THE SITUATIONAL FEATURE RECOGNITION TEST: A MEASURE OF SCHEMA COMPREHENSION FOR SCHIZOPHRENIA

PATRICK W. CORRIGAN
Center for Psychiatric Rehabilitation, University of Chicago, 7220 Arbor Drive, Tinley Park, IL 60477, USA

MICHAEL F. GREEN
UCLA Clinical Research Center for Schizophrenia and Psychiatric Rehabilitation, P.O. Box 6022 Camarillo, CA 93011-6022, USA

SUMMARY
Although considerable evidence exists regarding information processing deficits in schizophrenia, strategies examining the manner in which this population represents information have been lacking. Of particular interest are situational schemata that are described by characteristic features like actions, roles, rules and goals. A pencil-and-paper test might be able to assess differences in feature detection within schizophrenic patients as well as across patient and control populations; this paper reviews findings about one such measure, the Situational Feature Recognition Test (SFRT). The SFRT comprises lists of targets and non-targets representing the four classes of features for four social situations. Efforts were made to match correct identification and false positive rates for item consistency and difficulty for each of the four classes of situational features across the four social situations on standardization and cross-validation samples of normal control subjects. The SFRT was then administered to 25 schizophrenic patients. Relatively unbiased, signal detection indices were used to represent performance on the task. Results showed that schizophrenic patients were less sensitive to situational features than normal controls. Moreover, schizophrenic patients were less sensitive to more abstract features like goals than to more concrete features like actions, roles or rules. Results also indicated that the schizophrenic subjects' recognition of schematic features interacted with the content of the specific situation. The SFRT may be a useful tool for understanding the social cognitive deficits that underlie the interpersonal dysfunctions of schizophrenia.

KEY WORDS—Schizophrenia, situational feature recognition test.

INTRODUCTION
Several studies have examined deficits in the way in which information is processed in schizophrenia (Neuchterlein and Dawson, 1984). For example, investigators have shown that memory functions of schizophrenic patients are far worse than normal subjects (Koh, 1978; McClain, 1983; Nachman and Cohen, 1969). To our knowledge, however, few studies have examined deficits in the manner in which schizophrenics represent information in memory. Methods have been developed that describe cognitive schema in normal samples. Extrapolating these strategies to research into schizophrenic dysfunctions may provide insights into memory and social skill deficits in this population.

Social schemata describe the manner in which interpersonal information is represented and may be viewed as templates through which incoming social information is encoded or blueprints by which interpersonal responses are guided. Investigators have identified several classes of social schemata that describe self (Rogers et al., 1977), persons (Cantor and Mischel, 1979) and situations (Argyle, 1986; Argyle et al., 1981; Galambos et al., 1986; Schank and Abelson, 1977). The Situational Feature Recognition Test (SFRT) was developed to assess sensitivity to situational schemata because the construct has particular relevance for understanding interpersonal functioning deficits in schizophrenia (Corrigan and Green, 1991a, Forgas, 1983; Trower, 1986).

The SFRT was developed based on methods from social and cognitive psychology. Bower et al. (1979) showed that Stanford undergraduates were

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consistently able to identify component actions from a list of behaviors that comprise two social situations – eating at a restaurant and visiting a doctor’s office. Bower and his colleagues concluded that information regarding social actions are grouped and subsequently retrieved in terms of situational schema. Argyle and his colleagues (Argyle, 1986; Argyle et al., 1981; Trower et al., 1978) said that situational schema vary in terms of the components or ‘features’ by which they are understood. Of the various features described by Argyle et al., four have been included in the SFRT: actions, roles, rules and goals. Actions comprise the characteristic behaviors that occur in a situation; e.g., in a restaurant, the customer follows the hostess to his seat, takes the menu and places an order. Many of these actions are consistently employed by situationally defined characters or roles; e.g., the hostess seats the customer or the barmaid serves the drink. Rules consist of the subtle interpersonal customs that govern the situation; customers wait until the hostess calls them to be seated. Goals define the actor’s purpose for entering and engaging in the situation; customers are trying to satiate their hunger.

