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Emotion Recognition in Schizophrenia: Further Investigation of Generalized Versus Specific Deficit Models

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In this study, the authors examined the nature of emotion perception in schizophrenia. Two samples of people with schizophrenia, one receiving acute care for a recent exacerbation of symptoms and the other receiving extended care, were compared with a nonclinical control group on emotion perception and general perception measures. The nonclinical control group obtained the highest scores on all of the study measures, and the acutely ill group obtained the lowest scores. Furthermore, the acutely ill sample had a specific deficit in emotion perception that remained present after controlling for performance on the general perception tasks. Conversely, the deficits in emotion discrimination in the extended-care sample reflected generalized poor performance. Differences in performance on the emotion identification task between the 2 clinical groups were reduced when controlling for active symptoms.

Individuals with schizophrenia are impaired in their ability to recognize the facial affect of others (Mandal, Pandey, & Prasad, 1998). This deficit may be more pronounced during acute than remitted stages of the illness (Gessler, Cutting, Frith, & Weinman, 1989), although there is some evidence for stable deficits across phases of the disorder (Addington & Addington, 1998). Finally, this impairment may reflect generalized poor performance rather than a specific deficit in emotion perception (Penn, Corrigan, Bentall, Racenstein, & Newman, 1997).

A number of extensions can be made on previous research in this area. First, the majority of studies investigating the generalized- versus specific-deficit issue have included only one sample with schizophrenia rather than multiple groups representing different phases of the disorder (Bellack, Blanchard, & Mueser, 1996; Kerr & Neale, 1993; Mueser et al., 1996; Salem, Kring, & Kerr, 1996). This strategy may be limited by comparing groups tested in different laboratories and during different periods of time. A second extension concerns the use of the Benton Test of Facial Recognition (TFR; Benton, VanAllen, Hamsher, & Levin, 1978) as a control task to assess the presence of a generalized performance deficit. The TFR comprises a series of target faces, which the participant has to identify from a larger set of faces. A limitation of the TFR as a control task is that it indicates only whether a perception deficit is present across a range of social stimuli (i.e., faces) rather than nonsocial stimuli (e.g., geometric figures). It has yet to be determined whether the generalized deficit remains after a social/affective-neutral control task is utilized (Salem et al., 1996).

In this study, the performance of two samples of people with schizophrenia, those recovering from an acute episode and those residing in an extended-care setting, were compared with a nonclinical control group on emotion perception, face perception, and nonsocial perception tasks. We hypothesized that both clinical groups would perform worse than the nonclinical control group on the emotion and social perception tasks, with the performance of the acutely ill group being the most impaired. We also hypothesized that this pattern of impairment would remain after controlling for performance on a nonsocial perception task.

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Method

Participants

One hundred fourteen individuals participated in the study. Thirty-nine of the participants were residents of the extended-care program at Southeast Louisiana State Hospital in Mandeville, Louisiana, and 35 were residents of the acute-care unit at Charity Hospital in New Orleans, Louisiana. Participants at Southeast Louisiana State Hospital were tested after being on the unit for an average of just over five months; those at Charity Hospital were tested within two weeks of admission. Forty nonclinical control participants were recruited from the community and the Louisiana State University campus. Clinical participants were excluded from the study if they had a history of neurological injury, did not have a primary diagnosis of schizophrenia or schizoaffective disorder, and were younger than 18 years or older than 60 years.[1]

All clinical participants met criteria for either schizophrenia or schizoaffective disorder based on the Structured Clinical Interview for DSM-IV, Patient Version (SCID-P; Spitzer, Williams, Gibbon, & First, 1995) and a chart review.[2] The SCID-P was administered by clinical psychology doctoral students trained to 100% agreement on primary diagnosis with a previously trained interviewer.

