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A Multimethod, Multichannel Assessment of Affective Flattening in Schizophrenia

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Abstract. Flat affect was examined across multiple contexts (during interviews and emotional films), multiple channels of expression (facial and vocal), and different assessment techniques (clinical ratings, observational ratings of facial expression, and acoustic analyses) in 23 medication-free schizophrenic patients. Patients participated in three different interviews during which either clinical ratings were made or their voices were audiotaped for later acoustic analyses. Patients were also videotaped while they viewed positive and negative emotional films. The videotapes were then coded for the frequency, intensity, and duration of positive and negative facial expressions. Results indicated that general clinical ratings were related across different interviews. However, only those items specific to affective flattening bore significant relationships to vocal and facial expressiveness. Vocal expressiveness and negative facial expressiveness were related, but vocal expressiveness was not related to positive facial expressiveness.

Key Words. Emotional expression, acoustic analyses, flat affect, Scale for the Assessment of Negative Symptoms, Brief Psychiatric Rating Scale.

The positive and negative symptom distinction in schizophrenia has found favor among psychopathology researchers intent on diminishing the heterogeneity of the disorder. Indeed, empirical findings in support of this subtyping scheme encompass areas such as neuropsychological deficits (e.g., Green and Walker, 1985), visual information processing (e.g., Green and Walker, 1986), genetic loading (e.g., Dworkin and Lenzenweger, 1984; Berenbaum et al., 1985), and course (e.g., Pfohl and Winokur, 1982; Pogue-Geile and Harrow, 1985) to name but a few. In addition to the positive-negative symptom subtyping approach, several researchers have argued for the importance of examining individual features or symptoms of schizophrenia (Neale et al., 1985; Persons, 1986). In this manner, specific task performance can be related to specific and observable features of the disorder instead of to general diagnostic classifications. The focus of the present investigation is on the symptom of flat affect and more specifically on the relationship between several

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currently used clinical rating scales and performance on specific behavioral indices of affective expression.

Flat affect refers to a lack of outward expression of emotion. Although not universal among schizophrenic patients, this symptom has been shown to be temporally stable (Pfohl and Winokur, 1982), related to chronicity (Pogue-Geile and Harrow, 1987), more common in schizophrenia than in depression (e.g., Andreasen, 1979), and prognostically significant (e.g., Knight et al., 1979).

Rating scales such as the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1981) and Abrams and Taylor's Scale for Emotional Blunting (Abrams and Taylor, 1978) permit the concept of flat affect to be studied systematically. Ratings are typically made after a brief interview designed to document the nature, history, and course of the patient's illness. These interviews, however, may fail to elicit emotional material in a systematic manner and thus may not provide an opportunity for patients to express a wide range of emotions.

The present study sought to expand the behavioral measurement base of affective flattening by including the manipulation of emotional material in addition to the more traditional clinical ratings that are typically used to determine the presence or absence of the symptom. Recent research using emotional stimuli has found that schizophrenic patients are less facially expressive than normal subjects (Krause et al., 1989; Martin et al., 1990; Berenbaum and Oltmanns, 1992; Kring et al., 1993) and depressive patients (Berenbaum and Oltmanns, 1992). In addition, the degree of vocal expressivity of schizophrenic patients has been used to differentiate them from normal subjects (Borod et al., 1989), depressive patients (Levin et al., 1985), and patients with Parkinson's disease (Borod et al., 1989). The present study included measures of emotional responding across both facial and vocal channels to provide a broader understanding of the nature of the diminished expressiveness that is seen in some schizophrenic patients. Finally, the present sample included patients who were not currently taking any neuroleptic medication. While their effects on affective expression are not clear, these medications can produce side effects (e.g., akinesia) that mimic flattened affect (e.g., Rifkin et al., 1975; Van Putten and Marder, 1987). Thus, to help disentangle reduced expressivity due to the disorder from that which is a side effect of the medication, all patients were tested while free of medication. Patients in the study were not drug-naive; rather, they had been withdrawn from a regimen of orally administered medication[1] for at least 2 weeks as part of a research protocol. Because orally administered neuroleptics have elimination half-lives of 20 to 40 hours (Baldessarini, 1985), medication washout periods of 2 to 4 weeks are considered adequate (Blanchard and Neale, 1992).

