Nonverbal Behavior During Standardized Interviews in Patients With Schizophrenia Spectrum Disorders

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Abstract: Several studies have consistently shown that patients with schizophrenia or schizophrenia spectrum disorders (SSD) can be distinguished from normal controls on the basis of their nonverbal behavior during standardized interviews, with considerable interactions between negative symptoms and poor facial expressivity. However, most studies have examined unmedicated patients, and gender of both interviewer and interviewee has not been taken into account. In this study we assessed the nonverbal behavior of male and female patients with SSD who were receiving second-generation antipsychotic medication (SGA) using the Ethological Coding System for Interviews (Troisi, 1998). In addition, we used a novel 5-factor model of the Positive and Negative Symptom Scale (PANSS, van der Gaag et al., 2006) to correlate nonverbal behavior with standard psychopathology ratings. Our findings strongly resembled results of previous studies into nonverbal behavior of patients with SSD, despite differences in cultural backgrounds and gender of the interviewer. Negative symptoms were inversely correlated with several of the nonverbal behavioral dimensions. Medication dose did not correlate with any one of the behavioral or psychopathological measures. Patients with SSD make less use of their nonverbal behavioral repertoire compared with controls, independent of antipsychotic treatment. Culture-specific nonverbal expressivity seems to play an additional (minor) role in distinguishing patients from healthy controls.

Key Words: Nonverbal behavior, schizophrenia spectrum disorders, antipsychotic medication, psychopathology.

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Schizophrenia spectrum disorders (SSD) disorders are traditionally conceptualized as a combination of clinical symptoms comprising positive symptoms such as delusions and hallucinations, negative symptoms such as avolition, apathy and lack of motivation, cognitive symptoms including inattentiveness, impaired cognitive flexibility and poor set shifting abilities, and affective symptoms such as euphoria, depression or flat affect (American Psychiatric Association, 2000). Apart from prominent negative and affective symptoms, the "core" features of SSD are largely invisible to the observer. However, empathetic interlocutors are often intuitively able to determine that there is "something wrong" with affected individuals, even in the absence of verbal reports of subjective distress. Such cues—although sometimes difficult to describe beyond vague intuition—almost always pertain to the nonverbal behavior of patients with SSD.

Ethological studies in humans using standardized ethograms to qualify and quantify nonverbal behaviors unanimously support the view that facial expressions, gestures, and whole body movements serve as evolved tools to convey communicative signals such as appeasement (submission), behaviors that invite social interaction (affiliation), motivational ambivalence (fight or flight), or assertion, often in very subtle ways (Eibl-Eibesfeldt, 1995; Manstead et al., 1999; Schmidt and Cohn, 2001). In psychiatric disorders, nonverbal abnormalities as measured using ethological tools have been shown to interfere with social functioning (Troisi, 1999; Troisi et al., 2006) and to have greater predictive value in terms of response to treatment than standard rating scales for psychopathology (Geerts et al., 1996; McGuire and Polsky, 1979; Schelde et al., 1988; Schelde, 1994, 1998; Troisi et al., 1989).

In contrast to the wealth of studies into cognitive functioning in SSD, however, comparatively little systematic attention has been paid to patients' facial expressions of emotions, body posture and gestures during social interactions, with some notable exceptions. Several studies using different technically sophisticated ethological coding methods, including infrared camera detectors of eye gaze (Gaebel, 1989) and the Facial Action Coding System (EM-FACS; Friesen and Ekman, 1984), could demonstrate reduced facial expressivity in schizophrenic patients, particularly a paucity of upper face movements expressing positive emotions (Gaebel and Wölwer, 2004; Juckel and Polzer, 1998; Krause et al., 1989). Other studies have focused on the tendency in