The clinical participants were administered the expanded version of the Brief Psychiatric Rating Scale (BPRS; Ventura et al., 1993) by clinical psychology graduate students trained to a minimum intraclass correlation coefficient of .80 with previously trained raters. Four symptom clusters were computed: Affect, Anergia, Thought Disorder, and Disorganization (Mueser, Curran, & McHugo, 1997).

Demographic data for the three groups are summarized in Table 1. One-way analyses of variance (ANOVAs) and chi-square tests revealed that the three groups significantly differed from one another in Age, $F(2, 111) = 6.44$, $p < .01$; Years of Education, $F(2, 109) = 14.47$, $p < .01$; Gender, $\chi^2(R, N = 114) = 12.47$, $p < .05$; and Ethnicity, $\chi^2(R, N = 114) = 12.39$, $p < .05$. The acute-care group was also rated as higher than the extended-care sample on the Affect, Disorganization, and Thought Disorder BPRS scales (all $ps < .05$).

Table 1
Demographic and Clinical Characteristics of Participants

Variable	Nonclinical control	Extended care	Acute care
Group			
Age (years)			
M	32.33	40.15	36.40*
SD	10.79	8.09	10.02
Education (years)			
M	13.18	11.49	11.42*
SD	0.87	2.04	1.80
Ethnicity (*n*)			
Caucasian	16	21	6*
African American	24	18	29
Gender (*n*)			
Male	19	22	30*
Female	21	17	5
DSM diagnosis (*n*)			
Schizophrenia		29	29
Schizoaffective		10	6
CPZ equivalents (mg/day)			
M		828.46	726.51
SD		629.86	462.24
Anticholinergic status (*n*)			
Not receiving		14	14
Receiving		25	21
Years since illness onset			
M		16.9	13.4
SD		9.3	8.5
BPRS factor			
Affect			
M		7.71	9.71*
SD		3.25	3.19
Anergia			
M		8.12	7.65
SD		4.87	2.73
Disorganization			
M		4.58	5.85*
SD		1.56	1.73
Thought Disorder			
M		10.00	14.05*
SD		4.27	4.49

Note. *DSM* = *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition; CPZ = chlorpromazine; BPRS = Brief Psychiatric Rating Scale.
* $p < .05$.

Materials

Facial affect perception tasks. Facial affect identification was assessed with the Face Emotion Identification Task (FEIT; Kerr & Neale, 1993). The FEIT consists of 19 black-and-white photographs of faces expressing six basic emotions. The faces are presented on videotape for 15 s, and the participant's task is to identify which of the six emotions best represents the affect expressed by the face. Cronbach's alphas were as follows: nonclinical controls, $\alpha = .37$; acute-care participants, $\alpha = .52$; and extended-care participants, $\alpha = .41$.

Facial affect discrimination was assessed with the Face Emotion Discrimination Task (FEDT; Kerr & Neale, 1993). The FEDT requires the participant to determine whether two faces presented next to one another are expressing the same or different emotions. Thirty pairs of target faces are presented to the research participant. Alphas were as follows: nonclinical controls, $\alpha = .66$; acute-care participants, $\alpha = .67$; and extended-care participants, $\alpha = .64$.

Perception control tasks. General face perception was assessed with the Benton Test of Facial Recognition (TFR; Benton et al., 1978). In the first part of the TFR, the participant is shown a target photo of a person, and the task is to identify which of six photos (shown below the target face) is the same as the face in the target photograph. During the second part, the participant is required to identify which three of six photos are the same person as the target. The TFR is indexed as the total number correct (range = 0–54). Alphas were as follows: nonclinical controls, $\alpha = .35$; acute-care participants, $\alpha = .75$; and extended-care participants, $\alpha = .39$.[3]

General perception was assessed with the Benton Visual Form Discrimination Test (VFD; Benton, Hamsher, Varney, & Spreen, 1983). The VFD comprises 16 target geometric figures. The participant's task is to identify the target figure from an array of four geometric figures, three of which are

[1] Nine of the participants from Charity Hospital who met criteria for either schizophrenia or schizoaffective disorder had positive toxic screens at the time of admission. However, analyses of variance (ANOVAs) revealed that these 9 participants did not differ significantly from the other Charity participants in symptomology or on emotion perception or general perception tasks. Therefore, these participants were included in the acute-care group.

