Nonverbal Communication Of Emotion
In Hypothetically Psychosis-Prone Individuals

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The nonverbal communication abilities of hypothetically psychosis-prone college students [Anhedonics (N = 19) and Per-Mags (N = 25)] were compared with those of a normal control group [students who scored in the normal range on these measures (N = 23)]. It was hypothesized that anhedonics would show the poorest nonverbal communication ability, followed by Per-Mags, followed by controls. A similar pattern was expected on related measures (liking others, social anxiety, interpersonal success). Contrary to predictions, anhedonics' and per-mags' nonverbal receiving ability is intact. However, anhedonics are less expressive and less interpersonally successful than per-mags and controls. Further, compared to controls, anhedonics and per-mags report less liking of others, and compared to anhedonics and controls, per-mags are more socially anxious.

Researchers have recently begun to identify and evaluate individuals who may be psychosis-prone as a way of learning more about the development of psychosis. One promising line of research uses a behavioral high risk paradigm (Chapman, Chapman, Raulin & Edell, 1978), where college students hypothesized to be at risk for psychosis are identified by scales developed by the Chapmans and their associates. Some of the more widely used scales are Physical Anhedonia, Perceptual Aberration, and Magical Ideation. High scorers on these scales are called schizotypes, Meehl's (1973) term for individuals at genetic risk for schizophrenia. This paradigm has been used to study interpersonal and cognitive aspects of functioning in these hypothetically high risk subjects. As yet unstudied, however, is the ability of schizotypes to receive and send nonverbal emotional communications.

Nonverbal emotional communication appears to be deficient in schizophrenics. Kraepelin (1919) had noted that disturbed affect is a central feature of schizophrenia, and severe problems with interpersonal relationships and poor social skills are common in schizophrenics. It's reasonable to hypothesize that schizophrenics' emotional and social deficits are associated with abnormal nonverbal communication. Several recent studies have tested schizophrenics' skill at judging facial expressions of emotion (see, for example, Cutting, 1981; Dougherty, Bartlett, & Izard, 1974; Muzekari & Bates, 1977; Walker, Marwit, & Emory, 1980; Walker, McGuire, & Bettes, 1984; Feinberg, Rifkin, Schaffer, & Walker, 1986; Borod et al., 1989). The experimental tasks have generally involved matching emotion labels (e.g., happy, sad) with photographs or videotapes of human faces. There is some inconsistency in this literature, possibly reflecting the heterogeneity of schizophrenia (Morrison & Bellack, 1987). However, schizophrenics are typically less accurate at these tasks than normals and have sometimes been less accurate than patients with affective disorders as well. Rosenthal, Hall, DiMatteo, Rogers, and Archer (1979) used their *Profile of Nonverbal Sensitivity Test*, or *PONS*, to study psychiatric patients' skill at judging expressions. The *PONS* is a 45-minute film and soundtrack of a woman portraying various emotional scenes. Subjects attempt to identify what scene the woman is portraying based on the woman's face only, body only, tone of voice only, or various combinations of these (e.g., face and body). Thus, the *PONS* assesses the ability to interpret emotions expressed through a variety

of visual and auditory nonverbal channels. Channel for channel, and overall, the *PONS* responses of the psychiatric patients were significantly less accurate than those of the normal subjects. Also, psychiatric and normal groups differed in their relative performance across channels; the performance deficit of psychiatric patients was greatest on pure visual channels and less on the pure audio channels. This finding is consistent with McGhie's (1973) study of schizophrenics using a different measure of receiving ability.

Until recently, there was little research on schizophrenics' ability to send nonverbal cues of emotion (i.e., to express emotion through the face, body gestures, and tone of voice). This is a striking omission given that Bleuler (1911/1950) saw blunted affect as a core symptom of schizophrenia. Disputing the DSM-III's claim that the presence of affective disturbances "is often difficult to judge except when present in extreme form" (APA, 1980, p. 183), Andreasen (1979, 1982a) developed a reliable scale for rating blunt and flat affect in psychiatric patients. Andreasen's *Scale for the Assessment of Negative Symptoms*, or *SANS*, identifies nine observable phenomena indicative of flat affect, including unchanging facial expression, poor eye contact, lack of vocal inflections, and paucity of expressive body gestures. She found that this measure could reliably discriminate psychiatric patients, with 63% of the schizophrenics, compared to 55% of the depressed patients and 21% of the manic patients, rated as at least somewhat flat.