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schizophrenic patients to avoid physical proximity to others in "natural" settings on the ward, abnormally persistent gaze (staring) during interviews, or other deficits in engaging in social interaction (McGuire and Polsky, 1983; Pitman et al., 1987). A simpler method to analyze videotaped nonverbal behavior was introduced by Troisi et al. (1998) who developed a 37-item Ethological Coding System for Interviews (ECSI, Troisi et al., 1998), based on the work of Grant (1968), McGuire and Polsky (1979), as well as Schelde et al (1988). Troisi and coworkers observed that unmedicated young male schizophrenic patients could be distinguished from normal controls on the basis of their behavioral repertoire during interviews, including the use of "prosocial" behaviors such as yes-nodding and smiling, the use of gestures, and the amount of so-called "displacement activities" as nonverbal signals of motivational conflict (Troisi et al., 1998). Facial and bodily expressivity of patients with schizophrenia may, however, be influenced by a number of factors: It may correlate inversely with neuroleptic dosage (Schneider et al., 1992), be reduced by the presence of negative symptoms (Trémeau et al., 2005), or altered by a combination of both, because it has repeatedly been pointed out that classic antipsychotic medications may worsen existing negative symptoms (Heinz et al., 1998).

In this study we sought to expand on the existing material for several reasons: First, after the introduction of second-generation antipsychotic drugs ("atypicals") with little influence on psychomotor behavior and putative beneficial effects on negative symptoms, it is unknown whether patients with SSD treated with second-generation antipsychotics (SGA) can be distinguished from normals on the basis of their nonverbal behavior during interviews, similar to unmedicated patients. Second, if there is an impact of negative symptoms on nonverbal behavior (Troisi et al., 2006), this may perhaps be independent of medication effects. Third, since Troisi and coworkers studied young Italian male patients examined by a male psychiatrist, we were interested in the question of whether cultural factors or gender would have a measurable impact on nonverbal behavior in a sample of German male and female patients with SSD during interviews performed by female interviewers.

METHODS

Participants

Forty-four inpatients (20 males, 24 females) treated for acute episodes were enrolled in the study after giving written informed consent. Thirty-five patients were diagnosed with schizophrenia and 9 with schizoaffective disorder according to DSM-IV-TR criteria (American Psychiatric Association, 2000). Patients with a history of substance abuse, brain injury, or mental retardation were excluded. All patients received SGA treatment (amisulpride, aripiprazole, clozapine, olanzapine, risperidone, quetiapine). The mean chlorpromazine equivalent dosage (CPZ) as determined according to Wood's suggestions (2003) was 661.5 (*SD* ± 617 mg) per day. For comparisons, 29 healthy controls (10 males, 19 females) were included, paralleled for age and sex distribution. The study was approved by the Ethics Committee of the University of Bochum. The patients had a mean age of 38.05 (*SD* ± 12.53). The patients' mean age at onset was 28.58 years (*SD* ± 12.79), and their average illness duration was 9.84 years (*SD* ± 8.75). The mean age of the control group was 37.0 (*SD* ± 13.74). No differences between the groups were found with respect to sex distribution ($\chi^2 = 0.869$, $df = 1$, Fisher exact test, $p = 0.246$, n.s.) or age ($t = 0.336$, $df = 71$, $p = 0.738$, n.s.). Group comparisons for demographic variables and PANSS scores for patients are shown in Table 1.

TABLE 1. Demographic Characteristics for Patients With SSD and Healthy Controls

	Schizophrenia Spectrum	Healthy Controls	Statistics
N	44	29	
Sex ratio (m:f)	20:24	10:19	$p = 0.246$, n.s.
Index age (yr)	38.1 ± 12.5	37.0 ± 13.7	$p = 0.738$, n.s.
Age at onset (yr)	28.6 ± 12.8	—	
Duration of illness (yr)	9.8 ± 8.7	—	
PANSS positive	15.0 ± 5.8		
PANSS negative	17.7 ± 8.9		
PANSS disorganization	21.8 ± 6.5		
PANSS excitement	6.5 ± 2.7		
PANSS emotional distress	10.9 ± 3.3		
PANSS sum score	72.1 ± 16.6		

