the theory of mind task, results revealed that both patient groups made significantly more sequencing errors than controls. Additionally, paranoid and nonparanoid schizophrenia patients performed significantly more poorly on the theory of mind questionnaire than did control participants. Finally, paranoid and nonparanoid patients were significantly slower than controls at naming the colors of the words included in all five Stroop lists. Stroop interference (reaction time for emotion word list minus reaction time for neutral word list) for depression-, threat-, and anxiety-related word lists was also examined. Comparisons indicated that patients and controls exhibited similar interference patterns.

Within-group correlations between scores on the cognitive measures and demographic variables were computed given that recent reports suggest a relationship between some of the cognitive measures and IQ (Brüne, Abdel-Hamid, Lehmkämper, & Sonntag, 2007; Greig, Bryson, & Bell, 2004). A significant relationship was found in each group between IQ estimates and sum score for the theory of mind task ($r = .636$, $p = .000$ for nonparanoid group; $r = .620$, $p = .001$ for paranoid group; $r = .496$, $p = .006$ for control group), suggesting that individuals with higher intellectual functioning were more likely to obtain a higher score on the theory of mind task. Student’s t-tests were also
computed for each group to examine whether gender and racial differences existed in terms of demographic variables and performance on the cognitive measures. For the nonparanoid group, comparisons yielded significant racial differences in terms of Stroop interference for anxiety words \(t(23) = 2.29, p = .032\); Caucasian nonparanoid patients experienced more interference when naming the ink color of the anxiety-related words than African American nonparanoid patients. For the paranoid group, comparisons yielded significant gender differences in terms of Stroop interference for threat-related words \(t(22) = 2.59, p = .017\) and external bias \(t(22) = -2.08, p = .05\), such that male paranoid patients experienced more interference when naming threat-related words, but did not exhibit as strong a self-serving bias as female paranoid patients. Finally, a racial difference in terms of theory of mind was found in the control group. Caucasian control participants obtained higher scores on the theory of mind task compared to African American control participants \(t(26) = 4.03, p < .001\).

Given that IQ estimates correlated with scores on the theory of mind task, group comparisons were performed once again, but this time controlling for IQ. Results of the ANCOVA revealed that, after controlling for IQ, the theory of mind scores of nonparanoid patients, paranoid patients, and controls no longer significantly differed \(F(2) = 1.01, p = .369\).

Despite the fact that certain race and gender differences were found within each group, no attempt was made to control for the effect of these two variables on the various cognitive measures because the groups did not differ much in terms of race and gender. Additionally, separate analyses for group by race and group by gender could not be
performed because of our small sample size. These interesting results, however, should be further examined in a larger sample.

Because paranoid patients not only obtained significantly lower accuracy scores than control participants on the emotion recognition task but also showed limited signs of a cognitive bias towards threatening material, there was very little hope that we would find that paranoid thinking and biased performance on the cognitive measures would predict better performance on the emotion recognition task for the genuine expressions of negative emotions. Nevertheless, correlations between paranoid thinking, cognitive variables, and performance on the emotion recognition task were performed with the data obtained from the schizophrenia patients. This was followed by a linear regression analysis. Correlation coefficients are presented in Table 5. As can be seen in the table, the only meaningful relationship was between sum score on the theory of mind task and the recognition of spontaneous expressions of negative emotions. Those who obtained higher scores on the TOM questionnaire were more likely to have attained greater accuracy scores for the recognition of genuine expressions of negative emotions. The results of the regression analysis using data from patients yielded a nonsignificant equation \( F(7) = 1.631, p = .156, R^2 = .226 \). When IQ was added in a second step, the results of the regression analysis yielded a significant equation \( F(7) = 3.032, p = .010, R^2 = .390 \), with IQ as significant predictor of accurate recognition of spontaneous expressions of negative emotion (see Table 6). The results of the regression analyses suggest that impairments in the recognition of spontaneous expressions of emotion and theory of mind reflect a general cognitive impairment.
Table 5. Correlations between paranoid thinking, scores on cognitive measures, and performance on emotion recognition task – patient data only

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PSQ total score</td>
<td>-</td>
<td>.00</td>
<td>-.13</td>
<td>.03</td>
<td>.28</td>
<td>.08</td>
<td>-.08</td>
<td>.09</td>
</tr>
<tr>
<td>2. Number draws jars A&amp;B</td>
<td>-</td>
<td>.67**</td>
<td>.05</td>
<td>-.16</td>
<td>.09</td>
<td>-.01</td>
<td>-.15</td>
<td></td>
</tr>
<tr>
<td>3. Number draws jars X&amp;Y</td>
<td>-</td>
<td>.07</td>
<td>-.02</td>
<td>.22</td>
<td>.16</td>
<td>-.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Externalizing Bias</td>
<td>-</td>
<td>.25</td>
<td>-.07</td>
<td>.04</td>
<td>-.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Personalizing Bias</td>
<td>-</td>
<td>.05</td>
<td>-.10</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Theory of Mind sum score</td>
<td>-</td>
<td>.08</td>
<td>.30*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Mean interference for Stroop emotion word lists</td>
<td>-</td>
<td></td>
<td></td>
<td>-.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Emotion genuine negative</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, two-tailed. **p < .01, two-tailed.
The results of this set of analyses therefore refute the idea that paranoid schizophrenia patients have cognitive biases that make them more sensitive to the recognition of spontaneous expressions of negative emotions.

*Research Question # 4: Posed vs. Spontaneous Judgments*

Participants’ judgments of whether the emotion displayed in each photograph was felt or posed were examined. First, the proportions of “posed” and “genuine” labels used by the three groups, irrespective of whether they were correctly used, were subjected to a repeated-measures analysis. Group comparisons revealed a significant main effect for condition, as well as a significant group by condition interaction. Participants used the “genuine” label ($M = 56.9\%$) significantly more than the “posed” label ($41.7\%$) to describe the emotion displayed in each photograph [$F(1) = 38.0, p < .001$, Cohen’s $f = .707$, large effect size]. Additionally, paranoid patients made greater use of the “genuine” label than the control participants [$F(2) = 3.5, p = .034$]. The effect size for this comparison was medium ($\Omega^2 = .063$). Table 7a presents the distribution of label use by group.

Post hoc analyses were performed to examine why paranoid patients were more likely to use the “genuine” label than the other two groups. Correlations were computed between the proportion of the “genuine” label used and scores obtained on each of the cognitive measures for each of the three groups. The results of the analyses revealed that the use of the “genuine” label did not correlate with any of the cognitive measures. Correlations were also computed between the use of the “genuine” label and symptoms, as measured by the BPRS, in patients. Suspiciousness was the only symptom found to be
Table 6. Summary of regression analysis for variables predicting accuracy scores for the recognition of spontaneous expression of negative emotions – patient data only

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paranoia/Suspiciousness total scale score</td>
<td>.01</td>
<td>.19</td>
<td>.01</td>
</tr>
<tr>
<td>Mean interference for Stroop emotion word lists</td>
<td>-45</td>
<td>.44</td>
<td>-.15</td>
</tr>
<tr>
<td>Externalizing bias</td>
<td>-65</td>
<td>.53</td>
<td>-.18</td>
</tr>
<tr>
<td>Personalizing bias</td>
<td>4.45</td>
<td>8.56</td>
<td>.08</td>
</tr>
<tr>
<td>Number draws jars A&amp;B</td>
<td>.05</td>
<td>.82</td>
<td>.01</td>
</tr>
<tr>
<td>Number draws jars X&amp;Y</td>
<td>-1.06</td>
<td>.84</td>
<td>-.26</td>
</tr>
<tr>
<td>Theory of mind sum score</td>
<td>.50</td>
<td>.21</td>
<td>.35*</td>
</tr>
</tbody>
</table>

Step 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paranoia/Suspiciousness total scale score</td>
<td>.18</td>
<td>.18</td>
<td>.14</td>
</tr>
<tr>
<td>Mean interference for Stroop emotion word lists</td>
<td>-.31</td>
<td>.40</td>
<td>-.10</td>
</tr>
<tr>
<td>Externalizing bias</td>
<td>-.58</td>
<td>.47</td>
<td>-.16</td>
</tr>
<tr>
<td>Personalizing bias</td>
<td>3.83</td>
<td>7.71</td>
<td>.07</td>
</tr>
<tr>
<td>Number draws jars A&amp;B</td>
<td>.25</td>
<td>.74</td>
<td>.06</td>
</tr>
<tr>
<td>Number draws jars X&amp;Y</td>
<td>-1.49</td>
<td>.77</td>
<td>-.37</td>
</tr>
<tr>
<td>Theory of mind sum score</td>
<td>-.03</td>
<td>.40</td>
<td>-.10</td>
</tr>
<tr>
<td>WAIS IQ estimate</td>
<td>.62</td>
<td>.19</td>
<td>.57**</td>
</tr>
</tbody>
</table>

* p < .05. ** p < .01.
Table 7a. Proportions of “posed” and “genuine” labels used by group

<table>
<thead>
<tr>
<th>Label used</th>
<th>Nonparanoid Patients (n = 26)</th>
<th>Paranoid Patients (n = 24)</th>
<th>Normal controls (n = 29)</th>
<th>F (df = 2)</th>
<th>Post-hoc comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Posed”</td>
<td>43 (14)</td>
<td>38 (9)</td>
<td>46 (9)</td>
<td>3.53*</td>
<td>par &lt; ctrl</td>
</tr>
<tr>
<td>“Genuine”</td>
<td>57 (14)</td>
<td>62 (9)</td>
<td>54 (9)</td>
<td>3.67*</td>
<td>ctrl &lt; par</td>
</tr>
</tbody>
</table>

*p < .05.

Table 7b. Proportions of correctly used “posed” and “genuine” labels by group

<table>
<thead>
<tr>
<th>Label used</th>
<th>Nonparanoid Patients (n = 26)</th>
<th>Paranoid Patients (n = 24)</th>
<th>Normal controls (n = 29)</th>
<th>F (df = 2)</th>
<th>Post-hoc comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Posed”</td>
<td>48 (20)</td>
<td>46 (13)</td>
<td>54 (15)</td>
<td>1.77</td>
<td>-</td>
</tr>
<tr>
<td>“Genuine”</td>
<td>59 (17)</td>
<td>67 (12)</td>
<td>60 (9)</td>
<td>2.8</td>
<td>-</td>
</tr>
</tbody>
</table>
significantly correlated with the use of “genuine” label in the paranoid patient group ($r = .466, p = .019$). Hence, the higher their suspiciousness ratings, the more likely the paranoid patients were to make use of the “genuine” label to describe the emotion presented in the photographs.

The proportions of correctly used “posed” and “genuine” labels were also compared using repeated-measures analysis. The results revealed a significant main effect for condition. The proportion of correctly identified genuine expressions of emotion was significantly greater than the proportion of correctly identified posed expressions of emotion [$F(1) = 20.6, p < .001$, Cohen’s $f = .520$, large effect size], perhaps because participants were more likely to choose the “genuine” label than the “posed” label, as discussed earlier. Table 7b presents the distribution of label use by group.
CONCLUSIONS AND DISCUSSION

The main objectives of this investigation were to replicate and explicate the findings that paranoid schizophrenia patients are not only more accurate than nonparanoid schizophrenia patients at recognizing posed and spontaneous expressions of negative emotion, but also more accurate than nonpsychiatric controls at recognizing spontaneous expressions of negative emotion.