Gottheil, Paredes, Exline, and Winkelmayer (1970), Gottheil, Thornton, and Exline (1976), Levin, Hall, Knight, and Alpert (1985), and Borod et al. (1989) studied schizophrenics' sending ability by instructing schizophrenic subjects and controls to express particular emotions and observing how accurately normal judges could identify, based on subjects' nonverbal cues, what emotion the subjects had been told to convey. For example, Gottheil et al. (1976) audiotaped subjects telling happy, sad, and angry stories. The audiotapes were content-filtered so that they conveyed subjects' tone of voice but masked individual words. The content-filtered audiotapes were reviewed by normal judges who tried to identify the emotional tone of the story being told. This study, and the others cited, show that normals are less accurate at judging the emotions expressed by schizophrenics than at judging the emotions expressed by other patient groups and by normals.

In sum, the existing data suggest that schizophrenics tend to be deficient receivers and senders of nonverbal cues of emotion. It would be interesting to know whether high scorers on the Chapmans' schizotypy scales have similar, if less extreme, difficulties with nonverbal communication.

This study also addresses the question of whether deficits in nonverbal communication are associated with specific schizotypic symptoms. The Chapmans have constructed a number of schizotypy scales, each designed to measure a different type of schizotypic symptomatology. High scorers on one schizotypy scale are not necessarily high scorers on another. Chapman, Chapman, and Miller (1982) note that the Physical Anhedonia Scale is negatively correlated with the Perceptual Aberration-Magical Ideation Scale (Per-Mag Scale). The Physical Anhedonia and Per-Mag Scales may identify people prone to different kinds of psychoses. These two kinds of psychoses may differ in the degree to which they are associated with deficits in nonverbal emotional communication.

What types of schizophrenia are associated with impaired nonverbal emotional communication? Andreasen's (1982b) typology of schizophrenia appears useful for addressing this question. Andreasen conceptualizes schizophrenia as consisting of three subtypes: negative, positive, and mixed schizophrenia. In negative schizophrenia deficit symptoms are prominent, including emotional deficits (affective flattening, anhedonia, and apathy) and cognitive deficits (poverty and content of speech and attentional impairment). In positive schizophrenia florid symptoms, such as delusions, hallucinations, and bizarre behavior, are more prominent. In mixed schizophrenia both positive and negative symptoms are present. Andreasen's research supports this typology in that positive, negative, and mixed schizophrenics differed in external criteria such as premorbid adjustment, indices of cognitive dysfunction, ventricular brain ratio, and course in the hospital. In addition, negative symptoms tended to correlate positively, positive symptoms tended to correlate positively, and negative and positive symptoms usually correlate negatively. Using Andreasen's theoretical framework, we would categorize impaired nonverbal receiving and sending abilities as deficit or negative symptoms. Thus, we would

expect impaired nonverbal emotional communication to occur most frequently in schizophrenics whose other predominant symptoms were also negative.

Anhedonia is a deficit or negative symptom. Perhaps negative symptoms cluster in schizotypes much as they do in schizophrenics. If so, nonverbal communication deficits, another negative symptom, should be characteristic of anhedonics. On the other hand, aberrant perception and magical ideation are positive symptoms. We would not expect nonverbal communication deficits in per-mags. It is possible that positive symptoms of per-mags (e.g., aberrant beliefs) might interfere somewhat with nonverbal communication, producing a deficit on this measure relative to normals.

Thus far, nonverbal communication in schizotypes has received little attention. Berenbaum, Snowhite, and Oltmanns (1987) found no significant differences between anhedonics and normals in facial expressiveness while viewing emotionally evocative films. However, viewing a film is a private rather than social experience, and therefore this would not qualify as a measure of nonverbal communication. No other studies of nonverbal communication in schizotypes have been reported.

This study also investigates the relative functioning of anhedonics, per-mags, and normals on interpersonal dimensions likely to be affected by nonverbal communication. Deficient nonverbal communication should create additional interpersonal problems. There appear to be no published data relating nonverbal skills with other types of social competence in the schizophrenia literature. Rosenthal et al. (1979) found small but significant correlations between *PONS* scores and other measures of social adjustment in normals. Assuming anhedonics are more deficient at nonverbal communication than per-mags and normals, we would expect anhedonics to also have greater difficulty in other areas of social functioning.