These components vary on a continuum of abstraction with actions and roles representing the more concrete schematic representations of situations and rules and goals representing the more abstract features. Given that schizophrenia has classically been viewed as a deficit in abstract thinking (Goldstein, 1959), individuals with schizophrenia should better identify the more concrete features of situations in the SFRT rather than abstract components like rules and goals. In support of this hypothesis, related research has shown that schizophrenic subjects were better able to recognize more concrete cues of an interpersonal situation (what they saw and heard in a vignette) than more abstract cues (what the observer inferred about the underlying affect and goals that led to an actor’s responses) (Corrigan and Green, 1991a).

In some studies of feature identification and situational schema, subjects are presented with lists of components and asked to distinguish correct from incorrect components (Bower et al., 1979; Galambos et al., 1986); dependent measures generated from such a task represent the frequency of correct identifications and false positives. Unfortunately, simple hit rates representing performance on detection tasks are biased parameters of perception, confounded by the perceived pay-off that mitigates any decision (e.g., ‘I’m more likely to say that opening a book is a characteristic feature of going to a restaurant if I think the examiner is going to reward me even for incorrect responses’). Signal detection parameters representing perceptual sensitivity are free of these response biases; i.e., for any task, sensitivity remains constant despite fluctuations in conditions that might affect correct identification and false positive rates (Davies and Parasuraman, 1982). Although signal detection principles are traditionally applied to vigilance tasks, recent research has applied them to measures of short term recall (Corrigan and Green, 1991b; Snodgrass and Corwin, 1988) and social cue recognition (Corrigan and Green, 1991a).

METHODS

Test construction and validation

Four test situations were used for development of the SFRT. Two situations – ‘eating at a nice restaurant’ and ‘visiting a doctor’ – were taken from Bower et al. (1979). Two other situations were added, one that was thought to be very familiar to the average schizophrenic patient – ‘staying at a psychiatric hospital’ – and one that was thought to be very unfamiliar – ‘attending an opera’. Four lists of situational features were generated for each test situation representing component actions, rules, rules and goals. Each list comprised 18 components of which eight were correct responses or targets and ten were distractor items or non-targets. Items representing action features for the restaurant and doctor situation were taken from Bower et al. (1979) and were single words or short phrases (e.g., target actions for restaurants included ‘read a menu’ and ‘eat dinner’).

Three independent judges rated each component item for whether it was representative of the situation and feature. Only 12 of the 288 items needed to be modified after this evaluation.

Several precautions must be taken when determining whether patients comprehend concrete situational features better than abstract features and hence show a differential deficit in this function. Chapman and Chapman (1973, 1978) warned that the magnitude of psychiatric patients’ performance decrement between any two tasks is a function of differences in the discriminating power of the component tests as validated on similar ‘normal’ groups. In cases where the difference in discriminating power between tests is large, differential
deficit attributed to patient groups may arise from statistical artifact. Differences in discriminating power between tests can be diminished by matching items across the component tests for difficulty and consistency.

To test for differences in discriminating power, recognition of actions, roles, rules and goals was collapsed across the four test situations into a single summary score for each feature. The items were then administered to a standardization group of 68 subjects who had no prior history of mental illness. This group included psychiatric technicians who worked at a nearby VA Medical Center (n = 15) and students at a small college in Southern California (n = 53). Because the two groups did not differ in task performance, scores were collapsed for further analyses of the test. The sample was 35% male and the average age was 25.8 years (SD = 9.9). Sample members had completed on average 15.2 years of education (SD = 1.3). The group was 90% Caucasian and 10% African American.

To reduce differences in discriminating power of the hit and false positive rates across the four tasks, some items in each task were discarded, yielding subsets of equal numbers of target and non-target items across features and situations; these subsets were equated for item consistency (using the KR-20) and for the mean and the variability of item difficulty. Results are summarized in Table 1. Note that normal subjects taking this test showed a ceiling effect; on average, this group identified 92.2% of targets correctly. Item consistency was very high, suggesting that the SFRT scores were reliable. As a result of this paring down process, the final task included 14 items per list: six targets and eight non-targets. There were 16 lists altogether representing four features by four situations.