[2] Data from the participants with schizophrenia and schizoaffective disorder were combined because preliminary analyses revealed that these two groups did not significantly differ on any of the emotion perception or general perception tasks.

[3] The chronically ill sample completed the short version of the TFR. Therefore, their total score was prorated, and computation of Cronbach's alpha was based on the first 27 items.

distractors. The VFD is indexed as the total number correct, from 0 to 32. The alphas were as follows: nonclinical controls, $\alpha = .33$; acute-care participants, $\alpha = .76$; and extended-care participants, $\alpha = .65$.

Procedure

Research participants completed the emotion perception and general perception tasks as part of a broader study on social cognition in schizophrenia. The FEIT and FEDT data for the extended-care group were collected as part of a project on modifying facial affect perception in schizophrenia (Penn & Combs, in press) and are also reported during the baseline phase of that study.

Results

Correlational Analyses

Consistent with previous research in this area, the intercorrelations among the emotional and control perception tasks were computed. For the nonclinical control participants, there was a significant association between the two emotion perception tasks ($r = .43$, $p < .01$), and only the FEIT was significantly associated with performance on the TFR ($r = .33$, $p < .05$). Among the clinical participants, the relationship between performance on the FEIT and the FEDT was significant for only the acutely ill participants ($r = .39$ $p < .05$), although this association was in the expected direction for the extended-care sample ($r = .26$). Finally, the TFR was significantly related to the FEDT ($r = .33$, $p < .05$) and the VFD ($r = .34$, $p < .05$) for the extended-care sample.

Between-Groups Analyses

Because the three groups differed in ethnicity and gender, a 2 (ethnicity) × 3 (group) multivariate analysis of variance (MANOVA) was conducted on FEIT, FEDT, TFR, and VFD scores. The analysis revealed no multivariate main effects for ethnicity and no Ethnicity × Group interaction. A 2 (gender) × 3 (group) MANOVA resulted in a multivariate effect for gender that approached statistical significance $F(4, 105) = 2.31$, $p < .065$. However, none of the one-way ANOVAs conducted on the four perception tasks were significant. (There was a slight mean advantage for female participants on only the FEIT and TFR tasks.) Further, the Gender × Group interaction was not significant. Therefore, participants' gender and ethnicity were collapsed across all subsequent analyses.

A MANOVA conducted on the four dependent measures as a function of group was significant, $F(8, 218) = 11.28$, $p < .01$ (see Table 2). A series of one-way ANOVAs conducted on each of the four tasks also was significant (all $ps < .01$). Post hoc tests (with Bonferroni adjustment) showed that all groups significantly differed from one another on the FEIT, the FEDT, and the TFR; the nonclinical control group had the highest scores, and the acute-care group had the lowest scores. On the VFD, the nonclinical control group had significantly higher scores than both clinical groups; the two clinical groups did not significantly differ from one another.

A multivariate analysis of covariance (MANCOVA) was then conducted on the two emotion perception tasks for the three groups with performance on the TFR as a covariate. The multivariate effect for group was significant, $F(4, 220) = 9.90$, $p < .01$, as were the one-way analyses of covariance (ANCOVAs) conducted on the FEIT and FEDT scores (both $ps < .01$). Probing of the group effect on the FEIT revealed the same pattern as the MANOVA conducted without any covariates: All groups significantly differed from one another, with the highest scores obtained for the nonclinical control group and the lowest scores obtained for the acute-care group with schizophrenia. On the FEDT, post hoc tests showed that the nonclinical control group performed significantly higher than the group with schizophrenia receiving acute care ($p < .01$). All other mean comparisons were not significant. The pattern of results for the FEDT and the FEIT was unchanged when performance on the VFD was included as a covariate, although the difference in mean performance on the FEDT between the group receiving extended care and both the acute-care group and the nonclinical control group approached statistical significance ($ps = .07$ and .064, respectively).