The results of the present study can be summarized in the following manner. First, patients and controls accurately recognized all positive expressions of emotion, regardless of whether the facial expressions were posed or spontaneous. Second, paranoid and nonparanoid schizophrenia patients did not significantly differ from one another in their ability to recognize posed and genuine facial expressions of negative emotion. Furthermore, both patient groups were significantly less accurate than control participants at recognizing posed and spontaneous expressions of negative emotions. Paranoid patients were therefore less accurate than controls at recognizing genuine expressions of negative emotion. Third, the three groups were significantly more likely to use a negative emotion label than a positive emotion label to describe the neutral expressions of emotion, disproving the idea of a negative bias amongst paranoid patients. Fourth, comparisons of scores on the cognitive measures yielded significant differences between the three groups for the theory of mind task, emotion Stroop task, and certain attribution variables. Control participants obtained significantly higher scores on the task.
that assessed theory of mind than paranoid patients, but after controlling for IQ, group scores on the theory of mind task did not significantly differ from one another. Participants in the control group took less time to complete all five Stroop word lists than the two patient groups. There was, however, no evidence of Stroop interference in any of the three groups disproving the idea of an attentional bias to threatening words in our paranoid patients. Paranoid patients were more likely to attribute the cause of events (negative events only as well as the combination of positive and negative events) to other people than controls. Taken together, these findings challenge the notion that paranoid patients have a suspicious cognitive set that leads them to ignore counter examples and exaggerate, distort, or selectively focus on threatening cues. Fifth, paranoid thinking and scores on the cognitive measures did not predict better performance on the recognition of negative emotions. Finally, although we were unable to detect statistically significant group differences in the proportion of correctly used “genuine” and “posed” labels to describe the emotion displayed in each photograph, paranoid patients were more likely to identify genuine expressions of emotion as such.

Hypothesis 1

The first research question pertained to the recognition of positive expressions of emotion in others. Findings from cross-cultural studies suggest that happiness is the most easily recognized facial expression of emotion (Izard, 1971; Russell, 1994). Furthermore, studies of brain damaged individuals and psychiatric patients suggest that even clinical populations do not have any difficulties recognizing facial expressions of happiness (Adolphs, Damasio, Tranel, & Damasio, 1996). Facials displays of happiness
may be easily identifiable because they involve a distinct configuration of facial muscle movements and are processed differently than all other facial expressions of emotion (Ekman & Friesen, 1978; Posamentier & Abdi, 2003). Neuroimaging studies suggest that there is no consistent pattern of brain activation when happy faces are presented, but that specific brain areas including the amygdala, orbitofrontal cortex, and basal ganglia are activated when faces displaying negative emotions are presented (Posamentier & Abdi, 2003). Studies measuring facial movement suggest that the facial display of happiness is produced by pulling the corner of the lips back and upward toward the cheekbone (lip corner pull – action unit 12) and raising the cheeks upward, causing crow’s feet and wrinkles below the eyes (cheek raiser – action unit 6) (Ekman & Friesen, 1978; Gosselin et al., 1995; Kohler et al., 2004). There is considerable overlap in the occurrence rate of action units in posed and spontaneous expressions of happiness (Gosselin et al., 1995). The smile (lip corner pull) is observable in both posed and genuine expressions of happiness, but the cheek raiser, which is very difficult to produce voluntarily, only occurs in genuine expressions of happiness (Ekman, Roper, & Hager, 1980). Despite the difference in facial muscle contraction involved in posed and spontaneous expressions of happiness, facial expressions of happiness, whether posed or genuine, are easily recognizable (Davis & Gibson, 2000).

No facial measurement system was used to examine the facial muscle configurations of the Kent State University students photographed for our facial stimuli. However, all happy photographs displayed an open-mouth smile signifying that, regardless of whether the students were genuinely happy or pretending to be happy, the
contraction of the zygomatic major muscles produced a lip corner pull. Hence, all pictures displayed the most obvious element of happiness. The intensity of the posed and spontaneous expressions of happiness was examined by asking a separate group of nonpsychiatric individuals (n = 7) to rate each photograph on a 5-point Likert scale (1 = no intensity to 5 = extremely intense). The mean intensity rating for posed expressions of happiness was 3.5 (SD = 0.88) and the mean intensity rating for the genuine expressions of happiness was 3.4 (SD = 0.87). The intensity ratings for posed and genuine expressions of happiness did not significantly differ \( t(5) = .44, p = .681 \), indicating that both types of expressions were similar in intensity. Mean intensity ratings can be found in Appendix C.

As hypothesized, paranoid patients, nonparanoid patients, and control participants did not significantly differ from one another in their ability to correctly recognize posed and genuine expressions of positive emotion. In fact a ceiling effect was observed; the three groups correctly recognized all posed and genuine facial expressions displaying happiness. These results are consistent with the findings of prior studies that looked at group differences between individuals with a diagnosis of schizophrenia and controls (Brüne, 2005a; Dougherty et al., 1974; Johnston, Devir, & Karayanidis, 2006; Kohler et al., 2003; Muzekari & Bates, 1977), and group differences between paranoid patients, nonparanoid patients, and controls (Davis & Gibson, 2000; Kline et al., 1992), regardless of whether the facial expressions of happiness presented were posed or genuine. Two studies, however, report significant group differences in accuracy scores for making correct judgments of happy emotions (Mandal et al., 1999; Walker et al., 1980). Mandal
and his colleagues (1999), who were interested in examining facial emotion recognition in schizophrenia patients with positive and negative symptoms, found that patients with predominantly positive symptoms and nonpsychiatric controls were significantly more accurate than patients with predominantly negative symptoms in their judgments of expressions of happiness. Dissimilarities in the subdivision of patient groups and emotion task used may explain differences in findings. The schizophrenia patients who participated in the present study were stable outpatients who were only moderately symptomatic. They were divided into paranoid and nonparanoid groups based on the BPRS ratings assigned for the suspiciousness item. The schizophrenia patients who were included in Mandal et al.’s study, on the other hand, were highly symptomatic inpatients who were divided into a patient group with predominantly positive symptoms and a patient group with predominantly negative symptoms according to Positive and Negative Syndrome Scale (PANSS) ratings. Based on their categorization, patients with predominantly positive symptoms would have reported hallucinations, delusions, and hostility, while patients with predominantly negative symptoms would have exhibited affective flattening, avolition (lack of motivation), anhedonia (inability to experience pleasure), and asociality. It is very likely that the patients with predominantly negative symptoms also suffered from social anhedonia, the inability to experience interpersonal enjoyment, which could have impaired their ability to recognize the expression of happiness in others. Furthermore, Mandal et al. used the Recognition of Emotion sub-test of the Penn Facial Discrimination Task (Erwin et al., 1992), which consists of 30 faces of actors displaying happy, sad, and neutral expressions. Each photograph was presented
for 20 seconds and participants were asked to rate the emotion on a 3-point scale (1 = sad, 2 = neutral, 3 = happy). This task is quite different from the task used in the present study, which was comprised of 5 different emotion expressions plus neutral expressions, but did not allow participants to use the label “neutral” to rate the facial expressions. Although not addressed in the paper, it is possible that, because they were allowed to use “neutral” as a label, the patients with predominantly negative emotions applied the “neutral” label to faces displaying happiness because of their difficulties relating to others and experiencing positive emotions.

Walker et al. (1980) also reported differences between adult schizophrenia patients and nonpsychiatric controls in their ability to recognize facial expressions of happiness. The authors only included adults with “process schizophrenia” to ensure that the adult patients had similar developmental histories as the children and adolescents with schizophrenia also included in this study. Although no longer used as a classification scheme, the term “process schizophrenia” was once used to refer to those patients with a slow, insidious onset, who exhibited poor social adjustment prior to the development of the illness. The clinical presentation of the adult patients included in the Walker et al. study is not reported. However, given that poor premorbid adjustment has been found to be related to negative symptoms (Schmael et al., 2007), it is likely that the adult patients included in this study were similar in terms of type and severity of symptoms to the patients with predominantly negative symptoms included in the Mandal et al. (1999) study. It may therefore be that the divergence in findings pertaining to whether or not patients with schizophrenia are impaired in their ability to recognize positive emotions
rests on the subtypes of patients investigated. Patients with poor social premorbid adjustment who suffer mostly from negative symptoms may be at risk for having difficulty recognizing facial expressions of happiness.

Hypothesis 2

The second research question was concerned with the ability to recognize facial expressions of negative emotions (i.e., sadness, anger, disgust, and fear). As mentioned earlier, facial expressions of negative emotion are more difficult to recognize than positive ones. Cross cultural studies of individuals from the general population and studies using clinical populations all show that accuracy scores for the recognition of negative emotions are much lower than for positive emotions (Davis & Gibson, 2000; Ekman et al., 1987; Elfenbein & Ambady, 2002; Gosselin et al., 1995; Kline et al., 1992; Kohler et al., 2004; Kohler et al., 2003; Motley & Camden, 1988; Russell, 1994; Walker et al., 1980). Because studies have used different facial stimuli and response formats, there is no agreement as to which negative emotion is easier to recognize and which is most difficult to recognize. However, the results of two meta-analyses suggest that the facial expression of fear is most difficult to recognize, while anger, sadness, and disgust have similar accuracy rates (Elfenbein & Ambady, 2002; Russell, 1994). Although facial expressions of sadness, anger, disgust, and fear are associated with a unique configuration of action units, there is significant overlap in facial muscle movement among all four emotions (Gosselin et al., 1995; Kohler et al., 2004). The overlap in facial muscle contractions that produce expressions of negative emotions may explain why controls and clinical populations are not as accurate at identifying specific negative
emotions as they are for facial expressions of happiness. Results from neuroimaging and brain lesion studies provide additional support for the specific and general processing of negative emotions. Certain brain regions appear to be activated only when specific emotions are presented while other brain regions appear to be activated when negative emotions, regardless of the type, are presented (Adolphs, 2002; Keltner et al., 2003; Posamentier & Abdi, 2003).

As previously noted, the patterns of facial movements displayed in the photographs comprising our emotion recognition task were not examined. We cannot therefore comment on the degree of shared action units among the four negative emotions. However, given that accuracy scores of patients and controls for negative emotions were significantly lower than for happiness, it is very likely that participants mislabeled negative emotions because the photographs of different negative emotions displayed similar facial muscle configurations. As can be seen in Tables 3a-3c, participants were likely to confuse posed facial expressions of sadness with disgust, posed expressions of anger with disgust, posed expressions of disgust with happiness, and posed expressions of fear with happiness and disgust. For the genuine facial expressions of negative emotions, participants were likely to confuse sadness with disgust, anger with happiness and disgust, disgust with sadness and happiness, and fear with disgust. The label “disgust” was often incorrectly used as was the label “happiness.” Although it might be surprising that the label happiness was used to describe negative emotions of anger, disgust, and fear, closer examination of the photographs revealed that the mouth was open in those photographs. Hence, it is likely that participants paid more attention to
the mouth area than the eyes and cheek area when deciding which label best described the emotion displayed in those photographs. Unfortunately, because the patterns of eye movements and foveal fixations (visual scanpaths) were not examined in this study, there is no data to support this claim. However, the results of a number of visual scanpath studies do suggest that schizophrenia patients have restricted scanpaths and tend to avoid salient features such as the eyes and cheeks (Loughland, Williams, & Gordon, 2002; Phillips & David, 1997; Williams, Loughland, Gordon, & Davidson, 1999).

Interestingly, these same studies also demonstrate that schizophrenia patients do not tend to focus much attention to the mouth area. Given the visual scanpath findings for schizophrenia patients, there may be other reasons explaining why patients used a positive emotion label to describe certain expressions of negative emotion.

Regarding the intensity of the emotion displayed in each photograph, judges rated the negative emotions as less intense than happiness (see Appendix C). Of the four negative emotions, expressions of sadness were given the lowest ratings (slightly intense) while expressions of anger, disgust, and fear were similarly found to be of moderate intensity.