In addition to achieving similar discriminating power for the four feature identification tasks, qualities of the instrument meet important criteria for signal detection. Sufficient numbers of targets and non-targets were provided for each SFRT feature to adequately describe the signal and noise distributions (Davies and Parasuraman, 1982). Unfortunately, an item difficulty of about 93% is at the high end of signal detection requirements. This problem was diminished somewhat by derivation of a non-parametric index of sensitivity (A') from hit and false positive rates for each feature.

\[
A' = \frac{1}{2} \left( \frac{(\text{hits} - \text{FPs})}{(1 + \text{hits} - \text{FPs})} \right) + \frac{1}{2} \left( \frac{4 \times \text{hits}}{1 - \text{FPs}} \right)
\]

where FP are false positives. Moreover, 93% approaches a ceiling effect for item difficulty, yielding a challenge to some assumptions about matching for discriminating power that must be considered in the interpretation of the results.

**Subjects**

Twenty-five in-patients with DSM-III-R diagnoses of schizophrenia from Camarillo State Hospital participated in this study. All diagnoses were based on an expanded version of the Present State Exam (Wing et al., 1974); clinicians conducting the interviews were trained to a minimum agreement of 85% for the presence of symptoms according to criterion ratings of the Diagnosis and Psychopathology Unit of the Clinical Research Center for the Study of Schizophrenia at UCLA (Robert P. Liberman, principal investigator). Subjects with a history of drug or alcohol dependence, organicity or mental retardation were excluded. The schizophrenic subjects also demonstrated at least a fourth grade reading level as measured on the Wide Range Achievement Test (WRAT) and had corrected vision of at least 20/30.

Schema feature recognition by the schizophrenic sample was compared to that by 15 normal control subjects drawn from the psychiatric technician training program at the same hospital. The control group also served to cross-validate low differences in item difficulty and item consistency across features found on the standardization sample. Subjects in this group were screened using the lifetime version of the expanded Present State Exam and selected parts of the personality disorders section of the Structured Clinical Inventory for

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Table 1. Mean and standard deviations of item difficulty and item consistency (KR-20) for target and non-target items on the four tasks for the standardization sample

<table>
<thead>
<tr>
<th>Task</th>
<th>M (%)</th>
<th>SD (%)</th>
<th>KR-20</th>
<th>M (%)</th>
<th>SD (%)</th>
<th>KR-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions</td>
<td>92.6</td>
<td>4.6</td>
<td>0.95</td>
<td>2.3</td>
<td>4.4</td>
<td>0.99</td>
</tr>
<tr>
<td>Roles</td>
<td>92.8</td>
<td>7.1</td>
<td>0.99</td>
<td>3.8</td>
<td>2.3</td>
<td>0.81</td>
</tr>
<tr>
<td>Rules</td>
<td>93.0</td>
<td>4.9</td>
<td>0.97</td>
<td>2.9</td>
<td>4.0</td>
<td>0.95</td>
</tr>
<tr>
<td>Goals</td>
<td>91.9</td>
<td>7.5</td>
<td>0.98</td>
<td>2.8</td>
<td>4.5</td>
<td>0.96</td>
</tr>
</tbody>
</table>

M, mean; SD, standard deviation.
DSM-III-R (Spitzer et al., 1990). Potential subjects for the control group were excluded if they had a history of psychotic disorder, personality disorder, organicity or substance dependence, or if their parents or siblings had severe mental illness. All normal control subjects scored above the fourth grade reading level on the WRAT and had corrected vision of at least 20/30.

Procedure

Subjects, after being informed of the purpose of the study and agreeing to participate, were tested individually. Subjects were administered the four sets of situational lists comprising the SFRT in one of four counterbalanced conditions to control for order effects. The lists were handed to them one at a time with the instructions: 'Circle every action (role, rule or goal) that is usually associated with the situation below'. Directions were repeated to subjects who circled more than five consecutive components on any one list or who circled no items on a list. Patients who consented to participate in the study received snacks and beverages for completing the measures. Normal control subjects received $5.00.

