British Journal of Clinical Psychology (2006), 45, 19–31
© 2006 The British Psychological Society

The British Psychological Society

www.bpsjournals.co.uk

Paranoia and emotion perception across the continuum

Dennis R. Combs[1]*, Christopher O. Michael[1] and David L. Penn[2]
[1]University of Tulsa, USA
[2]University of North Carolina at Chapel Hill, USA

Objectives. Persons with high levels of paranoid ideation may be more sensitive to emotional stimuli, particularly negative emotions, reflecting the operation of a paranoid schema. However, this finding has not been consistently supported and needs further study. This study examined the effect of paranoia, as measured on a continuum, on emotion perception. It was predicted that higher levels of paranoia would be associated with improved emotion perception scores with better recognition for negative emotions than positive.

Design. A four-group ANOVA design was used to compare participants with clinical and sub-clinical paranoia to reflect the continuum view of paranoia.

Methods. A group with persecutory delusions (N=30) was compared with three sub-clinical groups (N=88) on two posed emotion perception tasks. The sub-clinical participants were divided into high, moderate, and low groups based on scores from the Paranoia Scale, a widely used measure of sub-clinical paranoia.

Results. Persons with persecutory delusions had lower overall emotion perception scores than all of the sub-clinical groups. For negative emotions, persons with persecutory delusions had lower identification scores than the moderate and low sub-clinical groups, but were no different than the high sub-clinical group. Anger was especially problematic for clinical participants. There were no differences for positive emotions.

Conclusions. Instead of an enhanced sensitivity for the recognition of emotional states, higher levels of paranoia were linked to a performance deficit on emotion perception tasks. The deficits in emotion perception may reflect the increased skepticism and scrutiny associated with posed emotion tasks (Davis & Gibson, 2000). Research should begin to focus on the underlying mechanisms of emotion perception deficits in paranoia.

Recent approaches to the study of psychosis have emphasized a symptom-based approach instead of the study of diagnostic syndromes such as schizophrenia (Bentall,

*Correspondence should be addressed to Dennis R. Combs, Ph.D., Department of Psychology, University of Tulsa, 600 South College Avenue, Tulsa, Oklahoma 74104, USA (e-mail: dennis-combs@utulsa.edu).

DOI:10.1348/014466505X29099

Jackson, & Pilgrim, 1988; Clark, Watson, & Reynolds, 1995; Peters, Joseph, & Garety, 1999; van Os, Hanssen, Bijl, & Ravelli, 2000). Paranoia is one such symptom that is believed to exist on a continuum (Combs, Penn, & Fenigstein, 2002; Fenigstein, 1997; Garety & Freeman, 1999), although the actual link between sub-clinical and clinical-paranoia is not well understood at the present time.

Paranoia has a significant impact on social cognition and behaviour (Fenigstein, 1997; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002; Martin & Penn, 2001; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997). The majority of research has focused on the effect of persecutory delusions on attributional style and cognitive reasoning tasks (Bentall, 2001; Kinderman & Bentall, 1996; Martin & Penn, 2002; see Garety & Freeman, 1999 for a review of this literature). Persons with persecutory delusions exhibit an exaggerated self-serving bias on attributional measures and reach conclusions using less available data (e.g. jumping to conclusions bias). Consistent with the continuum view of psychosis, the same social-cognitive biases are found in sub-clinical populations as well (Combs, Penn, & Mathews, 2003; Fenigstein, 1997; Fenigstein & Vanable, 1992; Martin & Penn, 2001).

Most of the social-cognitive findings in the literature on paranoia have suggested the operation of a paranoid schema or information-processing bias, which may be sensitive to ambiguous social stimuli and influence the processing of threatening stimuli (Brennan & Hemsley, 1984; Freeman *et al.*, 2002; Locascio & Synder, 1975; Magaro, 1981; Miller & Karoni, 1996; Phillips *et al.*, 2000). Information-processing biases have been discussed as important factors in the both the development and maintenance of persecutory delusions (Freeman *et al.*, 2002). It is believed that schemas can facilitate the processing and retrieval of information when that information is congruent with the schema (Markus, 1977; Fenigstein, 1997). However, they can also cause biases, delays, and distortions through selective remembering, perception, or interpretation of information as well (Fiske & Taylor, 1991; Wyer & Carlston, 1979 in Fenigstein, 1997; Pinkham, Penn, Perkins, & Lieberman, 2003). This information processing bias has been shown to be associated with an increased recall for threatening words/stories and a higher tendency to form illusory correlations to threatening words (Bentall, Kaney, & Bowen-Jones, 1995; Brennan & Hemsley, 1984; Fear, Sharp, & Healy, 1996; Kaney, Wolfenden, Dewey, & Bentall, 1992; Magaro, 1981). In other studies, paranoia was linked to an impaired performance on the Emotional Stroop Task and delayed processing of threatening affective stimuli (Bentall & Kaney, 1989; Green, Williams, & Davidson, 2001). Similar impairments in attentional processes have been demonstrated in sub-clinical samples as well (Combs *et al.*, 2003). Thus, the influence of the paranoid schema needs further study as to its impact on social tasks.