Our analyses revealed that accuracy scores for posed expressions of negative emotions were above chance level for paranoid, nonparanoid, and control participants. Group comparisons of accuracy scores for posed expressions of negative emotions confirmed our hypothesis that control participants would be significantly more accurate at recognizing posed expressions of negative emotions than paranoid and nonparanoid schizophrenia patients. This finding is in agreement with what has been found in
previous studies looking at different groups of patients with schizophrenia (Davis & Gibson, 2000; Johnston et al., 2006; Kohler et al., 2003; LaRusso, 1978; Muzekari & Bates, 1977; Walker et al., 1980). However, the lack of significant difference between paranoid and nonparanoid patient groups is inconsistent with the findings of Kline et al. (1992) who found that paranoid patients were significantly more accurate at recognizing posed expressions of negative emotions than nonparanoid patients. Although the patient groups used in Kline et al.’s study and our study shared similar characteristics in terms of education, outpatient treatment services, and symptom severity (as rated using the BPRS), our patient groups were slightly older and had been more frequently hospitalized for psychiatric reasons. Furthermore, Kline and colleagues used Research Diagnostic Criteria (RDC) (Spitzer, Endicott, & Robins, 1981) to differentiate paranoid from nonparanoid groups while we classified our patients into paranoid and nonparanoid groups according to ratings received on the suspiciousness item of the BPRS. It is therefore possible that the difference in results was due to sample variations. It is also possible that the difference in results was due to dissimilarity in facial affect stimuli used, as Kline and colleagues utilized Ekman and Friesen’s (1976) black and white photographs of actors while we used colored photographs of undergraduate students pretending to be experiencing negative emotions.

The three groups’ accuracy scores for the recognition of genuine expressions of negative emotions were also found to be above chance level. Group comparisons of accuracy scores for genuine expressions of negative emotions failed to confirm our hypothesis that paranoid schizophrenia patients would be more accurate at recognizing
genuine expressions of negative emotions than control participants and nonparanoid schizophrenia patients. In contrast to the results of Davis and Gibson (2000), we found that control participants were significantly more accurate than the two patient groups at recognizing spontaneous facial expressions of negative emotions. Our inability to replicate Davis and Gibson’s findings may be due to differences in patient characteristics and facial emotion stimuli used. The participants included in Davis and Gibson’s study were significantly younger than the subjects included in the present study [mean age of paranoid patients in Davis and Gibson study = 29.6 (±9.22) years vs. mean age of paranoid patients in this study = 42.1 (±5.3) years, $t = 5.0, p < .001$; mean age of nonparanoid patients in Davis and Gibson study = 28.3 (±11.38) years vs. mean age of nonparanoid patients in this study = 42.4 (±8.1) years, $t = 4.17, p < .01$; mean age of controls in Davis and Gibson study = 30.1 (±9.67) years vs. mean age of controls in this study = 39.7 (±9) years, $t = 2.85, p < .01$]. Age differences may explain why we could not replicate Davis and Gibson’s findings. Results from cross-sectional studies suggest that people from the general population become less accurate at recognizing facial expressions of negative emotions in others as they get older (Isaacowitz et al., 2007). Although no studies to date have investigated the effects of age on emotion recognition in schizophrenia, it is highly probable that patients’ emotion recognition abilities also decline with age. We performed correlational analyses between age and accuracy scores for the recognition of negative emotions for all participants, and found that age correlated negatively with accuracy scores ($r = -.231, p = .040$ for genuine expressions and $r = -.238, p = .035$ for posed expressions.) However, the relationships between age and
accuracy scores for the recognition of negative emotions were no longer significant when correlational analyses were performed for each group. The lack of significance was perhaps due to the fact that age was not normally distributed across each of our three groups. Nevertheless, the fact that the paranoid patients included in the present study were on average more than 12 years older than the paranoid patients included in Davis and Gibson’s study may explain why they showed more impairment at identifying the correct emotion displayed in the photographs showing spontaneous expressions of negative emotion. This explanation, however, does not address why accuracy scores for the paranoid and nonparanoid patients did not significantly differ from one another for spontaneous expressions of negative emotions, as was expected. It remains to be investigated in a larger sample whether the decline in facial affect recognition is significantly greater in paranoid patients than nonparanoid patients as they age. Additionally, the fact that paranoid patients in this study did not significantly outperform controls and nonparanoid patients at recognizing facial expressions of negative emotions could be the result of differences in how paranoid and nonparanoid groups were defined. Davis and Gibson used DSM-IV criteria to assign their participants into paranoid and nonparanoid groups. The patients included in their paranoid group therefore suffered primarily from hallucinations and/or delusions and were not necessarily more suspicious than the patients assigned to the nonparanoid group. The patients included in this study, on the other hand, were assigned to paranoid and nonparanoid groups based on their current level of suspiciousness/paranoia, as determined by their rating assigned on the suspiciousness item on the BPRS scale. Post hoc analyses, however, revealed no
significant group differences between patient groups in accuracy scores when our patient participants were divided into paranoid and nonparanoid groups according to DSM-IV criteria, which weakens this explanation. Another difference between the schizophrenia patients who participated in the present study and those who participated in Davis and Gibson’s study is that our patients were receiving outpatient services while their patients were hospitalized at the time they completed the study assessments. Although Davis and Gibson did not provide information about symptom severity, it is very likely that their schizophrenia patients were significantly more symptomatic than those who participated in this study. Our patients were only mildly symptomatic and received ratings ranging from 27 to 68 on a possible score of 168 on the BPRS (\(M = 44, SD = 10.12\)). Perhaps patients who are so suspicious of other people’s motives that they require hospitalization are somehow better able to recognize genuine expressions of negative emotions in others. Paranoid patients’ emotion recognition accuracy for genuine negative emotions may therefore reflect a state rather than a trait. Future studies should examine whether symptom severity and level of care received (i.e., inpatient vs. outpatient) have any effect on emotion recognition abilities, especially in patients prone to suspiciousness. Given that Davis and Gibson did not investigate the effects of IQ on emotion recognition, future studies should also further examine the relationship between the ability to accurately recognize spontaneous expressions of negative emotions and cognitive functioning. Our results suggest a relationship between these two variables, with individuals of higher IQ being more likely to obtain higher accuracy scores. It may be that, when groups are
equivalent in terms of IQ, paranoid patients outperform nonparanoid schizophrenia patients and controls.

Within-group comparisons revealed that both patient groups and control participants were generally more accurate at recognizing genuine expressions of negative emotions than posed ones. Specifically, participants’ accuracy scores were significantly higher for spontaneous expressions of sadness and fear than their posed counterparts. Participants’ accuracy scores for posed and spontaneous expressions of anger and disgust, however, were not significantly different from one another, although there was a tendency for the posed expressions to be more easily recognized than their genuine equivalents. These results are similar to those reported by Gosselin et al. (1995). While they used undergraduate and graduate students to rate the emotion displayed in short 10-second excerpts of actors that were instructed to either feel or not feel the emotion they were portraying, the investigators found that participants’ accuracy scores were higher in the felt emotion condition for fear and sadness, and the unfelt emotion condition for anger and disgust. The fact that subjects were found to be generally more accurate at recognizing spontaneous expressions of negative emotion contrasts with the results of Motley and Camden (1988). Using photographs of undergraduate students in which candid and posed expressions of emotion were captured, the investigators asked a group of 20 college students to label the emotion displayed in each photograph. The results of their experiment indicate that participants were significantly more accurate at labeling posed expressions of emotion than spontaneous expressions of emotion. It is possible that the participants included in Motley and Camden’s study had atypical decoding
abilities, which could explain why their results were so dissimilar to ours and Gosselin et al.’s results. Motley and Camden used undergraduate students who were enrolled in a communication course. Although this was apparently their first communication course and nonverbal communication was not a topic explored in this course, it is likely that participants were enrolled in this course because of their interest in human interactions and emotional communication. Hence, participants in this study may have been more responsive to posed expressions of emotion because they were more consistent with traditional facial emotion schemas. Aside from participants’ decoding abilities, the discrepancy in findings could have been caused by differences at the encoding stage. In contrast to Gosselin et al. who used trained actors from the Conservatory of Dramatic Arts of Quebec, we as well as Motley and Camden used quasi-randomly-selected undergraduate students to portray the various emotions displayed in our facial emotion recognition tasks. The students who were photographed had no training on how to express various emotions with their faces. Different methods were used to elicit genuine and posed facial expressions of emotion in the students. In Motley and Camden’s study, students were hooked up to a polygraph and interacted with three confederates who were trained to elicit emotional reactions from the students. The students were photographed without their knowing during the social interaction with the confederates. After being debriefed at the conclusion of the emotion-elicitation task, students returned to the lab a week later to pose each of the six target emotions. In contrast, the students used in the present study interacted only with the investigator and completed a series of brief tasks designed to elicit facial expressions of emotion. Students were photographed without
their knowledge while completing the various tasks. Following the completion of the series of tasks, students were debriefed and asked to stay a few minutes longer to pose each of the five target emotions. Differences in the methods used to elicit emotion may have produced differences in the recognizability of posed and genuine expressions of emotion. Furthermore, because there was a one week interval between the compilation of spontaneous and posed displays of emotion in the Motley and Camden study, it is possible that, during this time lag, students practiced posing the various emotions in preparation for their upcoming visit to the lab. The students photographed for the present study did not have the opportunity to practice, as they were immediately asked to pose the various emotions. These students therefore had to rely on their own interpretation of what a good posed expression of emotion looks like. Additionally, the context in which the photographs were collected may have affected the intensity of the emotions displayed. The students in Motley and Camden’s study interacted with a group of confederates while the students used in the present study interacted only with the investigator. Although the students in both studies found themselves in an unfamiliar lab setting, those in Motley and Camden’s study may have been more restricted in their displays of emotion because of the larger number of unfamiliar individuals with whom they were interacting. Moreover, facial displays of emotion may have been less intense because students interacted with strangers as opposed to familiar others (Keltner et al., 2003; Lee & Wagner, 2002; Wagner & Smith, 1991). Taken together, these methodological differences may explain why participants in Motley and Camden’s study had less difficulty recognizing posed expressions of emotion than genuine expressions of
emotion. Motley and Camden unfortunately do not report intensity ratings for the photographs used in their emotion recognition study. However, based on their methods and findings, it is likely that the posed expressions were more intense than the genuine expressions of emotion, making them easier to recognize. Analyses of the intensity of the emotions displayed in the photographs used in our study revealed no significant differences in intensity between posed expressions and their genuine counterparts (See Appendix C).

Hypothesis 3

Previous investigations have found that schizophrenia patients with paranoid/persecutory delusions tend to misattribute affective meaning to neutral stimuli (Holt, Kunkel et al., 2006; Holt, Titone et al., 2006; Kohler et al., 2003). Based on these results, it was hypothesized that paranoid patients would be more likely ascribe negative emotion labels to the neutral facial expressions included in the emotion recognition task. The results of our analyses, however, did not support this hypothesis, as all three groups made significantly greater use of negative emotion labels than the “happy” label to describe the neutral facial expressions. The distribution of emotion labels ascribed to the neutral faces was similar across groups. “Happy” and “sad” were the most commonly used labels to describe the neutral faces followed by “disgust”, “fear”, and “anger.”

The distribution of emotion labels assigned to the neutral faces obtained in the present study resembles the misidentification patterns of neutral faces reported in Kohler et al.’s (2003) study, even though the studies differ in terms of patient group classification and emotion recognition task used. Kohler and colleagues did not subtype
their patients according to symptom presentation. Furthermore, they gave participants the option of using the “neutral” label to describe the emotion displayed in the photographs presented. Yet despite these differences, the authors found that, in comparison to controls, schizophrenia patients were less likely to ascribe the “neutral” label to neutral faces (86% versus 70%) and therefore more likely to misattribute affective meaning to neutral expressions. Similar to our findings, the schizophrenia patients in that study misidentified the neutral faces for “happy” (29%), “sad” (29%), “disgust” (23%), “fear” (10%), and “anger” (10%). In contrast, control participants, who on average mistakenly attributed an emotion to 2 of the 16 neutral faces, misidentified the neutral faces for “happy” (43%), “sad” (32%), “angry” (16%), “disgust” (5%), and “fear” (4%).