RESULTS

The mean age for schizophrenic subjects was 34.0 years (SD = 7.6) and these subjects had completed on average 10.4 years of education (SD = 2.1). In comparison, the mean age of the normal control sample was 35.4 years (SD = 7.5) and their mean educational level was 13.7 (SD = 2.2). Subsequent t-tests across groups showed no significant difference for age but a significantly higher educational level for the control group (t(38) = 3.06; p < 0.05). No significant correlations were found between age or education of subjects and their scores on the SFRT.

The group of schizophrenic subjects was 76.0% male while the normal control group was 53.3% male, a statistically non-significant difference. Given that numerous studies have shown that males with schizophrenia do worse on most measures of social functioning when compared to their female counterparts (Childers and Harding, 1990) and that our schizophrenic sample had more males than the normal comparison group, a two-factor (group x gender) ANOVA was completed. Results showed no significant difference between males and females on the SFRT. Fourteen out of 15 subjects in the normal group were Caucasian with the fifteenth subject being African American. Eighteen of the subjects in the schizophrenic group were Caucasian, three were Latino, two were Asian and two were African American. Results of a Student's t-test showed no differences in SFRT performance between minority and non-minority schizophrenic patients.

The patient sample had a long history of illness; the average age at first hospitalization was 19.8 years (SD = 6.0) and the average length of the illness since then was 15.4 years (SD = 4.6). All patients received neuroleptic medications, with the average dose equal to 1221 mg chlorpromazine equivalents (SD = 908). Twenty-four of the patients received benztrapine for side effects, with the average dose equal to 2.2 mg (SD = 1.8). There were no significant correlations between chronicity or oral medication levels and SFRT scores.

Differences across SFRT features

The means and standard deviations of the sensitivity scores and the hit and false positive rates across the four SFRT features are summarized in Table 2. Note that for the normal subjects, the hit rate is similar across features and differs from hit rates of the standardization group by only 3 percentage points. Although differences in hit rates are small for the cross validation sample (p > 0.50), the mean and standard deviation of scores for recognizing action features seems to be higher than for the other three variables. The false positive rates are also similar across features and differ less than 4 points from scores of the standardization group; again differences are small for the false positive rates (p > 0.50), although rates for role recognition seem noticeably lower. Nevertheless, it appears that discriminating power of the four features was roughly equivalent. An ANOVA conducted to test for order effects found negligible differences (the F ratios were all below 1.35; p > 0.30).

Differences between groups and across features, with sensitivity, hit rate and false positive rate as the dependent measures, were determined with three 2 x 4 ANOVAs; MANOVA was not used because sensitivity is arithmetically determined from hit and false alarm rate. Results showed a significant group difference for sensitivity, with the normal sample producing greater A' (F(1,37) = 9.99, p < 0.01). Although no significant effect was
Table 2. Mean and standard deviations of the frequency of schizophrenic and normal subjects recognition of situational features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Normal subjects</th>
<th>Schizophrenic subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity, actions</td>
<td>0.968 (0.054)</td>
<td>0.901 (0.147)</td>
</tr>
<tr>
<td>Sensitivity, roles</td>
<td>0.980 (0.023)</td>
<td>0.879 (0.117)</td>
</tr>
<tr>
<td>Sensitivity, rules</td>
<td>0.980 (0.016)</td>
<td>0.880 (0.118)</td>
</tr>
<tr>
<td>Sensitivity, goals</td>
<td>0.981 (0.021)</td>
<td>0.845 (0.134)</td>
</tr>
<tr>
<td>Hits, actions</td>
<td>93.8% (10.3%)</td>
<td>84.8% (15.0%)</td>
</tr>
<tr>
<td>Hits, roles</td>
<td>90.6 (12.7)</td>
<td>80.5 (18.6)</td>
</tr>
<tr>
<td>Hits, rules</td>
<td>89.4 (25.1)</td>
<td>81.2 (18.1)</td>
</tr>
<tr>
<td>Hits, goals</td>
<td>89.7 (25.2)</td>
<td>77.1 (22.3)</td>
</tr>
<tr>
<td>False positives, actions</td>
<td>4.2% (6.4%)</td>
<td>13.8% (19.1%)</td>
</tr>
<tr>
<td>False positives, roles</td>
<td>0.1 (1.4)</td>
<td>18.8 (26.2)</td>
</tr>
<tr>
<td>False positives, rules</td>
<td>3.3 (3.6)</td>
<td>17.4 (17.5)</td>
</tr>
<tr>
<td>False positives, goals</td>
<td>3.1 (4.1)</td>
<td>22.0 (26.3)</td>
</tr>
</tbody>
</table>