One area in which the operation of an information processing bias found in paranoia should be evident is emotion perception. Emotion perception is essential for effective social interaction, and persons with paranoia may be more sensitive to emotional stimuli than non-paranoid persons (Dudley, John, Young, & Over, 1997; Mueser *et al.*, 1996; Penn *et al.*, 1997). The information that is available on emotion perception and paranoia comes from studies using samples of persons with paranoid schizophrenia. In general, these studies found that persons with paranoid schizophrenia were better at emotion perception than persons with non-paranoid schizophrenia (Lewis & Garver, 1995; Kline, Smith, & Ellis, 1992), with this strength being particularly evident for naturalistic rather than posed emotions (Davis & Gibson, 2000; Green *et al.*, 2001; Peer, Rothman, Penrod, Penn, & Spaulding, 2004). The recognition of positive and negative emotions is another area in which the information-processing bias in paranoia can be examined

(Bell, Bryson, & Lysaker, 1997; Edwards, Jackson, & Pattison, 2002). Theoretically, persons with paranoia should be better at recognizing negative emotions than positive ones, due to the sensitivity of the paranoid schema to threatening stimuli (Kline *et al.*, 1992; Penn *et al.*, 1997). For positive emotions, there is generally no difference on accuracy scores between persons with paranoid schizophrenia and normal controls (Davis & Gibson, 2000; Kline *et al.*, 1992), which is a pattern of results also found in the general schizophrenia literature (Muzekari & Bates, 1977; Dougherty, Bartlett, & Izard, 1974). For negative emotions, the findings are more mixed and largely depend on the type of comparison group used in the study. Persons with paranoid schizophrenia typically perform better than persons with non-paranoid schizophrenia on the recognition of negative emotions (Kline *et al.*, 1992; Lewis & Garver, 1995), but there is equivocal evidence on whether they are similar to (or better than) normal controls on these tasks (Davis & Gibson, 2000; Green *et al.*, 2001; Kline *et al.*, 1992; LaRusso, 1978; Phillips *et al.*, 1999). Currently, there is limited evidence on the effect of paranoia on emotion perception, and particularly how persons with different levels of paranoid ideation process positive and negative emotions.

The purpose of this study was to examine the relationship between paranoia and emotion perception across the continuum using clinical and sub-clinical samples. Sub-clinical participants were divided into high, moderate, and low groups based on scores from the Paranoia scale, a widely used measure of sub-clinical paranoid ideation. In order to further validate the classification of the sub-clinical groups, two additional measures of paranoia, the Personality Assessment Inventory (PAI) paranoia subscale and the Emotional Stroop Task, were administered. In addition, the clinical group consisted of persons with persecutory delusions.

Consistent with the operation of a paranoid schema, it was hypothesized that the participants with persecutory delusions would show better overall emotion perception scores than the sub-clinical groups. Within the sub-clinical groups, we hypothesized that the high sub-clinical group would show the highest emotion perception scores followed by the moderate and low groups, respectively. Secondly, an examination of scores for the identification of positive and negative affect was conducted. It was hypothesized that the clinical groups would show better emotion perception scores for negative emotions than the other groups with an equivalent performance expected for positive emotions.

Method

Participants

In order to examine paranoia across the continuum, four groups of participants representing clinical and sub-clinical levels of paranoia were identified. The clinical group comprised 30 persons with persecutory delusions who were recruited from two large state hospital centres in Louisiana. Clinical participants all had diagnoses of paranoid schizophrenia based on the Structured clinical interview for DSM-IV (SCID, Spitzer, Williams, Gibbon, & First, 1995). More importantly, the clinical participants had current persecutory delusions as measured by the Brief psychiatric rating scale (BPRS, Lukoff, Nuechterlein, & Ventura, 1986). The clinical group showed a BPRS total score of 52.7 ($SD = 7.2$) with a BPRS suspiciousness item score of 5.0 or greater, which is consistent with the presence of persecutory delusions (see Martin & Penn, 2002). Exclusion criteria for the clinical group included a history of head trauma, substance

dependence within three months of the study, reading level less than fourth grade, and any documented neurological conditions.

Three groups of participants ($N = 88$), representing different levels of sub-clinical paranoia, were recruited from a university setting. The three sub-clinical groups were formed on the basis of scores from the Paranoia scale (PS; Fenigstein & Vanable, 1992). Twenty-nine persons (7 males, 22 female) who scored at or above the 86th percentile (+1 *SD*; PS scores of 53 or greater) on the PS comprised the high sub-clinical paranoia group. Thirty-one persons (12 male, 19 female) who scored at or below the 16th percentile (−1 *SD*; PS scores of less than 32) on the PS comprised the low paranoia group. Twenty-eight persons (22 female, 6 male) who fell between the +/− 1 *SD* mark on the PS comprised the moderate group. A summary of participant demographics can be found in Table 1. This group classification method has been used in previous paranoia research to study social-cognitive processing differences (Fenigstein, 1997). Percentile cutoff scores for the PS were obtained from normative data on the scale (Fenigstein & Vanable, 1992), which has been replicated with different samples of college students (Combs *et al.*, 2002). Sub-clinical participants were excluded if they were currently in or had a history of psychiatric treatment.