Social functioning of schizotypes has been studied, although the methodologies used thus far have been limited to role-play measures of social skill (Haberman, Chapman, Numbers, & McFall, 1979, Numbers & Chapman, 1982) and brief self-rating scales (Chapman, Edell, & Chapman, 1980). These data show social dysfunction in both anhedonics and per-mags. Anhedonics generally show the greater dysfunction, although Adamski, Raulin, and Capozzi (1982) found greater social impairment in per-mag psychotherapy clients compared to anhedonics. Further, verbal communication deviancies, such as use of odd phrases and vague forms of expression, appear to be characteristic of per-mags but not anhedonics (Chapman et al., 1980; Martin & Chapman, 1982), and such deviancies seem likely to interfere with overall social functioning. There is clearly a need for additional data about the relative social functioning of anhedonics and per-mags. Relating the nonverbal communication skills of anhedonics and per-mags to social functioning would add significantly to our understanding. Such data would help to clarify the differences between anhedonics and per-mags, as well as provide preliminary information about the relationship between schizotypy, nonverbal communication abilities, and general social competence.

These data would also contribute to our understanding of the connection between schizotypy and good versus poor prognosis schizophrenia. Andreasen (1982b), Crow (1980), and Pogue-Geile and Harrow (1984) have found a link between poor premorbid functioning and the later development of negative symptoms and between good premorbid functioning and the later development of positive symptoms. Supporting these findings are two decades of research (see, for example, Vaillant, 1962; Stephens, 1978) that has consistently related poor premorbid functioning with chronic schizophrenia and the negative symptom of affective blunting and good premorbid functioning with acute schizophrenia and a lower prevalence of blunted affect (Andreasen, 1987). Perhaps anhedonics are at risk for negative schizophrenia, and per-mags are at risk for positive schizophrenia.

The data comparing anhedonics and per-mags on cognitive functioning present a complex picture. On the one hand, Simons (1982) has found that anhedonics are the only schizotypic group to show deficits in attentional and psychophysiological aspects of stimulus significance evaluation. This suggests a strong similarity between anhedonics and poor premorbid schizophrenics, who also manifest these deficits (Silverstein, Raulin, Pristach, & Pomerantz, 1989). Nevertheless, some researchers consider per-mags to be the more dysfunctional group. Their view is based partly upon a study by Chapman et al. (1980), in which per-mags, but not anhedonics, reported more psychotic and psychotic-like

experiences than normals. This finding is sometimes taken to mean that per-mags are closer to psychosis than anhedonics. The problem with this interpretation is that it fails to take into account Edell and Chapman's (1979) finding that the Rorschach protocols of anhedonics suggest an underlying psychotic process. Per-mags may appear more dysfunctional because of their odd verbalizations (see Adamski, 1978; Chapman et al., 1980; Martin & Chapman, 1982) and other positive, more overt symptomatology, while "the social withdrawal and blunting of affect typical of anhedonics may mask much of the underlying pathology" (Adamski et al., 1982, p. 12).

Table 1
List of the Study's Hypotheses

I. Nonverbal Communication Skills

    1a. Anhedonics will be less accurate than per-mags and normals at interpreting the nonverbal cues of emotion presented on the *PONS*.

    1b. Per-mags will be less accurate than normals on the *PONS*.

    2a. On the measure of sending ability used in this study (the *Affect Communication Test*, or *ACT*), anhedonics will be rated as less emotionally expressive than per-mags and normals.

    2b. On the *ACT*, per-mags will be rated as less emotionally expressive than normals.

II. Interpersonal Functioning Related to Nonverbal Communication Abilities

    Compared to per-mags and normals, anhedonics will report having:

    3a. less overall liking for other people;

    4a. more anxiety-related cognitions in social situations;

    5a. a lower quality of current relationships;

    6a. fewer friends;

    7a. a slower speed in making friends;

    8a. less understanding in relationships (i.e., they will rate themselves as less able to understand and be understood by their friends); and

    9a. less interpersonal success overall.

    Compared to normals, per-mags will report having:

    3b. less overall liking for other people;

    4b. more anxiety-related cognitions in social situations;

    5b. a lower quality of current relationships;

    6b. fewer friends;

    7b. a slower speed in making friends;

    8b. less understanding in relationships; and

    9b. less interpersonal success overall.