It is interesting that, despite differences in the emotion recognition tasks used, the results of our study and Kohler et al.’s (2003) study suggest that schizophrenia patients in general, not just paranoid/suspicious patients as implied in other studies, have a tendency to attribute negative affect to neutral facial expressions. Although the schizophrenia patients who participated in the present study were much older than those who participated in the Kohler et al. study, patients in both studies were clinically stable and not very symptomatic at the time of their participation. Perhaps patients who are more acutely paranoid/suspicious show a stronger negative bias. Results from studies examining how neutral stimuli are processed in paranoid schizophrenia patients seem to support this idea. For instance, Epstein et al. (1999) administered a modified emotional Stroop consisting of neutral words (e.g., towel and rotate) and words suggesting
interpersonal threat (e.g., follow and whisper) to 6 actively paranoid schizophrenia patients, 5 schizophrenia patients showing no signs of paranoia, and 6 normal controls while they were scanned using PET methods. Scans were obtained while participants were resting as well as while they were naming the color of the neutral words and the color of the interpersonal threat words. The results of the study indicated that patients and normal controls showed amygdala activation during the color naming of the interpersonal threat words. Additionally, a similar pattern of activity in the mesotemporal region (periamygdalar/parahippocampal) was noted in the paranoid patients during the color naming of the neutral words, but not in the nonparanoid patients and controls. The results of the study therefore suggest that, in contrast to nonparanoid patients and normal controls, paranoid patients process neutral stimuli in a similar fashion as threatening stimuli. More recent neuroimaging studies using facial stimuli provide further evidence for abnormal processing of neutral cues in paranoid schizophrenia patients. For example, Sugurladze et al. (2006) presented photographs displaying different intensities of fear and neutral expressions to 15 schizophrenia patients and 11 normal controls while measuring neural response using event-related fMRI. The investigators found that neural activation patterns in response to the faces displaying fear were similar in patients and controls. They also found that, compared to the control participants, the schizophrenia patients in their study showed increased parahippocampal gyral activity to neutral faces. Abnormal parahippocampal gyral activity in response to neutral faces was significantly correlated with the reality distortion syndrome, which includes auditory hallucinations directed at the patient, delusions of persecution, and delusions of reference.
Thus far, the results of the present investigation suggest that the patients in our paranoid group obtained significantly lower accuracy scores for the recognition of posed and spontaneous expressions of negative emotion than the control participants. Additionally, our results suggest that paranoid patients were not more likely to ascribe negative emotion labels to the neutral facial expressions than the nonparanoid patients and controls. As suggested above, the inability to demonstrate that paranoid patients are more sensitive to ambiguous facial cues may be explained by the relatively muted degree of psychosis in our paranoid sample.

Paranoid schizophrenia patients seem to exhibit errors in thinking, which are hypothesized to contribute to the development and maintenance of delusional beliefs (Bentall et al., 2001; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002; Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001). The results of a number of studies indicate that paranoid schizophrenia patients require less information when making decisions, take excessive credit for positive events but blame others for negative events, struggle with taking other people’s perspective, and selectively attend to threatening stimuli (Green & Phillips, 2004; Green, Williams, & Davidson, 2001; Holt, Titone et al., 2006; Phillips, Senior, & David, 2000). These attentional and referential biases are believed to cause paranoid patients to selectively attend to threatening stimuli and to misinterpret ambiguous information as threatening (Green & Phillips, 2004; Green et al., 2001). Yet, no study until now had directly investigated the association between cognitive biases in paranoid patients and emotion recognition.
In the present investigation, paranoid, nonparanoid, and control participants completed four measures of attentional and inferential biases in addition to the emotion recognition task. It was hypothesized that we would not only replicate the finding that paranoid patients exhibit biased cognitive processing, but that the errors in thinking observed in paranoid patients would contribute to enhanced performance on the recognition of spontaneous expressions of negative emotion. Unfortunately, the data did not fully support our hypotheses.

We first examined whether there was any evidence of attentional bias in our paranoid patients by comparing their performance on a probabilistic reasoning task to the performance of the two other groups. In this task, beads were drawn from one of two jars and participants were asked to determine from which jar the beads were drawn. Paranoid patients asked for fewer draws than the two other groups, but differences did not reach statistical significance. Despite the fact that group differences were not significant, the direction of our results is consistent with findings from prior studies suggesting that schizophrenia patients with delusions “jump to conclusions” (Garety et al., 2005; Garety et al., 1991; Huq et al., 1988; Moritz & Woodward, 2005). Interestingly, most probabilistic reasoning studies have only compared deluded schizophrenia patients to controls, omitting to include a group of nondeluded patients (Garety & Freeman, 1999). Only two studies have investigated probabilistic reasoning in deluded schizophrenia patients, nondeluded patients, and nonpsychiatric healthy controls (Menon, Pomarol-Clotet, McKenna, & McCarthy, 2006; Moritz & Woodward, 2005). Moritz and
Woodward’s (2005) study used a method similar to ours to divide their patient sample into deluded and nondeluded groups, relying on BPRS ratings for the suspiciousness and the grandiosity items. Menon et al. (2006), on the other hand, divided their patients into deluded and nondeluded groups based on ratings given for the 20 delusion items of the Present State Examination (PSE), a structured psychiatric interview. Similar to our findings, the authors of both studies found that deluded patients required fewer draws than nondeluded patients and controls, although the difference did not reach statistical significance. Hence, the few studies that have investigated probabilistic reasoning in deluded (including paranoid) and nondeluded patients indicate that deluded patients ask for fewer draws than nondeluded patients and controls, but the difference in number of draws requested is not significant. This raises the issue of whether jumping to conclusion is specific to paranoid patients. However, given that different criteria were used to divide the patient samples and that patients in all three samples were only moderately ill, it is possible that jumping to conclusion is exaggerated in acutely paranoid schizophrenia patients.

Patterns in causal attributions were then examined, as it has been suggested that paranoid schizophrenia patients exhibit an extreme form of self-serving bias, which is the tendency to take credit for positive events and blame others for negative events (Bentall et al., 2001). The results of the analyses were not suggestive of an exaggerated self-serving bias in our paranoid patients. In fact, because the mean Externalizing Bias (EB) composite score for all three groups was in the positive direction, the three groups were found to have an equally strong self-serving bias (Kinderman & Bentall, 1997). This
finding is consistent with the results reported in previous studies (Bentall et al., 2001; Garety & Freeman, 1999; Martin & Penn, 2002). Earlier reports, however, suggest that paranoid patients do exhibit an exaggerated form of self-serving bias (Candido & Romney, 1990; Kaney & Bentall, 1989). The discrepant findings may be explained by a shift in the measures used to assess attributional style as well as by the recent inclusion of nonparanoid schizophrenia patients in the analyses. Earlier studies used the Attributional Style Questionnaire (ASQ), which requires participants first to generate causal statements for 6 positive and 6 negative events, and then rate each statement in terms of internality, stability, and globalness. The ASQ has been used extensively, but has been criticized for its poor psychometric properties and for its inability to distinguish external causes to others or to situations (Kinderman & Bentall, 1996). Many researchers have therefore replaced the ASQ with the Internal, Personal, Situational Attributions Questionnaire (IPSAQ) (Kinderman & Bentall, 1997; Martin & Penn, 2002). The exaggerated self-serving bias observed when the ASQ is used, but not when the IPSAQ is used, may result from the fact that the ASQ does not distinguish between personal and situational causes (Kinderman & Bentall, 1997).

Our results also suggest that paranoid patients were not more likely than nonparanoid patients and controls to blame others rather than situations for negative events (i.e., no evidence of a Personalizing Bias – PB). This finding is consistent with Martin and Penn’s (2002) observations, although participants in the latter study made greater use of personal attributions for negative events. Our finding, however, contrasts with Kinderman and Bentall’s (1997) report that paranoid patients have a solid preference
for making personal attributions for negative events. It is possible that the discrepancy in findings is due to the fact that Kinderman and Bentall used schizophrenia patients who were hospitalized at the time of the assessment. It is likely that these individuals were admitted for increased distress from their persecutory delusions and therefore may have been more prone to blaming other people for negative events.

Interestingly, our finding that paranoid patients made more personal attribution for both positive and negative events than nonparanoid patients and, to a lesser extent, controls is consistent with the results of a recent study by Moritz, Woodward, Burlon, Braus, and Andresen (2007). In this particular study, the authors investigated attributional style in psychiatric patients with schizophrenia, depression, and anxiety, as well as nonpsychiatric controls. Not only did the authors find that participants in all four groups exhibited a self-serving bias, but they also found that, when patients in the schizophrenia group were divided into paranoid and nonparanoid groups according to their BPRS ratings on the suspiciousness item (nonparanoid rating ≤ 2; paranoid rating ≥ 3), paranoid patients were more likely to attribute events (positive and negative combined) to other people (vs. themselves) than the psychiatric groups, including nonparanoid schizophrenia patients, and controls. In their discussion, Moritz and colleagues suggest that paranoid patients’ unique tendency to hold other people responsible for positive and negative events reflects the idea that paranoid patients do not see themselves as in control of their lives. Future studies should attempt to replicate this finding and test Moritz et al.’s theory.
Participants’ ability to infer mental states in other people, which is referred to as theory of mind, was also examined in this study, as it has been hypothesized that paranoid patients when acutely ill believe that others have malevolent intentions, but that they do not believe this when asymptomatic (Frith, 1992). This hypothesis has received partial empirical support (Garety & Freeman, 1999). Many studies suggest that schizophrenia patients in general, and not just paranoid patients, have theory of mind deficits in comparison to normal controls (Bentall et al., 2001; Brüne, 2005b; Garety & Freeman, 1999; Harrington et al., 2005). Furthermore, the evidence to date suggests that theory of mind deficits in schizophrenia are a feature of the illness, and not dependent on symptom severity (Brüne, 2005b; Harrington et al., 2005; Sprong et al., 2007). The results of the present investigation are consistent with prior findings. Both paranoid and nonparanoid groups not only made more sequencing errors than controls, but performed significantly more poorly on the theory of mind questionnaire, which assessed first and second order beliefs.

Although Frith’s (1992) idea that theory of mind deficits would vary by symptom presentation makes conceptual sense, the measures currently available were not designed to test this idea (Harrington et al., 2005). In fact, the existing theory of mind measures were designed for use with children and individuals suffering from autism. There is a variety of theory of mind tasks available to researchers, ranging from picture arrangement to joke comprehension. However, there is no agreement as to which measure is most appropriate for use with schizophrenia patients. There is little data available regarding the psychometric properties of these measures when used with adults. Additionally, as
we and others have found, IQ correlates significantly with theory of mind performance (Brüne, 2003b; Brüne et al., 2007; Garety & Freeman, 1999). The relationship between IQ and theory of mind is still not completely understood. Although it is reasonable to assume that IQ contributes to story comprehension, it is also possible that our current methods to measure theory of mind are not optimal and tap into both non-social and social cognitive functions. Finally, our data suggest that race had an effect on control participants’ theory of mind abilities. Caucasian participants were more likely to obtain higher scores on the theory of mind questionnaire than African American participants. To our knowledge, we are the first to report such finding. The measure used in the present study may have influenced our results, as it was developed in Germany and consists of cartoon picture stories depicting scenarios of two or three Caucasian individuals interacting with each other (Brüne, 2003a). The use of this measure with various American sub-cultures has not been validated. Clearly, more work in this area is required before firm conclusions about theory of mind in paranoid patients can be made.