Table 1. Summary of participant demographics

		Sub-clinical groups		
Variable	Clinical	High	Moderate	Low
N	30	29	28	31
Gender (*N*)[a]				
Male	16	7	6	12
Female	14	22	22	19
Ethnicity (*N*)[b]				
Caucasian	14	21	26	19
African American	16	8	2	12
Age (years)	39.4 (7.3)	20.7 (2.5)	22.8 (5.9)	21.2 (2.3)
Educational level (years)	11.2 (1.8)	14.9 (1.3)	14.8 (1.1)	15.1 (.85)

[a] $\chi^2 = 10.9$, $p = .001$.
[b] $\chi^2 = 14.9$. $p = .0001$.

Due to the nature of the samples (clinical vs. control), there were expected differences in age, $F(3, 114) = 95$, $p = .0001$, educational level, $F(3, 114) = 61$, $p = .0001$, gender, $\chi^2(df = 1, 117) = 10.9$, $p = .001$, and ethnic background, $\chi^2(df = 2, 117) = 14.9, p = .001$) between the four groups. Participants in the clinical group were significantly older and less educated than the sub-clinical groups. There were more males in the clinical group than in the sub-clinical groups, and there were more African-Americans in the clinical group as well.

Measures

Paranoia scale

The Paranoia scale (PS) is a 20-item scale that measures sub-clinical levels of paranoid ideation in non-psychiatric samples (PS; Fenigstein & Vanable, 1992). The PS is scored

on a 1–5 Likert scale with scores ranging from 20 to 100. Higher scores reflect higher levels of sub-clinical paranoia. The scale has good internal consistency ($\alpha = .84$) and stability ($r = .70$), and has been shown to be sensitive to experimental manipulations of paranoia such as the presence of two-way mirrors. The PS has been related to differences in implicit learning for threatening materials (Combs *et al.*, 2003) and greater social distance between high and low scorers on the scale (Combs & Penn, 2004). The PS has good convergent and discriminant validity (Fenigstein & Vanable, 1992). In this study, the PS showed excellent internal consistency for the sub-clinical groups ($\alpha = .91$).

Personality assessment inventory persecutory ideation subscale

The Personality Assessment Inventory (PAI) paranoia subscale is a 24-item scale that can be used in a variety of settings to assess paranoid beliefs (Morey, 1991). The PAI is scored on a Likert scale from 0 to 3 with scores ranging from 0 to 72. Higher scores reflect increased levels of paranoia. Validity data showed higher PAI paranoia subscale scores for persons diagnosed with paranoid ideation/delusions (Morey, 1991). The PAI paranoia subscale has been shown to correlate highly with the PS and the MMPI paranoia subscale (Combs *et al.*, 2002; Morey, 1991). In this study, the PAI showed excellent internal consistency for the sub-clinical groups ($\alpha = .87$).

Emotional Stroop Test

The Emotional Stroop Test was used to assess for cognitive interference effects for paranoia and depression (Bentall & Kaney, 1989). The participant was asked to read a list of non-threatening words, paranoid-content words (e.g. spy, threat), and depression-content words (e.g. sad, cry). An interference index can be calculated for both the paranoia and depression lists in which the time to read the control list is subtracted from the time to read the paranoia and depression lists, respectively. Prior research has shown that persons with persecutory delusions and high levels of sub-clinical paranoia showed more interference to threat words as compared with depressed and neutral words (Bentall & Kaney, 1989; Combs *et al.*, 2003; Fear *et al.*, 1996).

Clinical measures

The SCID-I/P is a structured interview used for the purpose of deriving a clinical psychiatric diagnosis based on DSM-IV criteria (Spitzer *et al.*, 1995). The Brief psychiatric rating scale (BPRS) was used to assess a participant's current level of symptomatology over the previous two week period of time (Lukoff *et al.*, 1986). The BPRS contains 24 items, which cover a wide-range of psychiatric symptoms. The BPRS is rated on a 1–7 Likert scale with a score of 1 indicative of no pathology and a score of 7 indicative of severe pathology. The principal investigator and research assistants were trained to adequate reliability (ICC and $\kappa > .70$ with a gold standard rater) on the BPRS and SCID-I/P.

Emotion perception measures

Two measures of emotion perception were administered in this study. The Bell–Lysaker Emotion Recognition Test (BLERT) and the Facial Emotion Identification Test (FEIT). The BLERT is a 21 item videotaped presentation of seven different emotional states (Bell *et al.*, 1997; Bryson, Bell, & Lysaker, 1997). The emotional states included

happiness, sadness, anger, fear, disgust, surprise, and no emotion. A male actor displays each emotion expression while reciting a series of three standard monologues regarding his job. Each emotional state was presented for 10 seconds and the participant was asked to select the correct emotion on a card, which displayed all of the choices. In previous research, the BLERT has good categorical stability ($\kappa = .76$) and 5-month test–retest reliability of .76. In the development sample, all of the items showed relatively equivalent difficulty levels (Bell *et al.*, 1997). The BLERT has demonstrated good discriminant and convergent validity as well (Bell *et al.*, 1997; Bryson *et al.*, 1997). In this study, the BLERT showed a low level of internal consistency for the sub-clinical group ($\alpha = .36$) and moderate level of internal consistency for the clinical group ($\alpha = .69$). These reliability estimates are similar to studies that use both clinical and control samples (Penn *et al.*, 2000; Davis & Gibson, 2000).