Clearly, the relative functioning of anhedonics and per-mags requires further study. Data on the social deficits of these groups are needed to supplement the growing body of cognitive research. This study compared the nonverbal emotional receiving and sending abilities of the anhedonics and per-mags with a control group consisting of students scoring in the normal range on both measures. The primary dependent measure was the *PONS* (a measure of receiving ability). Also included were a measure of sending ability, as well as questionnaires assessing relevant aspects of social functioning:

liking of other people, frequency of anxiety-related conditions in social situations, and interpersonal success. The study hypotheses are summarized in Table 1.

Method

Subjects

Sixty-seven subjects were selected from Introductory Psychology classes on the basis of their scores on three scales of psychosis proneness, which were administered in the second week of class in a mass testing session. Anhedonic subjects (9 females, 10 males) scored two or more standard deviations above the mean for their sex on the Physical Anhedonia Scale (Chapman, Chapman, & Raulin, 1976; Chapman & Chapman, 1978); per-mag subjects (9 females, 16 males) scored two or more standard deviations above the mean for their sex on a combined Perceptual Aberration (Chapman, Chapman, & Raulin, 1978) and Magical Ideation (Eckblad & Chapman, 1983) Scale; control subjects (10 females, 13 males) scored no higher than .5 standard deviation above the mean on both the Anhedonia and Per-Mag Scales. All subjects who met the criteria for the anhedonic or per-mag groups were invited to participate in the study, until the target Ns, established on the basis of a priori power analyses, had been reached. Control subjects were selected randomly from the pool of normal scorers. Two subjects who scored high on both the Anhedonia and Per-Mag Scales were not included in the study.

Measures

Nonverbal receiving ability. The *Profile of Nonverbal Sensitivity Test* (*PONS*; Rosenthal et al., 1979) is a 45-minute black and white film and soundtrack consisting of 220 two-second segments. The segments are a randomized presentation of twenty short scenes portrayed by a young woman. The subjects' task is to identify in a forced-choice format what emotion is being portrayed. The *PONS* measures a variety of visual and auditory nonverbal channels, which are defined by the type of cues they contain. The pure visual channels contain cues from: (1) the face, (2) the body (from the neck to the knees), and (3) the entire figure (face and body down to the knees). In the two pure auditory channels, two different techniques are used to mask the speaker's words, but preserve tone of voice, pitch, and affect. The six additional channels combine auditory and visual cues. Other advantages of the *PONS* are that it uses motion pictures instead of still photographs, it is free of confounding contextual cues, and it includes mundane as well as dramatic emotional expressions.

Extensive validational data are available on the *PONS*. The measure is both internally consistent (alpha of .86) and stable (test-retest over 10 weeks averaging .69; Rosenthal, 1973). Over 80 validational studies have been completed. The *PONS* shows small but consistent correlations (.20 to .29) with other measures of interpersonal sensitivity. The *PONS* is only minimally correlated with IQ in normals but is moderately correlated with IQ in psychiatric patients (.26) and alcoholics (.52). There are consistent gender differences, with females outperforming males on every channel.

Sending ability (expressiveness). The *Affect Communication Test* (*ACT*; Friedman, Prince, Riggio, & DiMatteo, 1980) is a 13-item self-report measure of spontaneous emotional expressiveness, which was designed primarily for use with college students. The psychometric properties of the *ACT* are excellent. Internal consistency reliability was .77; test-retest reliability was .90 over two months. The *ACT* also appears to have excellent convergent validity (Buck, 1984) and good discriminant validity. *ACT* scores do correlate somewhat with social desirability but not with Machiavellianism or trait anxiety. There are small gender differences, with females scoring higher than males.

Measures of interpersonal functioning. Three additional measure were included to tap variables likely to be affected by deficits in nonverbal sending and receiving. The *Liking People Scale_(LPS*; Filsinger, 1981) is a 15-item self-report scale that distinguishes general liking of people from other, broader aspects of interpersonal orientation such as need for affiliation and need for inclusion in social activities. It has good internal consistency and excellent convergent validity (scores correlating positively with amount of time spent with others, number of close friends, affiliation motivation,

extroversion, social confidence, and with self-ratings of the ability to perceive the feelings and moods of others and correlating negatively with misanthropy). The discriminant validity of the *LPS* was also good; *LPS* scores did not correlate with need for autonomy, need for achievement, or social desirability.