Assessment of Nonverbal Behavior

The nonverbal behavior of patients and controls was evaluated using the Ethological Coding System for Interviews (ECSI; Troisi, 1999). The ECSI comprises 37 different patterns of behavior, particularly facial expressions and head movements as well as body posture, gestures, and whole-body movements. This coding system was specifically designed for measuring nonverbal behavior during interviews on the basis of published human ethograms (Brannigan and Humphries, 1974; Grant, 1968; Eibl-Eibesfeldt, 1995). Items were grouped according to their meaning comprising "eye contact" (first item), "affiliation" (items 2–6),"submission" (items 7–9), "prosocial behavior" (items 2–9), "flight" (items 10–15),"assertion" (items 16–22), "gesture" (item 23), "displacement activities" (items 24–32) and "relaxation" (items 33–37). "Eye contact" represents an important aspect in social interactions. The amount of eye contact usually expresses attention and involvement."Affiliation" embraces patterns of behavior that invite and positively reassure social interaction. Submissive behaviors are appeasement signals and are used to prevent aggressive responses in the interlocutor. "Flight" embraces behavioral patterns that are used to cut off social stimuli that are perceived adverse. "Assertion" describes a set of behaviors indicating low levels of aggression and disagreement. "Gestures" are used to illustrate or emphasize the meaning of spoken language. "Displacement activities" comprise behaviors that are usually oriented towards the own body such as grooming or fumbling movements; displacement activities may also be expressed as suppressed locomotion, or the manipulation of objects. These patterns of behavior are strongly suggestive of motivational conflict. "Relaxation" comprises behaviors indicating low levels of emotional arousal. All items of the ECSI are shown in Table 2.

The interviews carried out by 3 female psychologists were videotaped with a camera such that the subject's face, trunk, and legs were in full view. To ascertain optimal evaluation, 2 trained observers simultaneously examined the videotapes for the presence or absence of each of the 37 behavioral items in successive 15-second intervals. We used a one-zero sampling method for recording the results, which has been shown to be highly correlated with both frequency and duration measures of the same behavior in previous studies (Troisi, 1999). During examination of the videotapes the volume of the player was turned mute. In cases of disagreement between the 2 raters, the respective time interval was reexamined until a consensus decision could be made. The overall duration of the videotaped part of the interview was 10 minutes (thus, 40 sampling intervals altogether) during which the interviewer collected as much information as possible for rating the subjects' psychopathology using the Positive and Negative Symptom Scale (PANSS, Kay et al., 1989). The scores of individual behaviors for each subject were expressed as the proportion of intervals during which the behavioral pattern occurred relative to all sample intervals.

Clinical Assessment

Patients and controls were videotaped during a clinical interview using the PANSS (Kay et al., 1989). We chose this setting for both groups to improve comparability of group results, although arguably this procedure might have created greater emotional involvement in patients compared with healthy controls. As expected, PANSS ratings were inconspicuous in controls. To get a more detailed impression of how psychopathology may be linked to nonverbal behavior, we chose to use a new 5-factor model of the PANSS (van der Gaag et al., 2006), instead of the classic 3-factor model, because the former has been shown to have superior statistical validity. The first 10 minutes of the interviews were videotaped for later assessment of nonverbal behavior (as outlined above).

Statistical Analysis

Wherever skewness and kurtosis of the variables were within acceptable ranges, we used Student *t* tests for group comparisons. For nonnormally distributed variables we used nonparametric Mann-Whitney *U* tests. To examine associations of psychopathology and medication with nonverbal behaviors in the patient group we calculated Spearman-Rho nonparametric correlation coefficients. Analyses were performed on a personal computer using SPSS for Windows, version 12.0.

RESULTS

Between-Group Differences of Nonverbal Behavior

Because we were interested in the question of whether patients with SSD treated with SGA would differ from controls in nonverbal behavior we performed group compar-

TABLE 2. Definitions of Behavior Patterns Included in the ECSI and Instructions for Calculating the Composite Scores of Behavioral Categories