The Facial Emotion Identification Test (FEIT) was developed by Kerr and Neale (1993) using emotional expressions from Ekman (1976) and Izard (1971). The FEIT consists of 19-videotaped pictures of six emotional states. The emotions presented are happiness, sadness, anger, surprise, fear, and shame. Similar to the BLERT, the person was instructed to look at the picture, and decide which emotion was being presented. Previous reliability results have shown an internal consistency ranging from .56 to .71 for control samples and .74 for clinical samples (Kerr & Neale, 1993; Salem, Kring, & Kerr, 1996). The development process for the FEIT retained items that were of comparable difficulty levels and was normed on both samples of persons with schizophrenia and normal controls (Kerr & Neale, 1993). In this study, the FEIT showed moderate levels of internal consistency for both the sub-clinical ($\alpha = .49$) and clinical groups ($\alpha = .45$).

Since the BLERT and FEIT were significantly correlated ($r = .51$, $p = .001$), a mean affect perception score (range 0–20) was computed and served as the main variable of interest. For each emotion correctly identified, the person was given one point and incorrect responses were given zero points. Across all of the affect perception tests, higher scores were indicative of better recognition abilities. In order to examine differences in the processing of positive and negative emotions, mean positive and negative emotion scores were also computed. Positive emotions were happy and surprised and negative emotions were angry, sad, and afraid (Bell *et al.*, 1997; Kline *et al.*, 1992; Penn *et al.*, 2000). The emotions of disgust and ashamed, which were not found on both tests, were not included in the negative emotion score.

Procedure

The participants in this study came from two sources. Some of the sub-clinical participants were part of a previous study on paranoia and social perception (Combs & Penn, 2004). The clinical participants were tested over the course of three years as part of an ongoing research programme on emotion perception and schizophrenia (Combs & Gouvier, 2004; Penn *et al.*, 2000). This present study represents a re-analysis and more focused study of an existing data collected by the investigators to study paranoia across the continuum. It should be noted that the sub-clinical participants were not administered the BPRS and SCID since these are clinical assessment measures. The PS and PAI were only administered to the sub-clinical groups as a means of ensuring the validity of the group classification method. The emotion perception measures were administered to all participants by use of a videotape format.

Data analytic plan

First, we examined the validity of our group classification method (high, moderate, and low) for the three sub-clinical groups. Since the Paranoia scale was used to initially define group membership, several other measures of paranoid ideation were included to determine if consistent differences were found between the groups. Second, we examined mean emotion perception scores along with positive and negative emotion scores across the four groups. Third, the analyses in step two were repeated with age, educational level, gender, and ethnic background as covariates due to the group differences on these demographic variables. Finally, we examined group differences on individual negative emotions (anger, sadness, and fear) from the BLERT and FEIT due to the importance of negative emotions to paranoia.

Results

Group classification method

Since level of paranoid ideation was used to define group membership and was the basis for the subsequent analyses, it is important to demonstrate that the groups do in fact differ on level of paranoid ideation. In order to further ensure that the sub-clinical groups were different in paranoid ideation as initially defined by PS scores, two additional measures of paranoia were examined, the PAI Paranoia scale and the Emotional Stroop Test. On the PAI total score, all three of the groups were found to differ, $F(2, 85) = 33.2$, $p = .0001$. The high sub-clinical group was significantly different ($M = 28.5$, $SD = 9.1$) from the moderate ($M = 18.3$, $SD = 6.2$) and low groups ($M = 13.0$, $SD = 6.7$) on the PAI scale. On the Emotional Stroop Test, there was a significant group $\times$ stroop task interaction, $F(2, 85) = 6.7$, $p = .002$. The high sub-clinical group was significantly more impaired (i.e. showed a longer reading time) on the paranoid words (mean interference index $= 4.3$, $SD = 5.8$) than both the moderate ($M = 2.2$, $SD = 4.0$) and low group ($M = 1.4$, $SD = 3.6$), $F(2, 85) = 4.5$, $p = .01$. In contrast, there were no differences on the depression interference index between the three sub-clinical groups, $F(2, 85) = .05$, *ns*. In summary, based on differences between the groups on the PAI and Emotional Stroop Task it can be concluded that the sub-clinical groups do in fact show differences in paranoid ideation. The clinical group participants all had current persecutory delusions, which is a more severe manifestation of paranoia than sub-clinical paranoia (Fenigstein & Vanable, 1992).

Overall, there seems to be good support for differences in paranoia across the sample of participants in the study. These differences span the continuum of paranoid ideation from clinical levels of paranoia to sub-clinical levels found in the normal population.