The *Social Anxiety Thoughts Questionnaire* (hereafter referred to as the *Social Anxiety Scale* or *SAS*; Hartman, 1984) is a 21-item scale measuring the frequency of cognitions that accompany social distress. It has excellent internal consistency and good concurrent validity [with *SAS* scores correlating positively with scores on both the *Social Avoidance and Distress Scale* and the *Fear of Negative Evaluation Scale* (Watson & Friend, 1969)--two reliable and valid measures of the emotional components of social anxiety].

The *Interpersonal Success Scale_(ISS)* is a shortened version of a face-valid measure used by Rosenthal et al. (1979) as part of their research on the *PONS*. The *ISS* used in this study asks subjects to rate the effectiveness of their current relationships. Little validational data are available on this measure.

Procedure

Subjects participated in groups of 6-10 in a testing session that lasted approximately 1.5 hours. All testing and scoring was done blindly. During the first 45 minutes, subjects were administered the *PONS*. After a brief break, subjects spent an additional 10 to 15 minutes responding to the *ACT*, *LPS*, *SAS*, and *ISS*, in that order.

Results

Unless otherwise specified, 3 (group) X 2 (gender) ANOVAs were computed. Gender was included because sex differences have been reported for many of the study's dependent variables, and because there is evidence that the nature of schizophrenia differs in women and men (Lewine, 1985). Due to the unequal cell Ns, significant main effects were probed using three 2 (group) X 2 (gender) ANOVAs; the ANOVAs compared anhedonics with per-mags, per-mags with normals, and anhedonics with normals. This procedure permitted testing for the effects of group adjusting for gender, and the effects of gender adjusting for group. The procedure for probing interaction effects was the same, with t-tests being conducted as an additional last step.

Demographic variables

ANOVAs were computed for several demographic variables. There were no significant main or interaction effects for SES and year in school. The mean SES score on the Hollingshead (1975) index was 47.9 (SD = 12.1); the average subject was middle-class, with subjects ranging from lower-class to upper middle-class. The majority of the subjects were freshman and sophomores (37.3% and 40.3%, respectively). There was a significant group X sex interaction (F (2, 61) = 3.17, p = .05) for age. Female per-mags were significantly older than males (Ms = 23.0, 19.4, respectively; $t(23)$ = 2.03, p = .05). The mean age for all subjects was 20.7. There was a significant gender effect for GPA, with females reporting higher GPAs than males for the last semester (Ms = 3.1 and 2.7; F (1, 61) = 5.9, p = .05), and cumulatively (Ms = 3.0 and 2.7; F (1, 61) = 4.2, p = .02).

Reliability

Table 2 presents the reliability indices for the dependent measures used in this study. When previous reliability data were available, they are included in this table for comparison. In general, the reliabilities were good to adequate. Reliabilities were also computed for the subscale scores of the

PONS. These reliabilities were considerably lower than the full-scale *PONS* reliability (ranging from 0 to .50).

Table 2
Internal Consistency Reliability of the Dependent Measures

Variable	In Present Study	In Validation Study
Full *PONS* / 220 (nonverbal receiving)	.71	.86
ACT / 13 (nonverbal sending)	.84	.77
LPS / 15 (liking people)	.87	.85, .75
SAS / 21 (social anxiety)	.91	.95
ISS / 8 (interpersonal success)	.81	not available
ISS-1 / 4 (quality of relationships)	.83	not available

Note. The number of items used to measure a given variable is listed to the right of that variable's name. Reliabilities of *ISS* subscales consisting of only two items are not reported.

Nonverbal Skill

The hypotheses about group differences in receiving ability were not supported by the data. The main effect of group was nonsignificant on the full *PONS*, as well as six of the seven subscales. The only significant group difference occurred for the *PONS* tone-of-voice only channel ($p < .009$) and was opposite prediction; anhedonics performed significantly better than per-mags and normals. However, this subscale had low internal consistency reliability (alpha = .20), so this finding should be interpreted cautiously. On the measure of sending ability, the *ACT*, a significant main effect for group was obtained; as predicted, anhedonics were significantly less expressive than per-mags and normals. There were no group X gender effects on either the *PONS* or the *ACT*.