Finally, time to complete each of the Emotion Stroop word lists was examined, given that a number of studies have found that paranoid schizophrenia patients show slow color-naming for threat-related words in comparison to depressed individuals and healthy controls, suggesting a bias in selective attention to threat (Bentall & Kaney, 1989; Fear et al., 1996). A major shortcoming of these investigations, however, is that nonparanoid schizophrenia patients were not included in the studies. Our results suggest that both paranoid and nonparanoid patients take significantly more time to name the colors of the words from each word list compared to controls. Furthermore, the two patient groups
took approximately the same amount of time to name the colors of the words from each word list. It is possible that slow color naming of threat-related words is only observable in acutely paranoid schizophrenia patients. However, results from a recent study by Combs and Penn (2004) seem to refute this idea. In this particular study, the authors administered the emotional Stroop to a group of healthy undergraduate students who were classified into high and low paranoia groups based on their scores on the paranoia subscale of the Personality Assessment Inventory. The results of this study showed that the interference effect for threatening words is observable even in subclinical paranoia. Unfortunately, because the authors did not include healthy participants with subclinical signs of other symptoms associated with schizophrenia, conclusions about the specificity of the results to subclinical paranoia cannot be drawn. More research is required to determine whether the Stroop interference effect for threat-related words is dependent on the severity of paranoia or whether it reflects a trait associated with schizophrenia in general.

The present study used the card version of the emotion Stroop task, which consists of presenting participants with a set number of cards with words of different colors printed on each card. For each card, participants are asked to name the color of the ink as quickly as possible, and time taken to complete each card is recorded. A major advantage of using this version of the Stroop task is that it is easy to administer and it permits investigators to analyze response time (Henik & Salo, 2004). The card version, however, does not allow researchers to analyze error patterns (Henik & Salo, 2004). Had we used the single-trial version, in which each word is presented on a computer screen
and information about response time and errors for single words is collected, we might have found that our paranoid patients took more time to name the color of the threat-related words because of abnormal inhibitory processes whereas our nonparanoid patients took more time due to self-correction (i.e., more mistakes). The single-trial version of the Stroop task has only been used with color words printed in different color ink. No schizophrenia researchers to date have used the single-trial version of the Stroop task with emotion words. Future investigations of the Stroop interference effect for threat-related words should consider using the single-trial version of the task since this would allow for the examination of error patterns in addition to response time.

As mentioned several times already, our failure to support our third set of hypotheses may have been due to the fact that the paranoid patients in this study were stable, medicated, and only moderately symptomatic outpatients. Post hoc analyses, in which patients given moderately severe and severe ratings on the suspiciousness item of the BPRS were compared to patients given lower suspiciousness ratings and controls, revealed that extremely suspicious patients scored in the more biased direction on the cognitive measures. The difference between extremely suspicious and low suspicious patients, however, did not reach significance. The cognitive biases associated with psychosis are perhaps more strongly observable in acutely paranoid patients. Future studies should investigate attentional and referential biases in schizophrenia using a dimensional approach to paranoia. The use of such an approach would allow conclusions to be drawn about which dimension(s) of paranoia (e.g., severity, bizarreness, conviction, preoccupation, distress) is (are) associated with attentional and referential biases.
One final comment should be made pertaining to the results of correlation and regression analyses. Other than overall performance on the theory of mind task, none of the cognitive measures was found to predict the recognition of facial expressions of negative emotions. Moreover, when IQ was added to the regression analysis the only predictor of emotion recognition was IQ. Hence our findings suggest that intelligence predicts recognition of spontaneous negative emotions in others. It is somewhat surprising that IQ, a nonsocial factor, would have a greater effect on the recognition of emotions than social cognitive variables. Hopefully more studies will investigate the relationship between intelligence and emotion recognition, which might shed more light on our results.

Hypothesis 4

Finally, participants’ judgments as to whether the emotion displayed in each photograph was felt or unfelt were examined. The first set of analyses looked at the “genuine” and “posed” label counts for each group regardless of whether the judgments were accurate. The results yielded a significant group by condition interaction, suggesting that paranoid patients were more likely to use the “genuine” label to describe the emotion displayed in each photograph than nonparanoid patients and controls. This bias seen in paranoid patients did not correlate with any of the cognitive measures, but it did correlate with suspiciousness. It may be therefore that the more suspicious patients are, the less able they are to consider alternative explanations. In this case, the more suspicious the paranoid patients were, the more difficult it may have been for them to
consider the possibility that the person in the photograph was not really experiencing the emotion being displayed.

The second set of analyses examined group differences in the correct use of the “genuine” and “posed” labels. The results of these analyses revealed that, although the three groups made more accurate judgments of the genuine expressions, control participants’ judgments were significantly more accurate than the paranoid and nonparanoid patients’ judgments. Furthermore, the data indicated that control participants’ judgments were above chance level, whereas patients made random judgments.

Unfortunately, no data were collected on the amount of time it took participants to judge whether the emotion displayed in each photograph was felt or posed. Such data could have provided additional information about participants’ approach to this task. For instance, had the paranoid patients taken significantly less or more time than the nonparanoid patients and controls to arrive at their judgments, then more could have been said about the cognitive processes underlying their biased tendency to rate emotions as felt. Furthermore, more could have been said about the cognitive processes involved in making judgments as to whether the emotions displayed were genuine or posed had participants been asked about how they arrived at their judgments. Future studies should therefore consider including these variables to elucidate why it is that paranoid patients are significantly more inclined to choose the label “genuine” to describe emotions displayed in photographs.
Limitations

Several methodological issues should be examined with regard to the present study. First, our participants volunteered to complete the study protocol. Our recruitment methods therefore could have engendered self-selection. This may have especially affected our paranoid patient group, as by its very definition, paranoia refers to an exaggerated distrust of others triggered by beliefs of perceived threat. It is therefore very unlikely that highly paranoid individuals would have agreed to meet with an unfamiliar investigator on two occasions to answer questions about their experiences and complete measures about the way they think. Hence, our paranoid group may have consisted of individuals at the lower end of the paranoia spectrum. Our data do in fact suggest that, as a group, our patients were only mildly to moderately suspicious (see Appendix D for graphic depiction of the distribution of ratings for the BPRS suspiciousness item). Our inability to recruit patients on the higher end of the paranoia spectrum may explain why our hypotheses regarding the paranoid group were not supported.

Relatedly, an effort was made to classify patients into paranoid and nonparanoid groups based on the suspiciousness item of the BPRS. The rationale for doing so was that diagnostic classifications of paranoid schizophrenia, such as the DSM, are overinclusive and do not distinguish between types of delusions held. Patients in this study were grouped into the paranoid category if they acknowledged being suspicious of other people’s motives. It is possible that the criteria used to divide patients into paranoid and nonparanoid subgroups were not specific enough, which might explain why we were
unable to find significant differences between our two patient groups. As some have argued, classifying patients according to the content of their delusions may yield more reliable results (Freeman & Garety, 2000). Many have recently proposed using “persecutory” delusions as opposed to “paranoid” delusions as a classification scheme since the former implies a clear intent of harm while the later implies threat in a more general sense (Bentall et al., 2001; Freeman & Garety, 2000; Garety & Freeman, 1999). Unfortunately, very few measures of persecutory ideation were available at the time of data collection. However, at least three measures of persecutory ideation have emerged in the literature during the past two years (Freeman et al., 2007; Green et al., 2008; McKay, Langdon, & Coltheart, 2006). Future studies should investigate emotion recognition and its relation to the cognitive processes associated with delusion formation and maintenance in patients with and without persecutory ideation using one of the newer instruments.

Another comment about our patient sample is that it was relatively homogeneous, consisting of fairly high functioning schizophrenia patients who were receiving outpatient services. The patients were, on average, only mildly symptomatic. All were prescribed antipsychotic medications and, according to their medical records, most were compliant with treatment. Furthermore, many had previously participated in research projects and were familiar with our work. Our results, therefore, may not be representative of schizophrenia patients in general.
Fourth, the results of our analyses should be viewed with caution since the sizes of our participant groups were small and we performed a number of comparisons without making statistical corrections for multiple testing. Furthermore, our statistical power analyses suggested that the inclusion of 30 participants in each group would be sufficient to detect group differences. However, although 62 patients completed the study assessments, only 50 met our inclusion criteria. The inclusion of a lower number of patients in each patient group could have affected our ability to detect significant group differences. Future studies should attempt to conduct similar analyses using larger sample sizes.

Fifth, the use of the emotion recognition task developed for this study represents both a major strength and weakness. The task was created because the only facial stimuli available at the time consisted of photographs of actors posing various facial expressions of emotion. Our task was carefully developed using photographs of undergraduate students displaying posed and spontaneous expressions of emotion. These undergraduate students had no training in expressing emotions facially, which added to the ecological validity of the task. However, some of the facial expressions captured in the photographs were difficult to sort into one emotion category (see Appendix B) and the emotions displayed were, on average, only given ratings of moderate intensity by our independent judges (see Appendix C). Furthermore, due to the quasi-random nature of participant enrollment in undergraduate research, the undergraduate students who were photographed identified as either “White” or “Indian.” Because no African American students volunteered to participate in the facial stimuli collection project, no photographs
of African American individuals were presented to the participants in the present study. This could have further affected our results given that there is research suggesting that people are more accurate at recognizing facial expressions of emotion of individuals of the same culture (e.g., Pinkham et al., in press) and given that many of the participants, and the majority of the patients in our paranoid group, were African American. Another issue pertaining to the facial stimuli used in this study is that our results cannot be easily compared with other studies because other studies have used different sets of facial stimuli. There is undoubtedly a need for the development of a set of facial stimuli consisting of photographs of individuals of different ages, genders, and cultural backgrounds displaying posed and spontaneous expressions of emotion that could be used by researchers interested in facial affect recognition.

Finally, although the inclusion of spontaneous expressions of emotion added to the ecological validity of the study, the lack of context makes it difficult to generalize our findings to real world observations. Emotions do not occur in a vacuum. In everyday interactions, more cues about the sender’s emotional state are available to the receiver. It would be worth investigating whether paranoid and nonparanoid patients also have difficulty recognizing facial emotions in others when more information about the context is available. Furthermore, it would be interesting to determine whether paranoid and nonparanoid patients differ in the types of cues they attend to when determining the emotion expressed in a particular context.
Concluding remarks

This study examined emotion recognition in paranoid schizophrenia patients, nonparanoid schizophrenia patients, and nonpsychiatric controls. It also investigated whether a relationship exists between emotion recognition and thinking errors in paranoid patients. The results of this study were more complex than expected and leave more questions than answers. Nevertheless, our results have implications for the next generation of emotion recognition studies and for the investigation of differences between paranoid and nonparanoid patients. It would be informative to look at emotion recognition abilities in young people at risk for psychosis and in first episode patients to determine whether emotion recognition deficit is a risk factor for the illness or the result of social isolation that occurs following the diagnosis of the illness. Furthermore, it would be worth studying emotion recognition abilities longitudinally to determine whether emotion recognition performance in schizophrenia is trait-dependent or state-dependent, depending on an increase in symptom, especially persecutory delusions. Future emotion recognition studies should also consider investigating reaction times, visual scanpaths, and brain activity of paranoid and nonparanoid schizophrenia patients to examine whether different patterns of result arise.


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Examples of photographs included in the emotion recognition task.