Primary analyses

A one-way (group) ANOVA was conducted on the mean affect perception score. A significant main effect for group was found, $F(3, 102) = 17.6$, $p = .0001$, $\eta_p^2 = .34$. *Post hoc* analyses with Tukey HSD showed that the clinical group had significantly lower emotion perception scores than all three of the sub-clinical groups. The high sub-clinical group performed significantly better than the clinical group, but significantly worse than the low sub-clinical group. The high sub-clinical group did not differ from the moderate sub-clinical group. There were no other significant differences found among the groups. A summary of the mean affect perception scores for each group can be found in Table 2. However, since there were differences between the groups on

Table 2. Affect perception scores by group membership

		Sub-clinical groups		
Variable (range)	Clinical	High	Moderate	Low
Mean affect score (0–20)	12.3 (3.3)	14.6 (1.6)	15.7 (1.6)	16.2 (1.4)
Mean positive score (0–5)	3.6 (1.0)	4.3 (.58)	4.3 (.58)	4.5 (.41)
Mean negative score (0–11)	7.0 (1.4)	7.5 (1.1)	8.2 (1.0)	8.5 (1.1)

Note. Higher scores indicate better emotion recognition abilities.

educational level, age, gender, and ethnic background, these variables were entered as covariates. A check of the homogeneity of variance assumption showed an interaction between educational level and group, $F(1, 98) = 3.6$, $p = .01$. Thus, educational level variable was entered as another independent variable (Tabachnick & Fidel, 1996) and was divided into three levels: high (15–16 years), medium (13–14), and low (12 years or fewer). A 4 (group) × 3 (education level) ANCOVA was conducted with age, gender, and ethnic background entered as covariates.[1] A significant main effect for group was still present even after controlling for the covariates, $F(3, 94) = 2.8$, $p = .04$, $\eta_p^2 = .08$. There was no main effect for education or a group × education interaction. A one-way ANCOVA was conducted to determine if there were group differences in mean negative emotion score (angry, afraid, and sad).[2] After entry of the covariates, a main effect for group remained, $F(3, 102) = 2.8$, $p = .04$, $\eta_p^2 = .08$. A one-way ANCOVA did not find a main effect for group on the mean positive emotion (happy & surprised) score, $F(3, 102) = 1.1$, $p = .33$, $\eta_p^2 = .04$.

Supplementary analyses

Due to the relevance that the recognition of negative emotions may have in paranoia, several follow-up analyses were conducted. Follow-up ANOVAs were used to examine negative emotion scores from the BLERT and FEIT separately. The results were unchanged as group differences still remained on the BLERT, $F(3, 106) = 9.3$, $p = .0001$, $\eta_p^2 = .21$, and FEIT, $F(3, 111) = 4.67$, $p = .004$, $\eta_p^2 = .12$. In order to determine which specific negative emotions differed between the groups, items comprising the anger, sadness, and fear subscales were analysed from the BLERT and FEIT (see Table 3). Significant group differences for the recognition of anger were found on both the BLERT, $F(3, 106) = 3.6$, $p = .015$ and FEIT, $F(3, 111) = 7.3$, $p = .001$. *Post hoc* testing showed that the clinical participants showed lower anger perception scores than the low and middle groups, but did not differ from the high sub-clinical group. The perception of sadness emotions was lower on the BLERT, $F(3, 106) = 9.1$, $p = .001$, but not on the FEIT, $F(3, 111) = 2.0$, *ns*, with clinical participants showing lower sadness scores when compared with the three sub-clinical groups. There were no differences on the recognition of fear between the groups on either the BLERT or FEIT (All Fs < 1, *ns*).

[1] *Since it could be argued that most of the clinical participants fall in the low educational group (less than 12 years), a median split procedure (median = 14 years of education) was conducted on the education score for the total sample, which divided participants more equally and can be used as a more conservative test of the influence of education on affect perception. A main effect for group differences was still present with this method of classifying education,* $F(3, 96) = 3.7$, $p = .01$.

[2] *A significant main effect for group was present when disgust and ashamed were included as negative emotions,* $F(3, 96) = 3.1$, $p = .03$.

Table 3. Negative emotion perception scores by group membership

		Sub-clinical groups		
Variable (range)	Clinical	High	Moderate	Low
BLERT				
Anger (0–3)	2.0 (.83)	2.4 (.68)	2.5 (.50)	2.6 (.48)
Sadness (0–3)	1.7 (.88)	2.4 (.63)	2.4 (.58)	2.7 (.52)
Fear (0–3)	1.6 (1.0)	1.7 (.75)	2.0 (.82)	1.8 (.77)
FEIT				
Anger (0–4)	2.7 (.81)	3.0 (.73)	3.1 (.68)	3.5 (.50)
Sadness (0–3)	1.7 (.90)	1.7 (.81)	2.0 (.78)	2.1 (.87)
Fear (0–6)	3.6 (1.5)	3.7 (1.3)	4.2 (1.1)	4.3 (1.1)

Note. Higher scores indicate better emotion recognition abilities.