Other Aspects of Interpersonal Functioning

Table 3 also summarizes the group main effects for the three interpersonal variables: liking of others, social anxiety thoughts, and interpersonal success. The data were consistent with predictions of poorer social functioning in schizotypes relative to normals, but the pattern of group scores differed for each variable. Both anhedonics and per-mags scored lower than normals on the *Liking People Scale*. Social anxiety thoughts were higher for per-mags relative to anhedonics and normals. However, compared to per-mags and normals, anhedonics reported less overall interpersonal success, a lower quality of interpersonal relationships, and fewer close friends, and compared to normals, anhedonics reported a slower rate of making friends. There was only one interpersonal success subscale -- degree of mutual understanding in friendships -- on which no group differences emerged.

Table 3
Mean Scores By Group for the Dependent Variables

Variable	Anhedonics	Per-Mags	Controls	F	p
Full *PONS* 220	178.5 (5.7)	176.9 (10.9)	175.1 (9.0)	.72	.49
Tone of Voice 40	27.8 (1.4)	25.7 (3.0)	25.3 (2.9)	5.06	.009
Face 20	16.5 (1.1)	16.7 (1.3)	16.6 (1.3)	.33	.72
Body 20	16.0 (1.5)	15.9 (2.0)	15.9 (1.9)	.03	.97
Figure 20	16.4 (1.5)	16.9 (1.5)	16.6 (1.3)	1.00	.37
Face + Voice 60	51.8 (2.0)	52.2 (2.9)	51.5 (3.3)	.42	.66
Body + Voice 60	47.4 (2.6)	47.1 (4.3)	47.0 (3.2)	.06	.94
Figure + Voice 60	51.5 (3.4)	52.0 (3.6)	51.3 (2.6)	.39	.68
ACT (Sending Ability) 117	61.7 (17.3)	72.6 (19.1)	74.3 (17.3)	3.59	.03
LPS (liking people) 75 (9.3)	53.7 (8.4)	57.2 (7.7)	62.5	5.85	.005
SAS (social anxiety) 105	46.6 (12.6)	56.4 (12.5)	47.8 (9.8)	4.99	.01
ISS (interpersonal success) 66	42.8 (11.31)	48.1 (6.72)	51.8 (7.39)	6.95	.01
ISS-1 (quality of relationships) 36	24.8 (7.3)	28.1 (3.9)	29.9 (4.9)	5.57	.006
ISS-2 (number of close friends) 3	1.9 (.46)	2.2 (.40)	2.2 (.39)	4.24	.02
ISS-3 (speed of making friends) 9	5.4 (2.2)	6.0 (2.0)	7.0 (1.4)	3.76	.03
ISS-4 (understanding in friendships) 18	10.8 (4.1)	11.8 (3.1)	12.8 (3.2)	2.00	.14

Note. Maximum scores are listed below variable names. Standard deviations are given in parentheses. *F* and *p* values correspond to main effects for group from 3 (group) X 2 (gender) ANOVAs.

Gender differences

Table 4 summarizes gender differences on all the dependent variables. While there were no significant gender X group interactions, a number of gender main effects were significant. Compared to males, females showed generally greater social facility, which is consistent with previous research.

Table 4
Mean Scores by Gender on the Dependent Variables

Variable	Females	Males	F	p
PONS (nonverbal receiving)	179.5 (7.0)	174.7 (9.8)	4.7	.03
ACT (sending ability)	76.1 (16.4)	65.8 (18.9)	6.6	.01
LPS (liking people)	57.7 (9.6)	58.3 (8.8)	.05	.83
SAS (social anxiety)	49.6 (14.3)	51.4 (10.9)	1.0	.76
ISS interpersonal success)	50.7 (8.7)	45.9 (8.9)	6.6	.01

Note. Maximum scores (in order of table listings) = 220, 117, 75, 105, and 66. Standard deviations are given in parentheses. *F* and *p* values correspond to main effects for gender from 3 (group) X 2 (gender) ANOVAs.

Discussion

Nonverbal receiving

The hypothesis that anhedonics would be impaired in interpreting nonverbal cues of emotion was not supported by the data. Although anhedonics experience less pleasure, and perhaps other emotions, they are able to judge accurately the emotions of others. The superior performance of the anhedonics on the PONS auditory channel is striking. To our knowledge, this represents the only evidence to date of anhedonics outperforming normals. This finding must be interpreted cautiously, since the reliability of this measure was so low. Rosenthal et al. (1979) had previously found that psychiatric patients are better at processing auditory compared to visual emotional cues. Research suggests that auditory stimuli, which are processed serially, are easier for schizophrenics to manage than visual stimuli, which are processed in a parallel fashion, thus demanding greater attentional capacity (see, for example, McGhie, 1973).