Standard deviations given in parentheses.

found for situational feature \( (F(3,37) = 1.16, \text{NS}) \), a non-significant trend was apparent in the interaction between group and feature \( (F(3,37) = 2.45, p = 0.07) \). A subsequent one-way repeated measures ANOVA across SFRT features for the schizophrenic patients alone found a significant effect for sensitivity \( (F(3,72) = 3.42, p = 0.02) \). Post hoc contrasts showed that the patient sample scored significantly lower \( (p < 0.05) \) on the identification of situational goals than on rules, roles or actions.

Results of \( 2 \times 4 \) ANOVAs for hit rates found non-significant group effects \( (F(1,37) = 3.55, p < 0.06) \). No significant findings were demonstrated for hit rate across situational feature \( (F(3,37) = 1.78, \text{NS}) \). The interaction was also not significant \( (F(3,37) = 0.24, \text{NS}) \).

Highly significant group differences were found for false positive rates \( (F(1,37) = 9.68, p < 0.01) \). Subjects in the normal control group produced lower false positives than did the schizophrenic patients. However, false positive rates did not differ significantly across situational features \( (F(3,37) = 1.01, \text{NS}) \) nor were interaction effects significantly different \( (F(3,37) = 1.91, \text{NS}) \).

Effects due to situational content

To determine whether situational content interacted with correct identification of actions, roles, rules and goals, the pattern of raw hit and false positive totals was examined across specific situations; this information is summarized in Table 3. Two \( 4 \times 4 \) ANOVAs (situational content by situational feature) were completed with hit and false positive rates as the dependent measures; \( A' \) could not be used as a dependent measure in this analysis because of an insufficient number of items for its derivation. For hit rate, results showed a main effect for feature \( (F(3,72) = 6.83, p = 0.0004) \) but not for content \( (F(3,72) = 0.59, \text{NS}) \). However, a significant interaction was found between feature and content \( (F(9,216) = 5.49, p = 0.0001) \). Main effects for false positives were found for both feature \( (F(3,72) = 2.21, p = 0.09) \) and content \( (F(3,72) = 3.79, p = 0.01) \), as well as a significant interaction \( (F(9,216) = 4.95, p = 0.0001) \). These findings suggest that feature detection varies with the content of the interpersonal situation. This interaction may, in part, be related to the familiarity of the stimulus situation. For example, for the relatively unfamiliar opera situation, subjects were able to identify the actions, which they could have learned from stereotypes, but were relatively unaware of roles, rules and goals, which may have required participation in these situations. Conversely, subjects were able to identify actions, roles and rules at a high rate for the familiar psychiatric hospital, although interestingly they were still less able to identify the more abstract goals.

Table 3. Mean and standard deviations of raw scores representing hits and false positives for schizophrenic subjects by situation and level of feature abstraction