Discussion

The purpose of this study was to examine the effects of paranoia on emotion perception across a continuum of participants who differed in level of paranoid ideation. Overall, there were consistent differences between the four groups on emotion perception scores. Participants with persecutory delusions showed the lowest overall emotion perception scores followed by the high, moderate, and low sub-clinical groups, respectively. These group differences remained even after demographic differences were controlled. There were no differences in the recognition of positive emotions, which is consistent with previous work conducted for all subtypes of schizophrenia (Mandal, Pandey, & Prasad, 1998). However, it is possible that since there were only two positive emotions (as compared with five negative), scores were enhanced due to chance response rates.

For the perception of negative emotions, the group with persecutory delusions had the lowest overall score, but did not differ from the high sub-clinical group. Follow-up analyses of specific negative emotions (anger, sadness, and fear) revealed a notable pattern of differences. The results showed that the clinical group had significant problems in the perception of anger across the both measures. There was mixed evidence for problems in the perception of sadness (BLERT only), and there were no differences in the perception of fear on either test. Though this is not the case for sadness, it is encouraging that consistent results were found on the BLERT and FEIT for the perception of anger and fear, which suggest that the measures are generally comparable. Problems with anger and hostility are consistent with theoretical and clinical accounts of paranoia (American Psychiatric Association, 1994; Kline *et al.*, 1992; Miller & Karoni, 1996; Penn *et al.*, 1997). This problem may be especially important in ambiguous social situations where interpersonal problems are likely to occur (Phillips, Senior, & Davis, 2000). In addition, the recognition of anger may be more relevant to paranoia (e.g. attack or threat) due to its association with hostility than fear or sadness, which are less personally threatening (see Green *et al.*, 2001 for similar findings).

The findings of lower emotion perception scores with increasing paranoia were counter to our hypotheses of enhanced emotion perception for individuals with greater paranoia, particularly for negative emotions (see Peer *et al.*, 2004; Phillips *et al.*, 1999 for similar findings). An important question is: how can one account for these unexpected findings? First, one may refer to the tasks used in the present study. Davis and Gibson

(2000) found deficits on posed emotion tasks, but not for genuine emotion tasks among persons with paranoid schizophrenia. It has been suggested that for posed emotion tasks persons with higher levels of paranoia may attempt to interpret the person's actual underlying emotional state instead of the one that is presented (Davis & Gibson, 2000; LaRusso, 1978). This may reflect a more sceptical strategy (e.g. 'I am being deceived' or 'what I see is not accurate') in which the person does not feel that the emotion presented is 'true' and looks for what may be hidden in others by 'second guessing' their decision. Thus, the paranoid person may engage in extensive scanning of the stimulus or may have problems disengaging from the emotional stimulus, especially anger (Green *et al.*, 2001). This sceptical strategy could be associated with the delayed conscious cognitive processing and a reduction in cortical activation for negative emotions found in recent studies (Green *et al.*, 2001; Horley *et al.*, 2001). It may also be likely that posed emotion tasks are more ambiguous and thus more difficult for persons with paranoia, but this requires empirical examination (Freeman *et al.*, 2002). A final explanation of the findings is based on the hypothesized schema-driven processing associated with paranoia, which might interfere with (instead of enhance) the cognitive processing of negative or threatening stimuli as observed during Emotion Stroop Tasks (Bentall & Kaney, 1989; Combs *et al.*, 2003). Such interference may result from the aforementioned 'over-scrutiny' of negative stimuli or the tendency for persons with paranoia or persecutory delusions to rapidly scan or even avoid threatening stimuli (e.g. 'jumping to conclusions bias') without actively processing pertinent emotional information (Freeman, Garety, & Phillips, 2000; Loughland, Williams, & Gordon, 2002; Phillips *et al.*, 2000).

The current study has several limitations that should be mentioned. First, there were no measures of genuine emotional expressions presented in the study.[3] Psychometrically valid tests using genuine emotions are difficult to construct and have numerous ethical issues regarding their development, particularly when negative emotions are being elicited in participants. Finally, regarding the sample, the sub-clinical group was divided into three groups based on a moderate sample of 88 participants and a larger sample of participants would have enhanced the generalizability of the results. There were also relatively large demographic differences between the groups, especially for age, which should be noted even though these differences were statistically controlled for in the study. The use of college students as the comparison sample may be less than ideal, and perhaps in future research, a community-based control group (similar in age, education, etc.) can be used to examine group differences.

In closing, the study of social cognitive and perceptual biases in paranoia is still in its early stage of development and much more needs to be known. Most of the research has focused on clinical samples with less attention for continuum-based models of paranoia. Sub-clinical research can provide a way to examine paranoia in a more cost effective manner that can add to our knowledge of clinical paranoia. Future studies on paranoia should not only employ a continuum-based approach, but also examine the mechanisms of paranoia (e.g. eye tracking; reaction time; psychophysiology) using a variety of posed and genuine emotion perception tasks so that when and how paranoia affects emotion perception can be better understood.

[3] *The genuine emotion tasks used in Davis & Gibson (2000) were requested, but were not available for use in this study.*

References

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Bell, M., Bryson, G., & Lysaker, P. (1997). Positive and negative affect recognition in schizophrenia: A comparison with substance abuse and normal control subjects. *Psychiatry Research*, *73*, 73–82.