Methods

Subjects. Twenty-three male schizophrenic patients selected from the research unit at the Bronx Veterans Administration Hospital participated in the study. Patients had been free of

1. Patients taking depot neuroleptics were excluded because these medications have much longer elimination half-lives and thus a drug-free period of 2 weeks is not sufficient for adequate medication washout (Wistedt et al., 1981).

medication for at least 2 weeks before testing (mean number of days medication free = 17.53, SD = 4.79). *DSM-III-R* diagnoses (American Psychiatric Association, 1987) were determined by trained interviewers (see Keefe et al., 1987) who used the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott and Spitzer, 1978). Any participant with a history of head trauma, severe alcohol or drug abuse, or known neurological disease was excluded from the study. Schizophrenic patients with evidence of tardive dyskinesia were also excluded so as not to confuse facial movements associated with medication side effects with facial expressions of emotion. The mean age of the patients was 43.05 (SD = 10.59), and the mean number of years of education was 12.29 (SD = 2.17). Of the total sample, 14 patients were white, six were black, and three were hispanic. These patients had a fairly chronic course of illness, characterized by a mean number of 6.33 hospitalizations and mean hospital stays of 13 months.

Interviews. Patients were not taking neuroleptic medication when they participated in three different interviews; the mean number of days between interviews was 5.05 (SD = 9.38). The first session (Interview A) was a semistructured interview during which the patients were asked about the history and nature of their illness. This interview was designed to provide a forum for patients to discuss personal issues that may elicit emotion in an interpersonal context. One of the authors (A.M.K.) or another member of her research laboratory at Stony Brook served as interviewers. These interviews were videotaped and later rated with a modified version of the Affective Flattening subscale of the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1981). Specifically, the following items were included in the ratings, which ranged from 0 (not at all) to 5 (severe): unchanging facial expressions, poor eye contact, paucity of expressive gestures, affective nonresponsivity, and lack of vocal inflections. Thus, the potential range of scores was 0 to 25, with a higher score indicating greater affective flattening. Each patient was rated independently by two raters from the Stony Brook research team. The five items from the affective flattening subscale were summed to form a total score, and the intraclass correlation coefficient (ICC) between the two raters for these total scores was 0.77 (ICC (2,1); Shrout and Fleiss, 1979). ICCs for the "unchanging facial expression" and the "lack of vocal inflection" items were 0.78 and 0.60, respectively. Internal consistency, as assessed by Cronbach's α coefficient (Cronbach, 1951), for the total score was 0.71. Means across the two raters were used in analyses that involved the SANS.

The second interview (Interview B) was a structured interview designed to allow patients to talk for a reasonable period of time during which their voices were audiotaped and later analyzed for specific acoustic properties (see below). During this interview, patients were asked questions about issues such as family, work, and hobbies. The same interviewer, a doctoral level graduate student from the laboratory of one of us (M.A.), conducted all of these interviews.

Finally, patients participated in a semistructured interview (Interview C) designed to elicit information about current symptom presentation. Two trained raters, who were members of the research team at the Bronx Veterans Administration Medical Center, were present during this interview. The rater who conducted the interview was designated rater 1. At the end of the interview, rater 2 could ask additional questions. Immediately after the interview, the two raters independently completed the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1988). The BPRS consists of 18 items that are rated from 1 (not present) to 7 (extremely severe). The range on the BPRS is thus 18 to 126, with higher scores indicating greater symptom severity. The 18 items were summed to form a total score. Consistent with previous research using the BPRS (e.g., Thiemann et al., 1987; Goldman et al., 1991), a Negative Symptom subscale comprised three items (emotional withdrawal, blunted affect, and motor retardation), and a Positive Symptom subscale comprised six items (conceptual disorganization, hostility, suspiciousness, hallucinatory behavior, unusual thought content, and excitement). Routine reliability assessments are made for pairs of raters at the Bronx VA Medical Center (e.g., Harvey et al., 1990, 1991), and these estimates are consistently high, ranging from 0.88 to 0.90 (κ coefficients). Internal consistency estimates, as assessed by

Cronbach's α coefficient, for the BPRS total, positive, and negative scores were 0.74, 0.62, and 0.71, respectively. Means across the two raters were used in analyses involving the BPRS.