Behavior patterns

1. Look at. Looking at the interviewer.
2. Head to side. The head is tilted to one side.
3. Bob. A sharp upwards movement of the head, rather like an inverted nod.
4. Flash. A quick raising and lowering of the eyebrows.
5. Raise. The eyebrows are raised and kept up for some time.
6. Smile. The lip corners are drawn back and up.
7. Nod. The normal affirmative gesture.
8. Lips in. The lips are drawn slightly in and pressed together.
9. Mouth corners back. The corners of the mouth are drawn back but not raised as in smile.
10. Look away. Looking away from the interviewer.
11. Look down. Looking down at feet, lap or floor.
12. Shut. The eyes are closed.
13. Chin. The chin is drawn in towards the chest.
14. Crouch. The body is bent right forward till the head is near the knees.
15. Still. A sudden cessation of movement, a freezing.
16. Shake. The normal negative gesture.
17. Thrust. A sharp forward movement of the head towards the interviewer.
18. Lean forward. Leaning forward from the hips towards the interviewer.
19. Frown. The eyebrows are drawn together and lowered at the centre.
20. Shrug. The shoulders are raised and dropped again.
21. Small mouth. The lip corners are brought towards each other so that the mouth looks small.
22. Wrinkle. A wrinkling of the skin on the bridge of the nose.
23. Gesture. Variable hand and arm movements used during speech.
24. Groom. The fingers are passed through the hair in a combing movement.
25. Hand-face. Hand(s) in contact with the face.
26. Hand-mouth. Hand(s) in contact with the mouth.
27. Scratch. The fingernails are used to scratch part of the body, frequently the head.
28. Yawn. The mouth opens widely, roundly and fairly slowly, closing more swiftly. Mouth movement is accompanied by a deep breath and often closing of the eyes, a lowering of the brows.
29. Fumble. Twisting and fiddling finger movements, with wedding ring, handkerchief, other hand, etc.
30. Twist mouth. The lips are closed, pushed forward and twisted to one side.
31. Lick lips. The tongue is passed over the lips.
32. Bite lips. One lip, usually the lower, is drawn into the mouth and held between the teeth.
33. Relax. An obvious loosening of muscle tension so that the whole body relaxes in the chair.
34. Settle. Adjusting movement into a more comfortable posture in the chair.
35. Fold arms. The arms are folded across the chest.
36. Laugh. The mouth corners are drawn up and out, remaining pointed, the lips parting to reveal some of the upper and lower teeth.
37. Neutral face. A face without expression and without particular muscular tension. It is the basic awake face.

Scoring instructions:
Add the items 2-6 to get AFFILIATION; add the items 7-9 to get SUBMISSION; add the items 10-15 to get FLIGHT; add the items 16-22 to get ASSERTION; add the items 24-32 to get DISPLACEMENT; add the items 33-37 to get RELAXATION.

TABLE 3. Parametric and Nonparametric Between-Group Comparisons of Nonverbal Behaviors Given as Mean Percentages (and Standard Deviations) of the Entire 10-Min Videotaped Interview

Item	Schizophrenia Spectrum	Healthy Controls	Statistics
Eye contact	98.9 ± 3.5	96.6 ± 10.7	$U = 592.0$, $p = 0.462$, n.s.
Affiliation	15.3 ± 10.0	24.9 ± 7.3	$t = -4.476$, $p < 0.001$
Submission	33.6 ± 16.6	36.6 ± 10.1	Mann-Whitney $U = 541.0$, $p = 0.274$, n.s.
Prosocial behavior	21.7 ± 8.5	29.3 ± 5.8	$t = -4.567$, $p < 0.001$
Flight	23.3 ± 6.6	28.1 ± 4.8	$t = -3.657$, $p < 0.001$
Assertion	14.5 ± 6.7	15.9 ± 5.7	$t = -0.959$, $p = 0.341$, n.s.
Gesture	42.2 ± 32.8	50.6 ± 25.4	$t = -1.228$, $p = 0.224$, n.s.
Displacement	10.3 ± 6.8	12.1 ± 3.8	$t = -1.493$, $p = 0.140$, n.s.
Relaxation	22.3 ± 6.6	25.1 ± 5.1	Mann-Whitney $U = 387.5$, $p = 0.005$