Neutral

Happy Spontaneous

Happy Posed

Sad Spontaneous

Sad Posed
Anger Spontaneous

Anger Posed

Disgust Spontaneous

Disgust Posed

Fear Spontaneous

Fear Posed
APPENDIX B
Ranges of inter-judge consistency ratings for the final set of 48 photographs used for the emotion recognition task

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Genuine</th>
<th>Posed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy</td>
<td>100%</td>
<td>95% - 100%</td>
</tr>
<tr>
<td>Sad</td>
<td>50% - 85%</td>
<td>55% - 75%</td>
</tr>
<tr>
<td>Anger</td>
<td>45% - 65%</td>
<td>30% - 75%</td>
</tr>
<tr>
<td>Disgust</td>
<td>60% - 100%</td>
<td>25% - 75%</td>
</tr>
<tr>
<td>Fear</td>
<td>20% - 35%</td>
<td>15% - 45%</td>
</tr>
<tr>
<td>Neutral</td>
<td>55% - 92%</td>
<td>-</td>
</tr>
</tbody>
</table>
Mean intensity ratings for the different facial expressions

<table>
<thead>
<tr>
<th></th>
<th>Genuine Expressions Mean (SD)</th>
<th>Posed Expressions Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy</td>
<td>3.4 (0.9)</td>
<td>3.5 (0.9)</td>
</tr>
<tr>
<td>Sadness</td>
<td>2.3 (0.8)</td>
<td>2.0 (0.5)</td>
</tr>
<tr>
<td>Anger</td>
<td>3.2 (0.4)</td>
<td>3.3 (0.4)</td>
</tr>
<tr>
<td>Disgust</td>
<td>3.0 (0.6)</td>
<td>3.1 (0.5)</td>
</tr>
<tr>
<td>Fear</td>
<td>3.2 (0.2)</td>
<td>3.2 (0.6)</td>
</tr>
<tr>
<td>Neutral</td>
<td>1.6 (0.3)</td>
<td>–</td>
</tr>
</tbody>
</table>

*Note.* Ratings made on a 5-point Likert scale (1 = no intensity to 5 = extremely intense)
Histogram depicting distribution of scores on the suspiciousness item of the BPRS

BPRS item 9 - suspiciousness

1 = Not present, 2 = Very mild, 3 = Mild
4 = Moderate, 5 = Moderately Severe, 6 = Severe

Std. Dev = 1.57
Mean = 2.7
N = 50.00
Consent Form: Facial Affect Recognition in Individuals With and Without Schizophrenia (Patient Consent Form)

I want to do research on people’s recognition of facial expressions of emotion in others. I want to do this because I would like to determine whether certain cognitive factors affect one’s ability to recognize facial expressions of emotion. I would like you to take part in this project. If you decide to do this, you will be asked to complete a diagnostic interview, provide two speech samples, which will be audiotaped, and take taking several tests. The tests include a facial recognition task, a facial emotion recognition task, a test assessing your ability to attend to the ink color of several words, a test measuring your attributional style, a test measuring your ability to understand other people’s mental states, and a probabilistic reasoning task. I will also consult your chart at Community Support Services (CSS) to obtain specific information about your diagnosis, the names and doses of the medications you are currently taking, the age at which you were first hospitalized for psychiatric reasons, the number of times you have been hospitalized for psychiatric reasons, and your treatment provider’s estimate of how well you are functioning in your life. Your participation will involve meeting twice with an experimenter for approximately 2 ½ hours on each occasion.

As a result of participating in this study, there is a possibility that you may feel tired, bored, or some discomfort due to the emotional content of some of the stimuli that will be presented to you. You may also experience some discomfort due to the personal nature of some questions. If you experience any distress or anxiety during the testing sessions, you can do any of the following: you can discuss your feelings with the experimenter, you can take a break and continue later, you can ask to skip the question(s) or task, or you can choose to stop the study.

All of the information obtained in this study will be kept strictly confidential and will only be available to the researchers. Your confidentiality will be maintained by the use of a code number on all the materials used for data collection and analysis. Your name will not be used in any of the communications that result from this study. Furthermore, your file will be stored in a filing cabinet in a locked office in the Psychology Department at Kent State University.

If you take part in this project, you will be assisting in the effort to find out more about schizophrenia. You will be paid $20 after each session for completing the study. If you decide to stop before completing any of the two sessions, you will be paid part of the
Consent Form: Facial Affect Recognition in Individuals With and Without Schizophrenia (Patient Consent Form)

money. How much you are paid will be based on how long you participated before deciding to stop. Taking part in this project is entirely up to you, and no one will hold it against you if you decide not to do it. If you take part, you may stop at any time.

If you want to know more about this research project, please call me, Annie St-Hilaire, and leave a message at (330) 672-8888. I will return your call as soon as I can. You can also call my advisor, Dr. Nancy Docherty, at the same number (330) 672-7670 for more information about the study. This project has been approved by Kent State University. If you have any questions about Kent State University’s rules for research, please call Dr. John L. West, Vice President and Dean, Division of Research and Graduate Studies at (330) 672-0700. Remember, this study is being conducted by researchers from Kent State University and has nothing to do with your treatment at Community Support Services.

You will get a copy of this consent form.

Sincerely,
Annie St-Hilaire, MSc
Primary Investigator

I agree to take part in this project. I know what I will have to do and that I can stop at any time.

__________________________  ______________________
Signature      Date
Audiotape Consent Form: Facial Affect Recognition in Individuals With and Without Schizophrenia

I agree to audiotaping at ____________________________________________________
on _____________________________.

__________________________________  _______________ _______________
Signature      Date

I have been told that I have the right to hear the audiotape before it is used. I have decided that I:

_______ want to hear the tape   _______ do not want to hear the tape

Sign now below if you do not want to hear the tape. If you want to hear the tape, you will be asked to sign after you hear it.

Annie St-Hilaire, Dr. Nancy Docherty, and other researchers approved by Kent State University may / may not use the tape made of me. The original tape or copies may be used for:

_____ this research project       _____ future research projects

____________________________________________________

__________________________________  _______________ _______________
Signature      Date
Consent Form: Facial Affect Recognition in Individuals With and Without Schizophrenia  
(Normal Control Consent Form)

I want to do research on people’s recognition of facial expressions of emotion in others. I want to do this because I would like to determine whether certain cognitive factors affect one’s ability to recognize facial expressions of emotion. I would like you to take part in this project. If you decide to do this, you will be asked to complete a diagnostic interview, provide two speech samples, which will be audiotaped, and take several tests. The tests include a facial recognition task, a facial emotion recognition task, a test assessing your ability to attend to the ink color of several words, a test measuring your attributional style, a test measuring your ability to understand other people’s mental states, and a probabilistic reasoning task. Your participation will involve meeting once with an experimenter for approximately 2 ½ - 3 hours.

As a result of participating in this study, there is a possibility that you may feel tired, bored, or some discomfort due to the emotional content of some of the stimuli that will be presented to you. You may also experience some discomfort due to the personal nature of some questions. If you experience any distress or anxiety during the testing sessions, you can do any of the following: you can discuss your feelings with the experimenter, you can take a break and continue later, you can ask to skip the question(s) or task, or you can choose to stop the study.

All of the information obtained in this study will be kept strictly confidential and will only be available to the researchers. Your confidentiality will be maintained by the use of a code number on all the materials used for data collection and analysis. Your name will not be used in any of the communications that result from this study. Furthermore, your file will be stored in a filing cabinet in a locked office in the Psychology Department at Kent State University.

If you take part in this project, you will be assisting in the effort to find out more about schizophrenia. You will be paid $40 for completing the study. If you decide to stop before completing the assessments, you will be paid part of the money. How much you are paid will be based on how long you participated before deciding to stop. Taking part in this project is entirely up to you, and no one will hold it against you if you decide not to do it. If you take part, you may stop at any time.
Consent Form: Facial Affect Recognition in Individuals With and Without Schizophrenia (Normal Control Consent Form)

If you want to know more about this research project, please call me, Annie St-Hilaire, and leave a message at (330) 672-8888. I will return your call as soon as I can. You can also call my advisor, Dr. Nancy Docherty at the same number (330) 672-7670 for more information about the study. This project has been approved by Kent State University. If you have any questions about Kent State University’s rules for research, please call Dr. John L. West, Vice President and Dean, Division of Research and Graduate Studies at (330) 672-0700.

You will get a copy of this consent form.

Sincerely,

Annie St-Hilaire, MSc
Primary Investigator

I agree to take part in this project. I know what I will have to do and that I can stop at any time.

__________________________________  _______________ _______________
Signature      Date
CONSENT FORM
Facial Affect Recognition in Individuals With and Without Schizophrenia

Full Project Title: Facial Affect Recognition in Individuals With and Without Schizophrenia
Investigators: Annie St-Hilaire, M.Sc., Nancy M. Docherty, Ph.D., Bradley P. Winkhart, M.D.

We are asking you to be in a research study. The following information is provided to inform you about the study and your participation in it. Please read it carefully and feel free to ask any questions.

PURPOSE OF STUDY: You are being asked to participate in a research study. The purpose of this study is to gain information that may help us better understand why some individuals with schizophrenia have difficulty recognizing facial expressions of emotion in other people while others are quite good at this task. To do this, we are studying people with and without a diagnosis of schizophrenia. We hope that the study will allow us to determine whether differences in cognitive processing are related to differences in facial affect recognition.

PROCEDURES: If you decide to take part in this study, you will be asked to meet twice with an experimenter for approximately 2 to 2½ hours on each occasion. You will receive a compensation of $20 after the completion of each session, for a total of $40. If you decide to stop before completing any of the two sessions, you will be paid part of the money. How much you are paid will be based on how long you participated before deciding to stop.

The first meeting will involve the completion of a diagnostic interview and two tests looking at your beliefs about yourself and others as well your knowledge of vocabulary words. You will also be asked to provide a speech sample, which will be audiotaped.

The second meeting will involve the completion of various cognitive tasks, including a test of facial recognition, a facial emotion recognition task, a task assessing your ability to attend to the ink color of several words, a task looking at how you explain the causes of certain events, a test measuring your ability to understand other people’s mental states, and a task assessing your ability to reason using probabilities. You will also be asked to provide another speech sample at the end of the second meeting.

You will be asked to provide authorization to review your hospital chart to obtain specific information about your diagnosis, the names and doses of the medications you are currently taking, the age at which you were first hospitalized for psychiatric reasons, and your treatment provider’s estimate of how well you are functioning at this time. All medical records will be treated as confidential.

Your confidentiality will be maintained by the use of a code number on all materials used for data collection and analysis. Your name will not be used in any of the
communications that result from this study. We will store all study materials in a locked filing cabinet in a locked office at Kent State University.

YOUR RIGHTS AS A PARTICIPANT: Your participation in this study is strictly voluntary and confidential. You may refuse to participate in this study or withdraw consent to participate at any time without penalty or loss of benefits. If you refuse to participate, it will not effect your treatment at Summa Health System.

RISKS AND DISCOMFORTS: We believe that the risks of this study are minimal. However, as a result of participating in this study, there is a slight possibility that you may feel tired, bored, or some discomfort due to the emotional content of some of the stimuli presented to you. You may also experience some discomfort due to the emotional nature of some of the questions. If you experience any distress or anxiety during either of the testing sessions, you can do any of the following: you can discuss your feelings with the experimenter, you can take a break and continue later, you can ask to skip the question(s) or task, or you can choose to stop the study.

If you experience any psychological distress or medical problem, medical care and mental health services are available at Summa Health System. Medical care and mental health services are also available outside the Summa Health System. However, you would have to make arrangements to pay for any services, and medical or mental health care would not be provided for free because you were in this research project.

POTENTIAL BENEFITS: This study is not designed to provide a treatment for any condition, so there are no direct benefits for participating. However, the outcome of the research will provide important information regarding the cognitive factors that affect how people process emotional information.

CRITERIA FOR INCLUSION/EXCLUSION FROM PARTICIPATION: You must be between the ages of 18 and 50 and be able to communicate in English. You will not be eligible to participate if you have a history of head injury or carry a diagnosis of alcohol or substance abuse or dependence at this time.

CONFIDENTIALITY: All research records will be kept in a locked office in the Department of Psychology at Kent State University. Confidentiality of your records will be maintained within the limits of the law; however, Federal law authorizes representatives from the Office of Human Research Protection and the Summa Health Systems Institutional Review Board to inspect the research records. The information you provide will be identified only by a number.

SPONSORS: This research involves collaboration between researchers at Summa Health System and researchers at Kent State University.

QUESTIONS: If you want to know more about this research project, please call Annie St-Hilaire at (330) 780-6427. The procedures for this project have been reviewed by the Human Subject’s Committee at Kent State University and at Summa Health System. If you
have questions about Kent State University's rules for research, please call Dr. John West, Dean, Division of Research and Graduate Studies (tel. 330-672-0700). If you have questions about Summa Health System’s rules for research, please contact Research Administration, Summa Health Systems, Akron OH 44309-2090 (tel. 330-375-4045).