Bentall, R. P. (2001). Social cognition and delusional beliefs. In P. W. Corrigan & D. L. Penn (Eds.), *Social cognition in schizophrenia*. Washington, DC: American Psychological Association.

Bentall, R., Jackson, H. F., & Pilgrim, D. (1988). Abandoning the concept of schizophrenia: Some implications of validity arguments for psychological research into psychotic phenomena. *British Journal of Clinical Psychology*, *27*, 156–169.

Bentall, R., & Kaney, S. (1989). Content specific information processing and persecutory delusions: An investigation using the emotional stroop test. *British Journal of Medical Psychology*, *62*, 355–364.

Bentall, R., Kaney, S., & Bowen-Jones, K. (1995). Persecutory delusions and recall of threat related, depression related, and neutral words. *Cognitive Therapy and Research*, *19*, 445–457.

Brennan, J. H., & Hemsley, D. R. (1984). Illusory correlations in paranoid and non-paranoid schizophrenia. *British Journal of Clinical Psychology*, *23*, 225–226.

Bryson, G., Bell, M., & Lysaker, P. (1997). Affect recognition in schizophrenia: A function of global impairment or a specific cognitive deficit. *Psychiatry Research*, *71*, 105–113.

Clark, L. A., Watson, D., & Reynolds, S. (1995). Diagnosis and classification in psychopathology: Challenges to the current system and future directions. *Annual Review of Psychology*, *46*, 121–153.

Combs, D. R., & Gouvier, W. D. (2004). The role of attention in affect perception: An examination of mirsky's four factor model of attention in chronic schizophrenia. *Schizophrenia Bulletin*, *30*, 727–738.

Combs, D. R., & Penn, D. L. (2004). The role of sub-clinical paranoia on social perception and behavior. *Schizophrenia Research*, *69*, 93–104.

Combs, D. R., Penn, D. L., & Fenigstein, A. (2002). Ethnic differences in sub-clinical paranoia: An expansion of norms for the Paranoia scale. *Cultural Diversity and Ethnic Minority Psychology*, *8*, 248–256.

Combs, D. R., Penn, D. L., & Mathews, R. (2003). Implicit learning and paranoia. *Personality and Individual Differences*, *34*, 143–157.

Davis, P. J., & Gibson, M. G. (2000). Recognition of posed and genuine facial expressions of emotion in paranoid and nonparanoid schizophrenia. *Journal of Abnormal Psychology*, *109*, 445–450.

Dougherty, E. E., Bartlett, E. S., & Izard, C. E. (1974). Responses of schizophrenics to expressions of fundamental emotions. *Journal of Clinical Psychology*, *30*, 243–246.

Dudley, R. E. J., John, C. H., Young, A. W., & Over, D. E. (1997). The effect of self-referent material on the reasoning of people with delusions. *British Journal of Clinical Psychology*, *36*, 575–584.

Edwards, J., Jackson, H. J., & Pattison, P. E. (2002). Emotion recognition via facial expression and affective prosody in schizophrenia: A methodological review. *Clinical Psychology Review*, *22*, 789–832.

Ekman, P. (1976). *Pictures of facial affect*. Palo Alto, CA: Consulting Psychologists Press.

Fear, C., Sharp, H., & Healy, D. (1996). Cognitive processes in delusional disorders. *British Journal of Psychiatry*, *168*, 61–67.

Fenigstein, A. (1997). Paranoid thought and schematic processing. *Journal of Social and Clinical Psychology*, *16*, 77–94.

Fenigstein, A., & Vanable, P. A. (1992). Paranoia and self-consciousness. *Journal of Personality and Social Psychology*, *62*, 129–138.

Fiske, S. T., & Taylor, S. (1991). *Social cognition* (2nd ed.). New York: Mcgraw-Hill.

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *British Journal of Clinical Psychology*, *41*, 331–347.

Freeman, D., Garety, P. A., & Phillips, M. L. (2000). The examination of hypervigilance for external threat in individuals with generalized anxiety disorder and individuals with persecutory delusions using visual scan paths. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, *53A*, 549–567.

Garety, P. A., & Freeman, D. (1999). Cognitive approaches to delusions: A critical review of theories and evidence. *British Journal of Clinical Psychology*, *38*, 113–154.

Green, M. J., Williams, L. M., & Davidson, D. J. (2001). Processing of threat-related affect is delayed in delusion-prone individuals. *British Journal of Clinical Psychology*, *40*, 157–165.

Horley, K., Gonsalvez, C., Williams, L., Lazzaro, I., Bahramali, H., & Gordon, E. (2001). Event-related potentials to threat-related faces in schizophrenia. *International Journal of Neuroscience*, *107*, 113–130.

Izard, C. E. (1971). *The face of emotion*. New York: Appelton-Century-Crofts.

Kaney, S., Wolfenden, M., Dewey, M. E., & Bentall, R. P. (1992). Persecutory delusions and recall of threatening propositions. *British Journal of Clinical Psychology*, *31*, 85–87.