Table 2
Group Performance on the Emotion Perception and General Perception Tasks

	Group					
	Nonclincal control		Extended care		Acute care	
Task	*M*	*SD*	*M*	*SD*	*M*	*SD*
FEIT	14.18	2.15	10.74	2.58	8.77	2.82
FEDT	25.75	2.86	23.44	3.54	21.29	4.07
TFR	46.73	2.78	41.72	5.24	38.69	5.97
VFD	30.60	1.65	27.05	3.79	25.46	5.35

Note. FEIT = Face Emotion Identification Task; FEDT = Face Emotion Discrimination Task; TFR = Test of Facial Recognition; VFD = Benton Visual Form Discrimination Test.

A key assumption underlying MANCOVA is that the slope of the covariate is constant across groups (Pedhazur, 1997). This assumption was tested by replication of the MANCOVA with additional terms for the group by covariate interactions. Because neither the Group × TFR, $F(4, 210) = 1.33$, $p > .25$, nor the Group × VFD, $F(4, 210) = 1.31$, $p > .25$, interaction was significant, the assumption of homogeneity of regression was met for these covariates.

Demographic and Clinical Variable Covariate Analyses

Because the groups differed in age and educational level, the final MANCOVA (which included the TFR and the VFD as covariates) was repeated, but with the additional covariates of age and years of education. The results for both the MANCOVA and the one-way ANCOVAs were unchanged, as were the post hoc tests on FEIT performance. The only change concerned the post hoc test on the FEDT, which now showed a significant performance advantage for the extended-care group over the acute-care group ($p < .05$). Further, a MANCOVA conducted on the FEIT and FEDT variables showed that both the Group × Age and the Group × Education interactions were not significant: $F(4, 202) = 0.15$, $p = .73$; $F(4, 202) = 0.27$, $p = .89$, respectively. Therefore, the assumption of homogeneity of regression was met for these covariates.

Finally, the two clinical groups significantly differed from one another on the FEIT, as well as on the Affect, Disorganization, and

Thought Disorder BPRS subscales. These BPRS subscales were combined to form a single index of "active" symptoms, and a one-way ANCOVA was conducted on the FEIT scores for the two clinical groups with active symptoms as a covariate. The covariate met the assumption of homogeneity of regression, $F(1, 70) = 0.72$, $p > .30$, and the ANCOVA was not significant, $F(1, 71) = 3.52$, $p = .065$.

Discussion

Two major findings emerged from this study. First, emotion perception impairments in acutely ill persons with schizophrenia were not accounted for by generalized poor performance. Although this clinical group was impaired relative to nonclinical controls on all perception tasks, its deficit on emotion perception tasks remained after controlling for performance on social and nonsocial perception control tasks. Second, the emotion discrimination deficits of people with schizophrenia in an extended-care setting appear to be part of a generalized performance deficit. Interestingly, this group's deficits in emotion identification did not reflect generalized poor performance, suggesting some independence between emotion identification and discrimination in this sample.

The acutely ill persons with schizophrenia were the most impaired on both the emotion and general perception tasks relative to both nonclinical control participants and persons with schizophrenia in an extended-care setting. This finding is consistent with previous research showing that the acute phase of schizophrenia may result in the greatest impairment in emotion perception (Gessler et al., 1989). However, these results are not consistent with those of Bellack et al. (1996), who did not find emotion perception deficits in patients recovering from an acute episode. Two explanations may be offered for these discrepant findings. First, the participants in Bellack et al.'s study were tested when their symptoms were stabilized, whereas our participants were still in the midst of an acute episode. Because there is some evidence that persons in the later stages of an acute episode perform better on emotion recognition tasks than do those in an earlier stage (Gaebel & Wolwer, 1992), then the discrepant findings may be explained by the fact that the participants in this study and in Bellack et al.'s study were tested during different periods of an acute episode.[4] Second, the nonclinical control participants in the present study scored at least one point higher on the two emotion perception tasks than the control participants in Bellack et al.'s study. Therefore, the combination of participants who were more acutely ill and control participants who performed better on the study tasks than those in Bellack et al.'s study may have contributed to the significant performance deficit observed in this study.