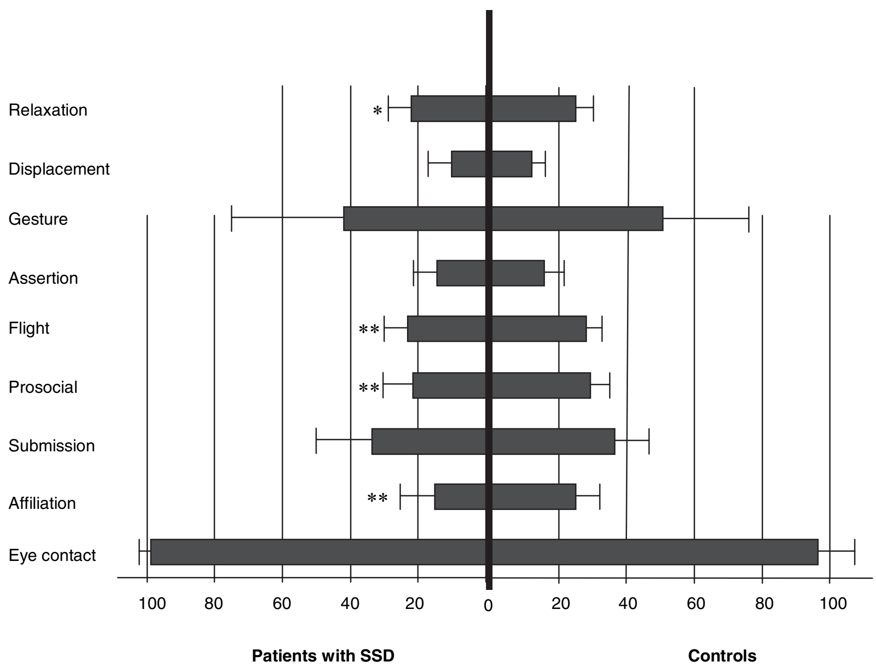

FIGURE 1. Differences in nonverbal behavior between patients with SSD (left) and controls (right). Significance level is indicated by asterisks (*: $p < 0.01$; **: $p < 0.001$).

isons using parametric and nonparametric tests. Strikingly similar to previous studies, patients with SSD showed significantly less affiliative behavior ($t = -4.476$, $df = 71$, $p < 0.001$), prosocial behavior ($t = -4.567$, $df = 71$, $p < 0.001$), and fewer flight elements ($t = -3.657$, $df = 71$, $p < 0.001$) compared with controls. Patients also displayed fewer signals relating to relaxation (Mann-Whitney $U = 387.5$, $Z = -2.832$, $p = 0.005$). No differences between the groups emerged regarding eye contact (Mann-Whitney $U = 592.0$, $Z = -0.735$, $p = 0.462$, n.s.), submission (Mann-Whitney $U = 541.0$, $Z = -1.094$, $p = 0.274$, n.s.), assertion ($t = -0.959$, $df = 71$, $p = 0.341$, n.s.), gesture ($t = -1.228$, $df = 71$, $p = 0.224$, n.s.), and displacement activities ($t = -1.493$, $df = 71$, $p = 0.140$). Means and standard deviations for all nonverbal behaviors are shown in Table 3. Differences of the means are also graphically depicted in Figure 1.

Associations Within the Patient Group

To determine associations of standard psychopathological measures and medication with nonverbal behavior, we calculated Spearman-Rho nonparametric correlations. The PANSS positive score correlated significantly with submission only (Spearman-Rho = −0.447, $p = 0.002$), as did the PANSS disorganization score (Spearman-Rho = −0.306, $p = 0.043$). The PANSS negative score correlated inversely with affiliation (Spearman-Rho = −0.355, $p = 0.018$), flight (Spearman-Rho = −0.373, $p = 0.013$), assertion (Spearman-Rho = −0.459, $p = 0.002$), and gesture (Spearman-Rho = −0.641, $p < 0.001$). PANSS excitement correlated with behavioral elements suggestive of flight (Spearman-Rho = 0.380, $p = 0.011$), and gesture (Spearman-Rho = 0.381, $p = 0.011$). No correlations were found between the PANSS emotional distress subscore and any one of the behavioral scores, nor did the amount of CPZ equivalents correlate with behavioral measures. Of note, there were several intercorrelations between nonverbal behavioral clusters, suggesting that some patients displayed more communicative signals in general and other patients less. The correlation coefficients are shown in Table 4. In addition to correlational analyses we performed median split calculations, by which patients were allocated to either a high- or low-score group for each factor. Patients with high versus low scores on the positive factor differed significantly with regard to submission (t = 2.577, df = 42, p = 0.014). Patients with prominent negative symptoms displayed almost significantly less flight behavior (t = 1.998, df = 32.419, p = 0.054), and highly significantly less assertion (t = 3.127, df = 42, p = 0.003) and gestures (t = 4.276, df = 40.556, $p < 0.001$) compared with patients with few negative symptoms. Patients with high versus low loads on the disorganization factor differed with respect to the amount of displacement activities (t = 2.203, df = 42, p = 0.033), whereas patients with high versus low excitement scores differed in flight (t = −2.916, df = 42, p = 0.006) and gesture (t = −2.301, df = 42, p = 0.026). Patients with high or low scores on the emotional distress factor did not differ in nonverbal behavior.