The data on per-mags also provided unexpected evidence of intact ability to interpret emotional cues. Some disruption in this ability was anticipated as a secondary reaction to per-mags' positive symptoms. Apparently, the odd ideations and perceptions of per-mags are not severe enough to interfere with their emotional receiving ability. However, these positive symptoms may disrupt receiving ability if and when the per-mags decompensated further.

Most likely, the absence of receiving deficits in schizotypes is not due to methodological shortcomings. Inadequate power is not a plausible explanation since the PONS scores were higher for the schizotypes than the normals. Further, sample size was determined by an *a priori* power analysis.

Since the PONS had adequate reliability, it should have been able to detect individual differences that existed. In sum, this null finding merits serious consideration.

Receiving versus Sending

As predicted, anhedonics were less expressive on the ACT than per-mags and normals. Diminished expressiveness appears to be associated with the other emotional deficiencies found in anhedonics, but not with the positive symptomatology of per-mags. Our results conflict with those of Berenbaum et al. (1987), who found anhedonics to be as expressive as normals. Perhaps anhedonics are inexpressive in social settings (the context measured by the ACT), but expressive in private settings (the context measured by Berenbaum et al.).

How can we explain anhedonics' diminished sending ability in the context of their intact receiving skills? One possibility is that receiving and sending deficits are independent symptoms. Another explanation may involve the distinction between performance and ability. The ACT measures one's characteristic level of expressiveness rather than ability level. In contrast, Gottheil et al.'s (1970) measure assesses ability; the investigator instructs subjects to express particular emotions nonverbally, and then observes how accurately judges can identify the emotions being conveyed. Presented with Gottheil et al.'s task, subjects are apt to express emotions as well as they can, even if they are typically unexpressive. The ACT data suggests that anhedonics tend to be unexpressive. However, since a measure such as Gottheil et al.'s was not administered, we do not know how expressive anhedonics can be when they do their best.

The PONS, unlike the ACT, is a measure of ability. When presented with the PONS, anhedonics probably did their best, as most college students would when presented with a test in a classroom setting. But PONS performance is not necessarily an indication of what anhedonics typically do. It is possible that in their daily lives, anhedonics are not motivated to attend well to nonverbal cues, and thus, will often interpret those cues inaccurately.

Social Anxiety, Liking of Others, and Interpersonal Success

Looking beyond nonverbal communication to related aspects of social functioning, a combination of predicted and unexpected findings emerged. Anhedonics report less social success, but curiously do not seem to be distressed by this (i.e., they are no more socially anxious than controls). This unpredicted finding may be in keeping with anhedonics' general flattening of affect reported in previous studies (Chapman et al., 1980; Simons, MacMillan, & Ireland, 1982). In striking contrast, per-mags report a normal degree of social success, but significantly more social anxiety than both anhedonics and normals. The excess social anxiety of per-mags may simply be a part of their psychopathology or might be an appropriate response to social impairment. Although in this study per-mags report a normal degree of social success, other investigators (Adamski, et al., 1982; Chapman, et al., 1980; Numbers & Chapman, 1982) have found evidence of social dysfunction in per-mags.

Both per-mags and anhedonics reported liking others less. One might surmise that per-mags and anhedonics are both apathetic about interpersonal relationships; Chapman et al. (1980) found that both anhedonics and per-mags were more withdrawn than normals. If we view our findings in the context of the social anxiety results, another interpretation emerges: For anhedonics, diminished liking of others and social withdrawal may indeed reflect a negative symptom cluster; however, for per-mags, liking others less may be a secondary reaction to their social anxiety. Mishlove and Chapman (1985, p. 385) have distinguished between schizoid and avoidant withdrawal. They define schizoid withdrawal as social withdrawal that results from a characterological indifference to people. Schizoid withdrawal is a negative symptom because it implies a lack of social motivation. Since anhedonics lack anxiety about their social dysfunction, their withdrawal clearly is schizoid. By contrast, avoidant withdrawal results from social anxiety or hypersensitivity. Since per-mags are socially anxious, their withdrawal may be from social anxiety or hypersensitivity.

largely avoidant. Per-mags' withdrawal could either be a defense against being rejected for their odd thought and speech or a way to avoid being cognitively overwhelmed by complex social stimuli.