<table>
<thead>
<tr>
<th></th>
<th>Doctor</th>
<th>Restaurant</th>
<th>Opera</th>
<th>Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions</td>
<td>4.8 (1.4)</td>
<td>4.8 (1.2)</td>
<td>5.5 (0.8)</td>
<td>5.2 (1.2)</td>
</tr>
<tr>
<td>False Positives</td>
<td>0.8 (1.5)</td>
<td>0.6 (1.7)</td>
<td>0.9 (1.6)</td>
<td>2.1 (2.2)</td>
</tr>
<tr>
<td>Roles</td>
<td>5.1 (1.4)</td>
<td>5.1 (1.1)</td>
<td>4.2 (1.8)</td>
<td>5.0 (1.2)</td>
</tr>
<tr>
<td>False Positives</td>
<td>0.8 (2.1)</td>
<td>1.7 (3.0)</td>
<td>2.4 (3.1)</td>
<td>1.1 (1.9)</td>
</tr>
<tr>
<td>Rules</td>
<td>4.9 (1.4)</td>
<td>4.8 (1.2)</td>
<td>4.5 (1.6)</td>
<td>5.2 (1.5)</td>
</tr>
<tr>
<td>False Positives</td>
<td>1.1 (2.1)</td>
<td>1.6 (1.5)</td>
<td>1.6 (2.2)</td>
<td>1.2 (2.0)</td>
</tr>
<tr>
<td>Goals</td>
<td>4.6 (1.5)</td>
<td>4.6 (1.4)</td>
<td>4.5 (1.6)</td>
<td>4.0 (1.5)</td>
</tr>
<tr>
<td>False Positives</td>
<td>1.6 (2.1)</td>
<td>1.1 (1.4)</td>
<td>2.0 (2.2)</td>
<td>2.4 (2.0)</td>
</tr>
</tbody>
</table>

Standard deviations are given in parentheses.
DISCUSSION

Results from this study suggest that the SFRT has several psychometric qualities that recommend it as a measure of situational feature detection in schizophrenia. It has high internal consistency. Item difficulty and consistency was matched across SFRT features on a standardization sample and cross-validated on a subsequent sample. The test has sufficient items to describe signal and noise distributions to allow summarization using non-parametric signal detection indices, variables which are relatively unbiased measures of feature detection.

Use of the SFRT showed that schizophrenic patients were significantly less sensitive to situational features than normal controls. Further analyses showed that differences between groups were relatively minor for hit rate, but quite large and significant for false positive rate. This pattern could occur if schizophrenic subjects were simply responding to test items at a higher rate than normal controls. Perhaps the most meaningful difference between groups was the number of items checked by subjects, rather than the features or levels of the items. However, results of a Student's t-test showed no significant difference between patients and normal controls in overall rate of responding (t(38) = 1.23, NS). Therefore, these findings suggest that differences in feature sensitivity are a function of schizophrenics reporting features not generally considered to be characteristic of the situation.

A limitation of the current study was that the two groups differed on educational achievement, number of minority members and medication. No significant relationships were found between SFRT performance and education, minority status or level of antipsychotic and anticholinergic medication. However, drug effects on more basic cognitive functions may have diminished feature detection in that patient group. Moreover, ingested dose does not correspond closely to drug plasma level; therefore, an absence of correlation between oral medication and SFRT performance does not rule out medication effects.

Findings with the SFRT support the hypothesis that the ability of schizophrenic subjects to identify characteristic situational components varies with the level of feature abstraction. Schizophrenic subjects in this study found it more difficult to accurately identify the goals driving interpersonal situations than the more overt actions, roles and rules. Because features were matched for difficulty, differences of the schizophrenic subjects across abstraction levels of situational features may represent a differential deficit characteristic of the disorder rather than a non-specific effect that may have been attributed to overall performance decrements exhibited by severely mentally ill populations.

Although significant differences were found across the four SFRT features for the schizophrenic subjects, post hoc tests showed that only goals yielded significantly less sensitivity than the other SFRT features. Inspection of Table 2 suggests that other differences, although not statistically significant, also existed; sensitivity to actions is greater than sensitivity to roles and rules, which are both greater than sensitivity to goals. Lack of statistical significance may have resulted from insufficient sample size. Future research with larger samples may show other statistically significant differences between abstract and concrete situational features.

Results from the study showed that the schizophrenic patients' recognition of situational features interacted significantly with the content of SFRT situations. We hypothesize that situational familiarity may account for this interaction. However, the data do not show unequivocally that the SFRT discriminates between features across situations. The task may have been too easy, causing a ceiling effect that negated situational differences.

Interest in feature recognition developed as a complement to information processing models of cognitive deficit in schizophrenia. Other recent studies by our group have looked at relationships between social schema and information processing deficits in severe mental illness. For example, the performance of schizophrenic patients on a similar feature recognition task has been shown to correlate significantly with visual vigilance and short-term recall memory (Corrigan et al., 1992). Continued research in this area will more fully describe the schizophrenic patients' deficits in processing and representing information.

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