Gender Differences Within the Patient Group

Because previous studies using the ECSI were biased by the gender of patients and interviewers, we wanted to examine the role of gender on the behavioral dimensions. Male and female patients with SSD differed with respect to age at onset of the disorder, which almost reached a 5% significance level (t = 1.965, df = 41, p = 0.058). No differences were found regarding index age, duration of illness, PANSS scores, medication, or any one of the nonverbal behavior patterns; nor did gender differences in nonverbal behavior emerge in the control group (results not shown).

DISCUSSION

In the present study, we sought to examine the nonverbal behavior in a comparatively large sample of patients with SSD treated with SGA. We hypothesized that these patients could be distinguished from healthy controls on the basis of ethologically defined patterns of behavior similar to antipsychotic-naive patients. As predicted and strikingly similar to previous studies, patients with SSD differed from healthy controls, paralleled for age and gender distribution, particularly by their lack of behaviors during interviews encouraging ongoing social interaction. In contrast to a study in young Italian men with schizophrenia (Troisi et al., 1998), our patient sample also differed from controls with respect to the amount of flight elements and behaviors indicating relaxation, whereas the Italian patients showed fewer gestures and displacement activities compared with healthy controls (Troisi et al., 1998). With regards to displacement activities, which indicate motivational conflict and autonomic arousal (Troisi, 2002), it has to be emphasized that the control subjects of Troisi et al.'s (1998) study were male medical students during their final oral examination, a situation much

TABLE 4. Correlations of Patients' ECSI Scores With PANSS 5-Factor Model and Medication

	EC	AFF	SUB	PRO	FLI	ASS	GEST	DISPL	REL	PANSSp	PANSSn	PANSSd	PANSSe	PANSSed	PANSSs	CPZ
EC		−0.148	0.101	−0.047	−0.112	−0.170	−0.114	−0.048	−0.104	0.019	−0.062	−0.057	−0.159	−0.163	−0.046	.134
AFF			−0.095	0.626**	0.572**	0.244	0.570**	0.180	0.151	0.084	−0.355*	−0.050	0.296	−0.158	−0.152	−0.005
SUB				0.635**	−0.052	0.033	−0.047	0.120	−0.011	−0.447**	−0.020	−0.306*	0.022	.032	−0.325*	0.202
PRO					0.322*	0.205	0.305*	0.305*	0.214	−0.285	−0.241	−0.263	0.160	−0.143	−0.340*	0.107
FLI						0.256	0.472**	0.172	−0.012	0.011	−0.373*	−0.167	0.380*	0.106	−0.261	0.028
ASS							0.439**	0.387**	0.116	0.002	−0.459**	−0.164	0.284	0.025	−0.318*	0.050
GEST								0.346*	0.122	0.108	−0.641**	−0.166	0.381*	−0.102	−0.377*	0.126
DISPL									0.405**	0.115	−0.284	−0.191	0.244	−0.251	−0.225	−0.091
REL										−0.009	−0.105	−0.027	0.149	−0.216	−0.043	0.030
PANSSp											0.085	0.361*	0.106	0.070	0.569**	0.035
PANSSn												0.228	−0.401*	0.312*	0.645**	−0.216
PANSSd													0.211	0.130	0.767**	−0.104
PANSSe														−0.013	0.036	0.031
PANSSed															0.366*	0.029
PANSSs																−0.149
CPZ																

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
AFF indicates affiliation; ASS, assertion; DISPL, displacement; EC, eye contact; FLI, flight; GEST, gesture; PRO, prosocial behavior; REL, relaxation; SUB, submission; PANSSp, PANSS positive factor; PANSSn, PANSS negative factor; PANSSd, PANSS disorganization factor; PANSSe, PANSS excitement factor; PANSSed, PANSS emotional distress factor; PANSSs, PANSS sum score; CPZ, Chlorpromazine equivalents.

more likely to arouse stress responses compared with a diagnostic interview as in our setting.