By signing this consent form you agree to take part in this research project. You may withdraw consent to participate at any time without penalty or loss of benefits.

You will get a signed copy of this consent form.

By signing this form I acknowledge that I have read it, understand it, and have had any questions regarding the risks and benefits of this study satisfactorily answered, and I am voluntarily consenting to participate in this study. Further, I realize that by signing this form I do not waive any of my legal rights, and that I can choose to terminate my participation at any time.

________________________________________________________________________ Date: __________
Participant Signature

________________________________________________________________________ Date: __________
Witness Signature

________________________________________________________________________ Date: __________
Person obtaining consent

________________________________________________________________________ Date: __________
Investigator
Demographic & Medication Form

Subject ID# ____________

Date _____________________
Age at first psychiatric treatment ___________________
Age at first hospitalization ________________________
Dates of most recent hospitalization ___________________
Number of hospitalizations _________________________
Total time hospitalized ___________________________

Sex       M         F
Race/Ethnicity __________________________________
DOB __________________________________________
Education level __________________________________
Current occupation ________________________________
Highest past occupation __________________________
Father’s education ________________________________
Father’s occupation (highest) _______________________
Mother’s education _______________________________
Mother’s occupation (highest) ______________________

<table>
<thead>
<tr>
<th>Current Medications</th>
<th>Dosage</th>
<th>Date Started</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

Additional Notes: _________________________________________________________
________________________________________________________________________
This questionnaire is designed to measure beliefs about yourself and others.
Please read each question and answer as honestly as you can. There are no right or wrong answers, and there are no trick questions.

1. Do people generally seem to take offense easily?
   - Yes
   - No

2. Do you often feel that people have it in for you?
   - Yes
   - No

3. Are you sometimes eaten up with jealousy?
   - Yes
   - No

4. Do you feel that it is other people who always seem to get the breaks?
   - Yes
   - No

5. Do you feel that you have often been punished without cause?
   - Yes
   - No

6. Would you have been more successful if others around you had not put difficulties in your way?
   - Yes
   - No

7. Do you tend to assume that all people have a vicious streak and it will come out when they are given the chance?
   - Yes
   - No

8. Are you sure you are being talked about?
   - Yes
   - No

9. Do you often get into a jam because you do things without thinking?
   - Yes
   - No

10. Have you had an awful lot of bad luck?
    - Yes
    - No

11. Do you wonder why sometimes you feel so bitter about things?
    - Yes
    - No

12. Do you believe you will never be satisfied?
    - Yes
    - No

13. Do you think that you feel more intensely than most people?
    - Yes
    - No

14. Do people you are with have a strong influence on your moods?
    - Yes
    - No

15. Do you tend to be envious of other people’s good fortune?
    - Yes
    - No

16. Do you feel that you have had more than your share of things to worry about?
    - Yes
    - No

17. Do you sometimes feel ‘like a powder keg ready to explode’?
    - Yes
    - No
<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you more sensitive than most people?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you believe in never trusting anyone who has a grudge against you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do people sometimes say insulting things about you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do people mean to do and say things that annoy you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you suspect that people who act friendly to you can be disloyal?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you an ‘even tempered’ person?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you feel at times that you’ve got a raw deal out on life?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you get suspicious of over friendly strangers?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you happy most of the time?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you often get involved in things you later wish you could get out of?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you had more trouble than most?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you get so ‘carried away’ by new and exciting ideas that you never think of possible snags?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you often notice your ears ringing or buzzing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When put in charge of something, do you insist that your instructions are followed, or else you resign?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When people are especially nice, do you wonder what they want?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you sometimes feel that people are laughing at you behind your back?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you doubt the honesty of people who are more friendly than you would expect them to be?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do some of your friends thin you are a hothead?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you find that you can’t help getting into arguments when people disagree with you?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
37 Do you sometimes fly off the handle for no good reason? Yes No
38 Do you agree that there are really more nice people than objectionable people in the world? Yes No
39 Do you get upset when people don’t notice how you look when you go out in public? Yes No
40 Do you have trouble controlling your temper? Yes No
41 Would you like to be in a position where people were frightened to defy you? Yes No
42 Do you often feel that people have it in for you? Yes No
43 Do you feel at times that people are talking about you? Yes No
44 Do you feel that you have to be on your guard even when you’re with people? Yes No
45 Do you feel it is safer to trust nobody? Yes No
46 Do you feel lonely most of the time, even when you’re with people? Yes No
47 Are you often bothered by the feeling that people are watching you? Yes No
## Brief Psychiatric Rating Scale (Version 4.0)

ID # : ______________  Date: ______________  Interviewer: ______________

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Somatic Concern</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>2. Anxiety</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>3. Depression</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>4. Suicidality</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>5. Guilt</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>6. Hostility</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>7. Elevated Mood</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>8. Grandiosity</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>9. Suspiciousness</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>10. Hallucinations</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>11. Unusual Thought</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>12. Bizarre Behavior</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>13. Self-neglect</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>14. Disorientation</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>N5. Abstract thinking</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>P12. Lack of Insight</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

Rate items 15-24 on the basis of observed behavior or speech of the patient during the interview.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Concept. Disorganization</td>
<td>1 2 3 4 5 6 7</td>
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<td>1 2 3 4 5 6 7</td>
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<td>17. Emotional Withdrawal</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>18. Motor Retardation</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>19. Tension</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>20. Uncooperativeness</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>21. Excitement</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>22. Distractibility</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>23. Motor Hyperactivity</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>24. Mannerisms and Posturing</td>
<td>1 2 3 4 5 6 7</td>
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Confidence in assessment :

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Explain here if validity of assessment is questionable:

- Symptoms possibly drug-induced
- Underreported due to lack of rapport
- Underreported due to negative symptoms
- Patient uncooperative
- Difficulty to assess due to formal thought disorder
- Other
**Shipley Institute of Living Scale**

**Instructions:** In the test below, the first word in each line is printed in capital letters. Opposite it are four other words. Circle the *one word* which means the *same thing*, or most nearly the same thing as the first word. If you don’t know, guess. Be sure to circle the *one word* in each line that means the same thing as the first word.

**Example:**

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<th>big</th>
<th>silent</th>
<th>wet</th>
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<td>sleep</td>
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<td>PERMIT</td>
<td>allow</td>
<td>sew</td>
<td>cut</td>
<td>drive</td>
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<td>PARDON</td>
<td>forgive</td>
<td>pound</td>
<td>divide</td>
<td>tell</td>
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<td>eraser</td>
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<td>swim</td>
<td>recall</td>
<td>number</td>
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<td>leafy</td>
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<td>vain</td>
<td>sound</td>
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Shipley Part II

**Instructions:** Complete the following by filling in either a number or a letter for each dash (___). Do the items in order, but don’t spend too much time on any one item.

**Example:**

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<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
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</tbody>
</table>

1. 1 2 3 4 5 ___
2. white black short long down ___ ___
3. AB BC CD D___
4. Z Y X W V U ___
5. 12321 23432 34543 456___ ___
6. NE/SW SE/NW E/W N/___
7. escape scape cape ___ ___ ___
8. oh ho rat tar mood ___ ___ ___ ___
9. A Z B Y C X D ___
10. tot tot bard drab 537 ___ ___ ___
11. mist is wasp as pint in tone___ ___
12. 57326 73265 32657 26573 ___ ___ ___ ___
13. knit in spud up both to stay ___ ___
14. Scotland landscape scapegoat ___ ___ ___ ___ ee
15. surgeon 1234567 snore 17635 rogue ___ ___ ___ ___
16. tam tan rib rid rat raw hip ___ ___ ___
17. tar pitch throw saloon bar rod fee tip end plank ___ ___ ___ ___ meals
18. 3124 82 73 154 46 13___
19. lag leg pen pin big bog rob ________
20. two w four r one o three ___
**Emotion Recognition Task Response Form**

This is a test of facial affect recognition. You will be presented pictures of individuals displaying different emotions. For each picture, you will have to decide which emotion best represents the emotion shown in the picture: happiness, sadness, anger, disgust, or fear.

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<th>Disgust</th>
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22  Happiness  Sadness  Anger  Disgust  Fear
23  Happiness  Sadness  Anger  Disgust  Fear
24  Happiness  Sadness  Anger  Disgust  Fear
25  Happiness  Sadness  Anger  Disgust  Fear
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# Posed versus Genuine Expressions Task

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I.P.S.A.Q.

INSTRUCTIONS
Please read the statements on the following pages. For each statement please try to vividly imagine that event happening to you. Then try to decide what was the main cause of the event described in each statement. Please write the cause you have thought of in the space provided. Then tick the appropriate letter (a, b, or c) according to whether the cause is:

a) Something about you
b) Something about another person (or a group of people)
c) Something about the situation (circumstances or chance)

It might be quite difficult to decide which of these options is exactly right. In this case, please pick one option, the option which best represents your opinion. Please pick only one letter in each case.

Thank you for your time and co-operation.

1. A friend gave you a lift home.
What caused your friend to give you a lift home? (Please write down the one major cause)

...............................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

2. A friend talked about you behind your back.
What caused your friend to talk about you behind your back? (Please write down the one major cause)

...............................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
3. A friend said that he(she) has no respect for you.

What caused your friend to say that he(she) has no respect for you?
(Please write down the one major cause)

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

4. A friend helped you with the gardening.

What caused your friend to help you with the gardening?
(Please write down the one major cause)

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
6. **A friend refused to talk to you.**

What caused your friend to refuse to talk to you?
(Please write down the one major cause)

Is this:

a. Something about you?

b. Something about the other person or other people?

c. Something about the situation (circumstances or chance)?

---

7. **A friend thinks you are interesting.**

What caused your friend to think you are interesting?
(Please write down the one major cause)

Is this:

a. Something about you?

b. Something about the other person or other people?

c. Something about the situation (circumstances or chance)?

---

8. **A friend sent you a postcard.**

What caused your friend to send you a postcard?
(Please write down the one major cause)

Is this:

a. Something about you?

b. Something about the other person or other people?

c. Something about the situation (circumstances or chance)?
9. **A friend thinks you are unfriendly.**

What caused your friend to think that you are unfriendly?
(Please write down the one major cause)

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Is this :

a. Something about you ?

b. Something about the other person or other people ?

c. Something about the situation (circumstances or chance) ?

10. **A friend made an insulting remark to you.**

What caused your friend to insult you?
(Please write down the one major cause)

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Is this :

a. Something about you ?

b. Something about the other person or other people ?

c. Something about the situation (circumstances or chance) ?

11. **A friend bought you a present.**

What caused your friend to buy you a present .
(Please write down the one major cause)

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Is this :

a. Something about you ?

b. Something about the other person or other people ?

c. Something about the situation (circumstances or chance) ?
12. **A friend picked a fight with you.**

What caused your friend to fight with you?
(Please write down the one major cause)

..........................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
15. **A friend thinks you are clever.**

What caused your friend to think you are clever?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

16. **A friend refused to help you with a job.**

What caused your friend to refuse to help you with the job?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

17. **A friend thinks you are sensible.**

What caused your friend to think that you were sensible?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
18. **A friend thinks you are unfair.**

What caused your friend to think that you are unfair?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

19. **A friend said that he(she) dislikes you.**

What caused your friend to say that he(she) dislikes you?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

20. **A friend called you to ask about you.**

What caused your friend to call to ask about you?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
21. A friend ignored you

What caused your friend to ignore you?  
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?

b. Something about the other person or other people?

c. Something about the situation (circumstances or chance)?

22. A friend said that she(he) admires you.

What caused your friend to say that she(he) admired you?  
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?

b. Something about the other person or other people?

c. Something about the situation (circumstances or chance)?

23. A friend said that he(she) finds you boring.

What caused your friend to say that he(she) finds you boring?  
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?

b. Something about the other person or other people?

c. Something about the situation (circumstances or chance)?
24. A friend said that she(he) resents you.