Prognosis

Do the data suggest that anhedonics are at risk for negative schizophrenia and per-mags for positive schizophrenia? Recall that Andreasen (1982b), Crow (1980), and Pogue-Geile and Harrow (1984) found a link between poor premorbid functioning and the later development of predominantly negative symptoms in schizophrenics. They also found an association between good premorbid functioning and positive symptoms. Can we consider anhedonics' social functioning poor and per-mags' good? Anhedonics social performance appears to be more dysfunctional than that of per-mags. Although the data did suggest some areas in which per-mags have social difficulty, per-mags differ markedly from anhedonics in that their expressiveness and their ability to establish quality relationships appear to be intact. Although the current data are suggestive, the degree to which anhedonics and per-mags are at risk, respectively, for positive and negative schizophrenia will remain uncertain until longitudinal studies of these groups are completed.

Cautions and Recommendations

Some cautions about the results are in order. First, the present study is limited by the use of only one measure per dependent variable. Thus, while it provides a valuable overview of a number of aspects of the social functioning of schizotypes, individual constructs were not explored in depth. For example, for nonverbal receiving, ability was assessed without also measuring characteristic performance. The use of only one measure per construct is also limiting from a psychometric standpoint (i.e., it was not possible to compensate for the weaknesses of one instrument with another). For example, the *ISS*, which has not been validated, relied mainly on self-report scales which are subject to social desirability response set; future research should include measures without this bias (e.g., peer ratings).

A second limitation of the study is that none of the dependent measures have been administered to schizophrenics. Rosenthal et al. (1979) gave the *PONS* to a mixed group of psychiatric patients, but there are no data available on the performance of schizophrenics *per se*. The other instruments have been used with normal populations only. To facilitate comparisons between schizotypes and schizophrenics, the same measures need to be administered to both groups, preferably in the same study.

Conclusion

Whether or not longitudinal research shows that anhedonics and per-mags are truly psychosis prone, their psychopathology resembles, in a less extreme form, that of psychotic individuals. Studying these groups can help clarify the process of psychotic decompensation. This study initiates research on the nonverbal skills of anhedonics and per-mags, and thus expands the database on the relationship between social functioning and prepsychotic symptomatology.

The interpersonal difficulties of psychosis-prone individuals need to be understood and ameliorated, since these difficulties interfere with the development and maintenance of social support systems. Social support has consistently proven to be a valuable stress buffer (Kanner, Coyne, Schaefer, & Lazarus, 1981). Further, as our data on per-mags show, prepsychotic symptomatology can be associated with significant stress. Continued research along these lines can guide us in the design of secondary prevention strategies. For example, enhancing nonverbal expression of emotion in anhedonics may be an important treatment goal. Per-mags, on the other hand, may benefit by learning to reduce their social anxiety, and to cope with odd and distracting ideations without relying exclusively upon social withdrawal.

Comparing and contrasting the social functioning of anhedonics and per-mags also proves to be an excellent vehicle for exploring the positive/negative symptom distinction, a key issue in current schizophrenia research. The finding of an inverse relationship between negative and positive symptoms in schizotypes parallels Andreasen's (1985) results with schizophrenics. This suggests continuity between schizotypy and schizophrenia and is an encouraging sign about the validity of the Physical Anhedonia and Perceptual Aberration-Magical Ideation Scales.

Morrison and Bellack (1987) observe that researchers have tended to treat schizophrenics as if they were a homogeneous group, focusing primarily on identifying differences between schizophrenics and normals. They recommend a more sophisticated approach that considers the heterogeneity of schizophrenia and accounts for all the schizophrenia spectrum disorders rather than schizophrenia alone. They note that "social skills deficits may be present in only certain subtypes of the disorder, may develop at different points in the course of different subtypes, or may differ across subtypes" (p. 721). The present study of anhedonics and per-mags meets Morrison and Bellack's recommendations. By investigating these distinct schizotypic subtypes, we can pinpoint the social deficits that precede decompensation and explore the relationship between social functioning and negative and positive symptoms.

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