Although gender differences in nonverbal behavior may also play a role, we interpret some of the differences between the 2 studies as culturally mediated, rather than being gender-bound, because in our sample no gender differences of nonverbal behavior emerged in either group. In a study of nonverbal behavior of depressed and nondepressed individuals, however, Troisi and Moles (1999) found higher scores in submission, affiliation and assertion in female subjects, regardless of whether they were depressed or not, which suggests subtle cultural differences in nonverbal behavior. On the other hand, the finding that prosocial behavior encouraging social interaction has consistently been shown (Troisi et al., 1998, 2006) to distinguish best between patients with schizophrenia and controls of both sexes, across cultures, and perhaps relatively independent of the interviewer's gender, may support the assumption of early cross-cultural psychiatrists that patients with schizophrenia or SSD are cross-culturally much more similar in behavior than the healthy individuals of the respective cultures (Pfeiffer, 1994).

In contrast to previous results (Troisi et al., 1998), our study revealed multiple associations of conventional psychopathological measures, particularly negative symptoms, with the patients' nonverbal behavior, a finding more similar to what Troisi et al. (2006) found in a recent study of stabilized medicated patients with schizophrenia (see also, Trémeau et al., 2005). In extension of previous findings, however, our study revealed, using the novel 5-factor model of the PANSS (van der Gaag et al., 2006) and median split procedures, inverse associations of positive symptoms with submissive behavior, inverse associations of negative symptoms with several expressive behaviors suggesting an overall reduction in expressive behaviors in patients with prominent negative symptomatology (Troisi et al., 1991), as well as positive associations of disorganization with the amount of displacement activities (i.e. motivational conflict), and "excitement" with flight elements and gesture. Not only are these findings intuitively plausible, they also point to the important—though much neglected—fact that nonverbal behavior substantially contributes to and guides clinicians' ratings of psychopathology.

Unlike earlier studies focusing on eye contact between patients and interviewers in patients with paranoid schizophrenia (Pitman et al., 1987), patients and controls did not differ with respect to the amount of eye contact. Pitman et al. (1987) found that paranoid patients differed from nonparanoid patients with schizophrenia in the duration of eye contact, which is perceived as "staring" or threat display (Ellsworth et al., 1972). We assume that the time interval of 15 seconds per rating as used in this study was not suitable for a more subtle evaluation of the *duration* of eye contact, whereas presence of eye contact could reliably be detected on a one-zero sampling basis. However, in line with Pitman et al. (1987) the inverse correlation of the PANSS positive score with submissive behavior in the patient group could indirectly support the assumption that paranoid patients are more likely to engage in nonverbal expressions of threat, although no association emerged between the PANSS positive score and assertion.

Importantly, our results did not reveal any confounding effects of the antipsychotic treatment, as no correlations emerged between the amount of CPZ equivalents and any one of the nonverbal behavior composite scores. This could be due to the fact that all of our patients received SGA supposed to improve negative symptoms and psychomotor speed (Kelley et al., 1999), whereas classic antipsychotics may have deleterious effects on nonverbal expressivity (Schneider et al., 1992).

Several shortcomings of the present study have to be mentioned. First, we did not compare the German sample with the Italian sample in terms of nonverbal behavior directly, partly because measures of psychopathology differed between the studies. Second, it is debatable whether or not calculating CPZ equivalent dosages is meaningful for SGA (Rijcken et al., 2003; Woods, 2003), such that a replication of our findings is warranted in an independent sample where the effects of different SGA on nonverbal behavior can be compared directly. Third, we exclusively examined in-patients, which leaves open the possibility that clinically stable outpatients may differ less from healthy controls in their nonverbal behavior. Fourth, it is unclear as to what extent our findings are specific to schizophrenia, because patients with depression have been found to be similarly impaired in their expressivity (Trémeau et al., 2005). Thus, future studies ought to examine gender differences using a crossover design (i.e., male patient/female interviewer and vice versa), and to compare different classes of SGA instead of estimating medication effects by determining CPZ equivalent doses. It could also be useful to subtype patients according to their psychopathological symptomatology including those in clinical remission, and to assess a comparison group of patients with diagnostic categories other than SSD such as depression or mania.

CONCLUSIONS

The results of our study support previous reports that patients with SSD differ in nonverbal behavior during interviews from healthy controls in that they display less behaviors inviting ongoing social interaction. These behavioral differences are apparently only marginally influenced by gender of both interviewee and interviewer, cultural background and, most importantly, treatment with modern antipsychotics (SGA). Patients with profound negative symptoms are probably generally less expressive in behavior than patients with fewer negative symptoms.

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