Emotional Films. In addition to the interviews, patients were videotaped while they viewed emotional film clips. Film clips included excerpts from three contemporary movies and represented both positive (happy) and negative (sad or fearful) emotions. Patients were randomly assigned to view one of two different stimulus sets that contained happy, sad, fearful, and neutral stimuli. Length of the film clips ranged from 264 to 350 seconds, and they were shown to all patients in the same order. These films have been used successfully in earlier studies of psychiatric patients (Berenbaum and Oltmanns, 1992; Kring et al., 1993; Blanchard et al., 1994).

Facial Expression Coding System (FACES). Videotapes of the patients were coded with FACES (Kring and Sloan, 1991), an observational coding system that provides information on the frequency, intensity, and duration of both positive and negative facial expressions. The system has been used with normal (Kring and Tomarken, 1993; Kring et al., 1994) and psychiatric populations (Kring et al., 1993; Blanchard et al., 1994). It offers a less time-consuming yet equally informative alternative to some of the more labor-intensive coding systems that are available. For the present study, two undergraduate research assistants, who were unaware of the diagnostic status of the patients and the hypotheses of the study, independently coded the tapes. Interrater reliability estimates for the frequency, intensity, and duration variables, as assessed by ICC (2,1; Shrout and Fleiss, 1979), were high, ranging from 0.70 to 0.99. Because the reliability was adequate, means across coders were computed for these variables. These means were then combined to form composites by first standardizing (Z score) each individual variable (frequency, intensity, and duration) and then adding these standard scores together to form two facial expression composites. The Positive Expression composite for the positive film was computed by adding the standardized frequency, intensity, and duration scores for positive expressions during the positive film. An overall Negative Expression composite was formed by adding the standardized frequency, intensity, and duration scores for negative expressions averaged across the two negative films. Thus, two facial expression variables (positive and negative composities) were used in the analyses.

Acoustic Analyses (VOXCOM). Audiotapes from Interview B were analyzed with the VOXCOM system developed by Alpert et al. (1986). During Interview B, patient and interviewer voices were recorded on separate channels. The patient's channel was filtered, rectified, and demodulated and fed into an analog-to-digital converter and then to a microcomputer. For the present study, we selected the subset of the variables produced by the VOXCOM analyses that were conceptually related to the clinical ratings conducted following the other interviews (A and C). These variables were combined to form three scales: *Productivity,* the total duration of patient's utterances; *expressiveness,* the variations in frequency (pitch) and amplitude (loudness); and *rate,* the number of peaks (i.e., syllables) per second.

Results

Table 1 presents descriptive statistics for the clinical rating scales. This group of patients was rated in the moderate to severe range of psychopathology. Table 2 presents Pearson correlations between the BPRS ratings from Interview C and the SANS Affective Flattening subscale ratings from Interview A. Not surprisingly, neither the BPRS Total score nor the BPRS Positive Symptom subscale were related to the Affective Flattening subscale of the SANS. However, the BPRS Negative Symptom subscale was significantly related to the SANS subscale (r = 0.52,

Table 1 Descriptive statistics for the clinical rating scales

Measure	Mean	SD	Minimum	Maximum
1. SANS—flat affect total	9.50	4.25	1	17
2. SANS1—"unchanging facial expression"	2.24	1.29	0	4
3. SANS2—"lack of vocal inflection"	2.02	1.17	0	3.5
4. BPRS Total score	47.00	11.05	28	70
5. BPRS Negative symptom subscale	8.41	3.28	4	14
6. BPRS Positive symptom subscale	17.46	5.35	7	27
7. BPRS16—"Blunted affect"	3.46	1.22	2	6

Note. Scale for the Assessment of Negative Symptoms (SANS) ratings were conducted following Interview A; Brief Psychiatric Rating Scale (BPRS) ratings were conducted following Interview C.