Kerr, S. L., & Neale, J. M. (1993). Emotion perception in schizophrenia: Specific deficit or further evidence of generalized poor performance. *Journal of Abnormal Psychology*, *102*, 312–318.

Kinderman, P., & Bentall, R. P. (1996). Self-discrepancies and persecutory delusions: Evidence for a model of paranoid ideation. *Journal of Abnormal Psychology*, *105*, 106–113.

Kline, J. S., Smith, J. E., & Ellis, H. C. (1992). Paranoid and nonparanoid schizophrenic processing of facially displayed affect. *Journal of Psychiatric Research*, *26*, 169–182.

LaRusso, L. (1978). Sensitivity of paranoid patients to nonverbal cues. *Journal of Abnormal Behavior*, *3*, 463–471.

Lewis, S. F., & Garver, D. L. (1995). Treatment and diagnostic subtype in facial affect recognition in schizophrenia. *Journal of Psychiatry Research*, *29*, 5–11.

Locascio, J. J., & Synder, C. R. (1975). Selective attention to threatening stimuli and field independence as factors in the etiology of paranoid behavior. *Journal of Abnormal Psychology*, *84*, 637–643.

Loughland, C. M., Williams, L. M., & Gordon, E. (2002). Visual scan paths to positive and negative facial emotions in an outpatient schizophrenia sample. *Schizophrenia Research*, *55*, 159–170.

Lukoff, D., Nuechterlein, K. H., & Ventura, J. (1986). Manual for the expanded brief psychiatric rating scale. *Schizophrenia Bulletin*, *12*, 594–602.

Magaro, P. (1981). The paranoid and the schizophrenic: The case for distinct cognitive style. *Schizophrenia Bulletin*, 7, 632–661.

Mandal, M. K., Pandey, R., & Prasad, A. B. (1998). Facial expressions of emotions and schizophrenia: A review. *Schizophrenia Bulletin*, *24*, 399–412.

Markus, H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology*, *35*, 63–78.

Martin, J. A., & Penn, D. L. (2001). Social cognition and sub-clinical paranoid ideation. *British Journal of Clinical Psychology*, *40*, 261–265.

Martin, J. A., & Penn, D. L. (2002). Attributional style in schizophrenia: An investigation in outpatients with and without persecutory delusions. *Schizophrenia Bulletin*, *28*, 131–142.

Miller, E., & Karoni, X. (1996). The cognitive psychology of delusions: A review. *Applied Cognitive Psychology*, *10*, 487–502.

Morey, L. C. (1991). *The personality assessment inventory manual*. Odessa, CA: PAR.

Mueser, K. T., Doonan, R., Penn, D. L., Blanchard, J. J., Bellack, A. S., Nishith, P., & DeLeon, J. (1996). Emotion recognition and social competence in chronic schizophrenia. *Journal of Abnormal Psychology*, *105*, 271–275.

Muzekari, L. H., & Bates, M. E. (1977). Judgment of emotion among chronic schizophrenics. *Journal of Clinical Psychology*, *32*, 662–666.

Peer, J. E., Rothman, T. L., Penrod, R. D., Penn, D. L., & Spaulding, W. D. (2004). *Social cognitive bias and neurocognitive deficit in paranoid symptoms: Evidence for an interaction effect and changes during treatment*. Manuscript submitted for publication.

Penn, D. L., Combs, D., Ritchie, M., Francis, J., Cassisi, J., Morris, S., & Townsend, M. (2000). Emotion recognition in schizophrenia: Further investigation of specific versus generalized performance deficit models. *Journal of Abnormal Psychology*, *109*, 512–516.

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

Peters, E. R., Joseph, S. A., & Garety, P. A. (1999). Measurement of delusional ideation in the normal population: Introducing the PDI. *Schizophrenia Bulletin*, *25*, 553–576.

Phillips, M. L., Senior, C., & Davis, A. S. (2000). Perception of threat in schizophrenics with persecutory delusions: An investigation using visual scan paths. *Psychological Medicine*, *30*, 157–167.

Phillips, M. L., Williams, L., Senior, C., Bullmore, E. T., Brammer, M. J., Andrew, C., Williams, S. C. R., & David, A. S. (1999). A differential neural response to threatening and non-threatening negative facial expressions in paranoia and non-paranoia schizophrenics. *Psychiatry Research: Neuroimaging section*, *92*, 11–31.

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

Salem, J. E., Kring, A. N., & Kerr, S. L. (1996). More evidence for generalized poor performance in facial emotion perception in schizophrenia. *Journal of Abnormal Psychology*, *105*, 480–483.

Spitzer, R. L., Williams, J. B. W., Gibbon, W., & First, M. B. (1995). *Structured clinical interview for DSM-IV.* Washington, DC: American Psychiatric Press.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). New York: Harper Collins.

van Os, J., Hanssen, M., Bijl, R. V., & Ravelli, A. (1969). Strauss (1969) revisited: A psychosis continuum in the general population. *Schizophrenia Research*, *45*, 11–20.

Wyer, R., & Carlston, D. (1979). *Social cognition, inference, and action*. Hillsdale, NJ: Erlbaum.

Received 16 March 2004; revised version received 18 August 2004