Consistent with previous research (Salem et al., 1996), impairments in emotion discrimination among medicated participants with schizophrenia in an extended-care setting appear to be part of a generalized performance deficit. However, their deficits in emotion identification were not accounted for by generalized poor performance, which does not replicate the results of either Mueser et al. (1996) or Salem et al. It is possible that the following differences in sample characteristics across these three studies may have bearing on the present findings: (a) The clinical sample in Mueser et al. had been hospitalized longer than the participants in the present study (9.5 years in Mueser et al.[1996] vs. 5.5 months in this study); (b) the clinical participants in Salem et al. appear to be less symptomatic (on the basis of total BPRS scores) than the participants in this study; and (c) our participants (both clinical and nonclinical) were younger than those in the two other studies. These factors, or a combination thereof, may have contributed to the differences in the findings between this study and those of Mueser et al. and Salem et al.

The two groups with schizophrenia significantly differed from one another on the emotion identification task. However, this difference was attenuated when active symptoms were controlled for. This finding suggests that active symptoms may have an important role in specifically disrupting emotion perception skills in schizophrenia.[5] Therefore, active symptoms may exert a greater impact on emotional rather than general perceptual abilities among persons with schizophrenia. It is possible that active symptoms preferentially disrupt emotion perception because of their selective impact on certain brain structures or functions. With growing evidence that separate brain areas may be responsible for emotion and face perception (e.g., George et al., 1993) and for social and nonsocial perception (discussed in Frith & Frith, 1999), the next step is to examine specific changes in neural functioning across both phase of the disorder and type of task (i.e., social or emotional vs. nonsocial or neutral).

A number of study limitations should be noted. First, the Benton VFD was relatively easy for the nonclinical control participants, and a ceiling effect seemed to occur. Further, it was not psychometrically matched to the emotion and face perception tasks. Therefore, these results should be replicated with a general perception task more closely matched in difficulty level with Kerr and Neale's (1993) stimuli. Second, the reliability of the emotion identification and general perception tasks was rather low, especially for the nonclinical control group. Similar problems have been noted in other studies using these stimuli (e.g., Mueser et al., 1996). Thus, including more reliable emotion and general perception measures in the study would have strengthened confidence in the present results. Future research should include multiple measures of emotion perception, allowing for evaluation of the convergence of results across tasks of varying psychometric properties.

In closing, this study suggests that emotion perception deficits in acutely ill individuals with schizophrenia and the emotion identification skills in individuals in an extended-care setting may not be explained by generalized poor performance. As noted by Bellack et al. (1996), it is possible that nonreplicating results such as these reflect the heterogeneity of schizophrenia and underscore the need

[4] Indirect support for this assertion is obtained by comparing the total mean BPRS scores for the participants in the two studies. The mean total BPRS score for our participants was 50.59. Mean total BPRS scores were 42.84 and 43.90, respectively, for the schizophrenia- and schizoaffective-diagnosed participants in Bellack et al.'s (1996) study.

[5] Indirect support for this assertion was obtained by a post hoc analysis in which a median split was computed on the active symptom index for all of the participants with schizophrenia. A one-way MANOVA conducted on the four perception tasks revealed significant group differences for only the two emotion perception tasks (both $ps < .05$). The high–active symptom group was significantly impaired on both the emotion identification and discrimination tasks relative to the low–active symptom group.

to more closely examine subtypes of the disorder. This is clearly an important challenge for future work in this area.

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