$p < 0.02$). The "unchanging facial expression" item from the SANS was significantly related to the BPRS Negative Symptom subscale ($r = 0.56$, $p < 0.02$) and the "blunted affect" item from the BPRS ($r = 0.53$, $p < 0.02$).The "lack of vocal inflection" item from the SANS was not, however, related to either the BPRS Negative Symptom subscale or the BPRS "blunted affect" item, a finding which suggests that perhaps the raters making more global ratings such as "blunted affect" may have been attending more to diminished facial expression than to diminished vocal expression.

Acoustic analyses of the patients' voices recorded during Interview B yielded measures of productivity, expressiveness, and rate. Similar to the finding that BPRS ratings were unrelated to SANS ratings of vocal inflection, BPRS ratings were also unrelated to the acoustic measures of vocal expression (see Table 3). However, the acoustic index of vocal expressiveness showed a significant negative relationship to the SANS total score from Interview A ($r = -0.47$, $p < 0.04$) and the "lack of vocal inflection" item ($r = -0.53$, $p < 0.01$), indicating that patients who were rated as being more affectively flat during Interview A were also less vocally expressive during Interview B. In addition, the acoustic index of productivity showed a significant negative relationship to the "lack of vocal inflection" item from the SANS ($r = -0.46$, $p < 0.04$), suggesting that patients rated as being more affectively flat

Table 2 Correlations between clinical rating scales

Measure	1	2	3	4	5	6	7
1. SANSTot							
2. SANS1	0.82***						
3. SANS2	0.77***	0.85***					
4. BPRSTot	0.16	0.26	0.17				
5. BPRSNeg	0.52**	0.49**	0.41	0.53**			
6. BPRSPos	-0.01	0.05	0.01	0.82***	0.11		
7. BPRS16	0.46*	0.51**	0.26	0.63***	0.91***	0.32	

Note. SANS = Scale for the Assessment of Negative Symptoms. SANSTot = Flat affect subscale. SANS1 = "Unchanging Facial Expression." SANS2 = "Lack of Vocal Inflection." BPRS = Brief Psychiatric Rating Scale. BPRSTot = BPRS Total score. BPRSNeg = BPRS Negative Symptom subscale; BPRSPos = BPRS Positive Symptom subscale; BPRS16 = BPRS "Blunted Affect."

*** indicates $p < 0.01$; ** indicates $p < 0.03$; * indicates $p < 0.05$.

during Interview A spoke for a shorter duration during Interview B. The correlation between the "lack of vocal inflection" item and the acoustic rate variable approached significance ($p < 0.06$).

Table 3 presents the correlations between the clinical ratings and facial expression during emotional films. Neither the SANS total score nor the "unchanging facial expression" item was related to facial expressivity during positive and negative films. However, the "blunted affect" item from the BPRS showed a significant positive correlation with positive expressiveness during the positive film, a finding which suggests that those patients rated as having more blunted affect during an interview (C) showed more positive expressions during a positive emotional film. In addition, those patients who were rated as having more positive symptoms (BPRS Positive Symptom subscale) displayed more negative expressions during negative films. None of the other correlations between clinical ratings and facial expressivity were significant. Note, however, that these patients were fairly unexpressive in response to all films. That is, only slightly more than a third of the patients exhibited any positive expressions in response to the positive films or negative expressions in response to the negative films. This limited expressivity is not surprising, given that affective flattening is defined by diminished expression of emotion. Indeed, in a study that examined different components of emotional response, these patients were shown to be much less facially expressive in response to the films than a comparison group of nonpatients (Kring et al., 1993). For the present study, however, the limited variability in the facial expression variables is likely contributing to the small correlations involving these variables (Nunnally, 1978).

Table 3. Correlations between facial expressivity, acoustic measures, and clinical ratings

	Facial expression		Acoustic measure		
Clinical Rating	**PosExpr**	**NegExpr**	**Exp**	**Prd**	**Rate**
1. SANS Total score	0.30	-0.15	-0.47**	-0.13	-0.30
2. "Unchanging facial expression" (SANS)	-0.04	-0.07	—	—	—
3. "Lack of vocal inflection" (SANS)	—	—	-0.51**	-0.46*	-0.42
4. BPRS Total score	0.29	-0.19	0.19	-0.09	-0.19
5. BPRS Negative	0.30	-0.28	-0.02	-0.30	-0.12
6. BPRS Positive	0.26	0.58**	0.31	0.04	-0.04
7. "Blunted affect" (BPRS)	0.48*	-0.18	0.06	-0.17	0.01

Note: PosExpr = positive expression composite, positive film. NegExpr = negative expression composite, negative films. Acoustic measures were obtained from Interview B. Exp = acoustic expressiveness. Prd = acoustic productivity. Rate = acoustic rate.