What caused your friend to say that she(he) resents you?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

25. A friend visited you for a friendly chat.

What caused your friend to visit you for a chat?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

26. A friend believes that you are honest

What caused your friend to believe that you are honest?
(Please write down the one major cause)

.................................................................

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
27. A friend betrayed the trust you had in her.

What caused your friend to betray your trust?
(Please write down the one major cause)

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

28. A friend ordered you to leave.

What caused your friend to order you to leave?
(Please write down the one major cause)

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?

29. A friend said that she(he) respects you.

What caused your friend to say that she(he) respects you?
(Please write down the one major cause)

Is this:

a. Something about you?
b. Something about the other person or other people?
c. Something about the situation (circumstances or chance)?
30. **A friend thinks you are stupid.**

What caused your friend to think that you are stupid?
(Please write down the one major cause)

-----------------------------------------------------

Is this :

a. Something about you ?
b. Something about the other person or other people ?
c. Something about the situation (circumstances or chance) ?

31. **A friend said that he(she) liked you.**

What caused your friend to say that he(she) liked you?
(Please write down the one major cause)

-----------------------------------------------------

Is this :

a. Something about you ?
b. Something about the other person or other people ?
c. Something about the situation (circumstances or chance) ?

32. **A neighbor invited you in for a drink.**

What caused your friend to invite you in for a drink?
(Please write down the one major cause)

-----------------------------------------------------

Is this :

a. Something about you ?
b. Something about the other person or other people ?
c. Something about the situation (circumstances or chance) ?
Theory of mind - picture stories

Sequencing score:
• 1./4. card correct = 2 pts. each
• 2./3. card correct = 1 point each

1st picture story

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Sequencing time:

Questionnaire:

a) What does the red person believe the blue one intends to do? (2nd order belief) (Pointing to 2nd picture)

b) What does the red person expect from the blue person? (Reciprocity) (Pointing to 4th picture)

Sum of points (max. 8)
2nd picture story

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sequencing time:

**Questionnaire:**

a) What does the blue person believe is in the bag?
   (false belief) (pointing to 2nd picture)

b) What's in the bag? (reality) (pointing to 2nd picture)

c) What does the blue person believe the red person intends to do?
   (2nd order false belief) (pointing to 2nd picture)

d) What does the red person expect, the blue person believes, what he
   (the red one) intends to do? (3rd order false belief)
   (pointing to 2nd picture)

e) What do you think the red person intended to do?
   (deception) (whole story)

sum of points (max. 11)
### 3rd picture story

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**sequencing time:**

**Questionnaire:**

a) What does the red person believe the others intend to do? (2nd order false belief) *(pointing to 3rd picture)*

b) What do the two characters want the red ought to believe, what they intend to do? (cheating) *(pointing to 3rd picture)*

c) What do they intend to do? (deception) *(whole story)*

d) What does the red person now think, the others intended to do? (cheating detection) *(pointing to 4th picture)*

sum of points (max. 10)
4th picture story

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patient's sequence

points (max. 6)

sequencing time:

**Questionnaire:**

a) What does the bald person think the other person intends to do? (2nd order belief) *(pointing to 1st picture)*

b) What does the bald person expect from the other person? (reciprocity) *(pointing to 3rd picture)*

sum of points (max. 8)
5th picture story

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points (max. 6)

sequencing time:

Questionnaire:

a) What does the blond person believe is in the box? (false belief) (pointing to 3rd picture)

b) What's in the box? (reality) (pointing to 3rd picture)

c) What does the blond person believe the other person intends to do? (2nd order false belief) (pointing to 3rd picture)

d) What does the person with the dark hair expect, the blond person believes, he (the dark person) intends to do? (3rd order false belief) (pointing to 2nd picture)

e) What do you think, the dark haired person intended to do? (deception) (whole story)

sum of points (max. 11)
6th picture story

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sequencing time:

Questionnaire:

a) What does the blue person intend to do? (intention) (pointing to 1st picture)

b) What does the shopgirl believe has happened? (false belief) (pointing to 3rd picture)

c) What do the blue and the red person intend to do? (cheating) (pointing to 2nd picture)

d) What does the red person expect from the blue person? (reciprocity) (pointing to 4th picture)

e) What does the shopgirl now think the boys intended to do? (cheating detection) (pointing to 4th picture)

sum of points (max. 11)
**Probabilistic Reasoning Task**

**Condition I**

Jars A & B

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Jars X & Y

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

**Condition II**

Jars A & B

______________________________
______________________________
______________________________
______________________________

Jars X & Y

______________________________
______________________________
______________________________
______________________________
Blue
Red
Green
Yellow
Black
Sadly  Defeat  Afraid  Reject  Hopelessly
Afraid  Hopelessly  Reject  Sadly  Defeat
Reject  Afraid  Sadly  Defeat  Hopelessly
Defeat  Reject  Hopelessly  Afraid  Sadly
Hopelessly  Sadly  Reject  Defeat  Afraid
Reject  Hopelessly  Defeat  Sadly  Afraid
Defeat  Sadly  Afraid  Reject  Hopelessly
Hopelessly  Afraid  Sadly  Reject  Defeat
Sadly  Defeat  Hopelessly  Afraid  Reject
Afraid  Reject  Defeat  Hopelessly  Sadly
Spy  Threat  Follow  Whisper  Persecute

Follow  Persecute  Spy  Whisper  Threat

Whisper  Spy  Threat  Persecute  Follow

Persecute  Threat  Whisper  Follow  Spy

Threat  Whisper  Persecute  Spy  Follow

Persecute  Follow  Spy  Threat  Whisper

Spy  Persecute  Follow  Threat  Whisper

Whisper  Spy  Threat  Persecute  Follow

Follow  Whisper  Persecute  Spy  Threat

Threat  Follow  Whisper  Persecute  Spy
Die Panic Terror Fearful Collapse
Collapse Fearful Die Terror Panic
Die Collapse Fearful Panic Terror
Fearful Terror Die Collapse Panic
Collapse Die Fearful Panic Terror
Panic Fearful Terror Die Collapse
Terror Panic Die Collapse Fearful
Fearful Terror Collapse Panic Die
Panic Collapse Fearful Die Terror
Die Fearful Panic Terror Collapse
Emotional Stroop Response Form

Instructions: “In a few moments, you will be presented lists of words of different colors. Your task will be to tell me the color of each word as quickly and accurately as possible. To do this, you will have to ignore the meaning of the words” **Interviewer, make sure that the cards are presented in a random order. Also, make sure to indicate the order of the cards**

Neutral Words (Order #  )

1. (Blue) ____ (Yellow) ____ (Black) ____ (Green)____ (Red) ____
2. (Red) ____ (Black) ____ (Green) ____ (Blue)____ (Yellow) ____
3. (Blue) ____ (Red) ____ (Yellow) ____ (Black)____ (Green) ____
4. (Red) ____ (Blue) ____ (Black) ____ (Yellow)____ (Green) ____
5. (Blue) ____ (Green) ____ (Red) ____ (Black)____ (Yellow) ____
6. (Green) ____ (Black) ____ (Blue) ____ (Red)____ (Yellow) ____
7. (Black) ____ (Red) ____ (Green) ____ (Yellow)____ (Blue) ____
8. (Yellow) ____ (Green) ____ (Blue) ____ (Red)____ (Black) ____
9. (Blue) ____ (Yellow) ____ (Red) ____ (Green)____ (Black) ____
10. (Red) ____ (Blue) ____ (Green) ____ (Black)____ (Yellow) ____

Time ____

Depression Words (Order #  )

1. (Yellow) ____ (Green) ____ (Black) ____ (Blue)____ (Red) ____
2. (Green) ____ (Yellow) ____ (Black) ____ (Blue)____ (Red) ____
3. (Black) ____ (Red) ____ (Green) ____ (Blue)____ (Yellow) ____
4. (Black) ____ (Blue) ____ (Green) ____ (Yellow)____ (Red) ____
5. (Green) ____ (Yellow) ____ (Red) ____ (Black)____ (Blue) ____
6. (Yellow) ____ (Green) ____ (Black) ____ (Blue)____ (Red) ____
7. (Black) ____ (Green) ____ (Yellow) ____ (Red)____ (Blue) ____
8. (Red) ____ (Green) ____ (Black) ____ (Blue)____ (Yellow) ____
9. (Green) ____ (Red) ____ (Blue) ____ (Black)____ (Yellow) ____
10. (Black) ____ (Green) ____ (Yellow) ____ (Blue)____ (Red) ____

Time ____
Threatening Words (Order # )
1. (Green) ____ (Yellow) ____ (Red) ____ (Black)____ (Blue) ____
2. (Blue) ____ (Red) ____ (Yellow) ____ (Green)____ (Black) ____
3. (Red) ____ (Blue) ____ (Green) ____ (Black)____ (Yellow) ____
4. (Black) ____ (Blue) ____ (Yellow) ____ (Red)____ (Green) ____
5. (Red) ____ (Yellow) ____ (Green) ____ (Black)____ (Blue) ____
6. (Yellow) ____ (Black) ____ (Red) ____ (Blue)____ (Green) ____
7. (Green) ____ (Black) ____ (Red) ____ (Yellow)____ (Blue) ____
8. (Blue) ____ (Yellow) ____ (Black) ____ (Green)____ (Red) ____
9. (Blue) ____ (Red) ____ (Yellow) ____ (Black)____ (Green) ____
10. (Red) ____ (Green) ____ (Yellow) ____ (Black)____ (Blue) ____

Time _____

Anxiety Words (Order # )
1. (Green) ____ (Blue) ____ (Black) ____ (Yellow)____ (Red) ____
2. (Blue) ____ (Black) ____ (Red) ____ (Green)____ (Yellow) ____
3. (Black) ____ (Yellow) ____ (Green) ____ (Red)____ (Blue) ____
4. (Green) ____ (Blue) ____ (Red) ____ (Yellow)____ (Black) ____
5. (Red) ____ (Black) ____ (Green) ____ (Blue)____ (Yellow) ____
6. (Green) ____ (Red) ____ (Yellow) ____ (Blue)____ (Green) ____
7. (Black) ____ (Red) ____ (Yellow) ____ (Blue)____ (Green) ____
8. (Yellow) ____ (Black) ____ (Blue) ____ (Green)____ (Red) ____
9. (Blue) ____ (Black) ____ (Red) ____ (Yellow)____ (Green) ____
10. (Yellow) ____ (Green) ____ (Blue) ____ (Red)____ (Black) ____

Time _____
Os (Order #)

1. (Red) ____ (Blue) ____ (Green) ____ (Black)____ (Yellow) ____
2. (Black) ____ (Red) ____ (Green) ____ (Yellow)____ (Blue) ____
3. (Yellow) ____ (Red) ____ (Blue) ____ (Black)____ (Green) ____
4. (Green) ____ (Black) ____ (Yellow) ____ (Red)____ (Blue) ____
5. (Yellow) ____ (Green) ____ (Blue) ____ (Red)____ (Black) ____
6. (Red) ____ (Yellow) ____ (Black) ____ (Green)____ (Blue) ____
7. (Blue) ____ (Black) ____ (Yellow) ____ (Green)____ (Red) ____
8. (Red) ____ (Black) ____ (Blue) ____ (Green)____ (Yellow) ____
9. (Black) ____ (Green) ____ (Red) ____ (Blue)____ (Yellow) ____
10. (Green) ____ (Yellow) ____ (Blue) ____ (Red)____ (Black) ____

Time _____
I was paid $20 to participate in Annie St-Hilaire and Nancy Docherty’s study.

Name: ______________________________
Signature: __________________________
Date: ______________________________
Witness: ____________________________

I was paid $20 to participate in Annie St-Hilaire and Nancy Docherty’s study.

Name: ______________________________
Signature: __________________________
Date: ______________________________
Witness: ____________________________