** indicates $p < 0.02$; * indicates $p < 0.04$.

As shown in Table 4, correlations between the acoustic variables and the facial expressivity variables revealed a significant positive correlation between vocal expressiveness and the negative facial expression composite ($r = 0.56$, $p < 0.02$). Thus, those patients who were more vocally expressive during Interview B were also more facially expressive in response to the negative emotional films. Neither productivity nor rate was related to negative facial expressiveness during negative films,

Table 4. Correlations between facial expressivity and acoustic measures

Measure	1	2	3	4
1. Productivity				
2. Expressiveness	0.01			
3. Rate	0.01	0.38		
4. Positive facial expression	0.07	-0.34	0.16	
5. Negative facial expression	-0.23	0.56*	0.29	0.01

Note. Productivity, expressiveness, and rate are acoustic measures from Interview B.

* $p < 0.02$.

and none of the acoustic variables were significantly correlated with positive facial expressiveness during the positive film.

Discussion

The present study sought to examine flat affect in schizophrenia across multiple contexts (during interviews and emotional films), multiple channels of expression (facial and vocal), and different assessment techniques (clinical ratings, observational ratings of facial expression, and acoustic analyses). Although any conclusions must be considered tentative due to the small number of subjects and the fact that only male subjects were studied, the results nonetheless suggest a complex and interesting set of interrelationships among these variables.

Consistent with prior studies (e.g., Thiemann et al., 1987; Czobor et al., 1991; Gur et al., 1991), traditional rating scales (i.e., the BPRS and the SANS) used to assess psychopathology showed a high degree of relatedness. Specifically, the SANS was significantly related to the BPRS Negative Symptom subscale. However, with respect to the symptom of flat affect, the general clinical rating scales showed little or no relationship to specific behavioral assessments of affective flattening. That is, BPRS total scores were not related to either vocal expressiveness during an interview or facial expressiveness in response to emotional films. Indices of global psychopathology such as the BPRS, while informative about the current clinical state of a patient, may not be useful indicators of specific symptoms. Indeed, Sommers (1985) has argued for the importance of using refined symptom assessments rather than more general psychiatric scales. The SANS was intended as a more symptom-specific measure of negative symptoms. In the present study, the affective flattening subscale of the SANS was significantly correlated with vocal expressiveness. Even more strongly related to vocal expressiveness, however, was the individual SANS item "lack of vocal inflection," a finding which indicated that clinical judgments about vocal expressiveness corresponded to more fine-grained acoustic analyses of speech.

It is of interest that neither the Affective Flattening subscale of the SANS nor the individual SANS item "unchanging facial expressions" was related to facial expressiveness in response to emotional films. That is, these ratings demonstrated a rather strong degree of distinctiveness from the measures of expressiveness during emotional films. The fact that the BPRS "blunted affect" item was positively

correlated with positive facial expressivity in response to a positive film (i.e., patients rated as "blunted" from Interview C were also likely to show more positive facial expressions in response to the positive film) also supports the notion that expressivity differs in these two contexts. In some respects, it is not surprising that expressiveness during an interpersonal interview is not highly related to expressiveness during emotion-eliciting films. Dworkin (1992) has argued that many currently available rating scales for affective deficits in schizophrenia, including the SANS, and the context in which these ratings are made (interview in an interpersonal situation) make the differentiation of affective deficits from social skills deficits nearly impossible. That is, schizophrenic patients may appear to lack interpersonal social skills due to an underlying affective deficit. Equally plausible, however, is the notion that schizophrenic patients appear affectively flat due to an underlying social skills deficit and thus do not have the requisite skills to interact appropriately in an interpersonal situation. By contrast, the film-viewing task did not require social interaction and thus provided for a nonsocial assessment of expressive behavior. Additionally, the interview may not have allowed for a full range of emotional expression. That is, the opportunity to express emotion during the interview was determined in part by the nature of what was discussed and the emotional significance each participant may have attached to the topic. In other words, although all patients were asked the same questions about their hospitalization history and current symptoms, these experiences differed greatly within the sample.

The degree of association between vocal and facial expressiveness depended in part on the nature of the emotional stimuli. That is, there was a significant correlation between vocal expressiveness during an interview (Interview B) and facial expressiveness during negative films, but there was no relationship between vocal expressiveness during an interview and facial expressiveness during positive films. Of course, the same disparity in emotional context exists for comparisons involving the "facial" and "vocal" tasks. That is, voice samples were obtained from an interpersonal and possibly emotionally benign interview, whereas the facial expressions were recorded during solitary viewing of emotionally evocative films. In future work, it will be informative to include an assessment of spontaneous vocal expressiveness in a more emotionally evocative situation.

Certainly, clinical rating scales are valuable for both researchers and clinicians in that they can provide reliable information about the individual patient's current symptom profile. Results from the present study, however, indicate that specific information about specific symptoms is not easily obtained from indexes of general psychopathology and may be better revealed by more fine-grained assessment devices that include greater coverage of individual symptoms. Going beyond rating scale assessments also provides information about symptoms that might otherwise be missed in the context of a clinical interview. This appears to be particularly true with respect to facial expressiveness. Prior studies have shown that schizophrenic patients are much less facially expressive than normal subjects, yet patients report experiencing equal if not greater levels of subjective experience of emotion (Berenbaum and Oltmanns, 1992; Kring et al., 1993), and they show heightened skin conductance responsivity in response to emotional films (Kring, 1991). Thus, the

diminished facial expressivity characteristic of affective flattening does not represent the underlying emotional experience of schizophrenic patients. In addition, clinical ratings of affective flattening made in an interview context appear to be tapping different aspects of expressivity than those that are assessed by ratings of facial behavior in an emotional situation. This conclusion is supported not only by the present study, but also by other recent studies of emotion in schizophrenia (e.g., Kring, 1991; Dworkin et al., 1993). Therefore, we believe that furthering our understanding of specific symptoms will come from more thorough examinations of these symptoms across different contexts. In turn, results from these studies may help refine our current clinical assessment devices. For example, in addition to the more standard interview that includes questions about current symptoms and hospitalization, inclusion of more emotionally charged material (e.g., recollection of happy and sad memories) may provide a better context within which emotion can be expressed and therefore rated.

Limitations of the current study must be acknowledged. The sample included only men, and thus no conclusions about affective flattening can be made for female patients. There is a large body of evidence that women may be more emotionally expressive than men (e.g., Hall, 1985). To the extent that these gender differences extend to schizophrenic patients, one might expect female patients to be more expressive (and perhaps rated as being less affectively flat) than men. Future work on the affective features of schizophrenia should explicitly examine gender differences. In addition, the current study did not include a comparison group against which the schizophrenic patients' responses could have been examined. Prior studies have shown, however, that schizophrenic patients differ from nonpatients and depressed patients in their facial expressivity in response to films (e.g., Berenbaum and Oltmanns, 1992; Kring et al., 1993), the acoustic properties of speech (e.g., Levin et al., 1985; Borod et al., 1989), and rating scale assessment of negative symptoms (e.g., Pogue-Geile and Harrow, 1984). Nonetheless, a psychiatric comparison group will be an important addition to future research on affective features of schizophrenia so that the pattern of response across different measures of affective response can be further specified.

In sum, the present study found agreement among currently used clinical rating scales. From the standpoint of individual symptoms, however, total scale scores from general rating scales may not provide complete information. In prior studies, more specific and objective behavioral assessments of the symptom of flat affect have indicated that schizophrenic patients with this symptom have different speech characteristics (e.g., Andreasen et al., 1981) and are less facially expressive (e.g., Berenbaum and Oltmanns, 1992; Kring et al., 1993) than those without the symptom. In the present study, objective indices of speech were related to rating scale items specifically assessing vocal characteristics rather than the total scale score. In contrast, objective indices of facial expressivity did not show a relationship to the clinical scales, which suggests that future work ought to attempt to distinguish between affective and social deficits.

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