

Shadowing on the basis of contextual information in individuals with schizotypal personality

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The Schizotypal Personality Questionnaire (SPQ; Raine, 1991) was administered to 100 volunteer undergraduates; the 20 with the highest and the 20 with the lowest scores were selected for further study. They undertook a shadowing task in which two passages of prose were presented simultaneously and binaurally, being distinguishable only by their content. Participants were required to repeat (shadow) one of the passages and to ignore the other (the distractor). Performance of the two groups differed with participants having high scores on the SPQ showing a significantly greater tendency to make intrusion errors (to repeat words from the distractor passage). It is suggested that schizotypy is characterized by a dysfunction in the normal response–selection mechanism of attention with the consequence that the response bias established by the semantic content of the input is insufficiently selective, extending to items that are only distantly associated with those present in the input.

The aim of this study was to determine if individuals who yield high scores on a questionnaire intended to measure schizotypal personality show deficits on a laboratory task designed to assess attentional processes. The task chosen was one on which patients diagnosed as suffering from schizophrenia are known to show a deficit. To find a deficit in an individual having a schizotypal personality would thus provide support for the suggestion that schizotypy as assessed by questionnaire does indeed involve characteristics akin to those found in people suffering from schizophrenia. It would also lend support to the view that a dysfunction of mechanisms concerned with attention is indeed a characteristic of (at least some types of) schizophrenia.

It has long been thought that schizophrenic characteristics might constitute a continuum from the extreme form exhibited by individuals who have suffered a breakdown to milder forms present in a section of the general population (e.g. Meehl, 1962). The ability of the latter group to continue to function normally may reflect their good fortune in escaping the influences of environmental stresses of one sort or another that play a part in precipitating breakdown in the former. There have been many attempts to devise scales that will serve to assess the presence of schizophrenia-like characteristics in otherwise normal people (for a review see Venables, Wilkins, Mitchell, Raine & Bailes, 1990). Some have dealt with

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psychoticism generally (e.g. Eysenck & Eysenck, 1976); others have concentrated on individual features of what is taken to be the schizotypal personality (e.g. physical and social anhedonia, Chapman, Chapman & Raulin, 1976; magical ideation, Eckblad & Chapman, 1983; schizophrenia and anhedonia, Venables *et al.*, 1990). Those devised by Bentall, Claridge & Slade (1989) and by Raine (1991) combine, in a single instrument, a range of subscales designed to tap the variety of traits that constitute schizotypy. Thus, for example, Raine's (1991) scale is modelled on the criteria proposed in DSM-III-R (American Psychiatric Association, 1987) as defining schizotypal personality disorder. This scale (the SPQ—schizotypal personality questionnaire) comprises nine subscales, one for each of the nine diagnostic criteria listed in DSM-III-R.

The validity of these various scales can be assessed in a number of ways. One of the most powerful is to demonstrate that people who have schizophrenia-like symptoms by self-report (i.e. those with high scores in tests of schizotypal personality) also show objective signs (e.g. behavioural or psychophysiological) akin to those seen in patients diagnosed with schizophrenia. Recent examples of the application of this strategy include studies by Asnarow, Nuechterlein & Marder (1983) who found poor performance on a span of apprehension task in participants having high scores on the schizophrenia scale of the Minnesota Multiphasic Personality Inventory (MMPI); patients diagnosed as suffering from schizophrenia are known to show a deficit on this task (Neale, McIntyre, Fox & Cromwell, 1969). Lenzenweger, Cornblatt & Putnick (1991) demonstrated a relationship between scores on the perceptual aberration scale of Chapman, Chapman & Raulin (1978) and performance on a test of sustained attention (or vigilance), a test on which patients are known to show a deficit (Cornblatt, Lenzenweger & Erlenmeyer-Kimling, 1989). Wilkins & Venables (1992) found a relationship between scores on the schizophrenia and physical anhedonia scales of Venables *et al.* (1990) and performance on a reaction-time task previously used to demonstrate a deficit in the ability of schizophrenics to switch attention (Sutton, Hakerem, Zubin & Portnoy, 1961). A further task thought to reveal the operation of an attentional process is the *latent inhibition* procedure, and the deficit shown by patients (e.g. Baruch, Hemsley & Gray, 1988) has now been demonstrated in several studies of people who score high on measures of proneness to psychosis (e.g. Lipp, Siddle & Arnold, 1994). Finally, Peters, Pickering & Hemsley (1994) have shown that those who score high on schizotypy, like those diagnosed as schizophrenic (e.g. Beech, Powell, McWilliam & Claridge, 1989), show a deficit in the *negative priming* paradigm (Tipper, 1985), a paradigm which, like latent inhibition, has been taken to give a measure of the ability of the participant to come to ignore certain types of information.

The present study extends this type of analysis by investigating the relationship between scores on Raine's (1991) SPQ and performance on a binaural listening task in which participants were required to attend to one of two simultaneously presented messages that differed in content but were otherwise indistinguishable.

The listening task, based on a paradigm developed by Treisman (e.g. 1964), has been employed by Hemsley & Richardson (1980) with schizophrenic patients, and is referred to by these authors as *shadowing by context*. In their version, participants were required to listen to two passages of continuous prose read simultaneously, at the

same rate, by the same speaker, and emanating from a common source. Their task was to repeat back continuously (to *shadow*) one of the passages and to ignore the other. Schizophrenic patients performed this task significantly less well than did normal controls or patients hospitalized with depression (who did not differ from the controls).

This result is of particular interest because it requires us to acknowledge that the attentional deficit in schizophrenia extends beyond those processes responsible for stimulus selection on the basis of relatively simple physical characteristics present in the input (the mechanism envisaged in Broadbent's, 1958, filter theory). In this task, unlike the dichotic task used in some studies (e.g. Payne, Hochberg & Hawks, 1970; Straube & Germer, 1979) the participants need to process the material they are presented with more fully in order to select the appropriate response on the basis of information about the semantic content of the message (see Broadbent, 1971). Indeed, successful performance on this task might require the person actively to inhibit attention to the distractor information (as in the negative priming procedure of Peters *et al.*, 1994; see Tipper & Cranston, 1985). This is not to deny that a dysfunction of basic mechanisms of stimulus selection may be a feature of some forms of schizophrenia and of related conditions—indeed the experiments by Lenzenweger *et al.* (1991) and by Wilkins & Venables (1992), cited above, can be taken as evidence for the presence of such a dysfunction in schizotypy. It remains to be demonstrated, however, that schizotypic individuals suffer dysfunctional mechanisms of response selection such as are required for successful performance in the shadowing-by-context task.

In the present study, therefore, we administered the SPQ to a population of undergraduate volunteers, and identified groups of high-scorers and low-scorers. These were then tested on the shadowing task. The central question of interest was whether high scorers would show a deficit on this task, akin to that already demonstrated for schizophrenic patients.

Method

Participants

The participants for this study were drawn from an initial sample of 100 undergraduates, recruited by advertisement within the University of York. There were 56 females and 44 males and their mean age was 22 years (range 18–25 years). They gave their services without payment. These participants were thus likely to be above the average in academic ability and to be drawn from higher socio-economic groups. This latter factor may be of relevance, given the possibility that schizophrenia itself tends to be overrepresented among those of lower social class. To the extent that the same is true of schizotypy, it is possible that individuals with schizotypal personality might be underrepresented in our participants. The age of the participants means, of course, that individuals suffering early-onset psychological breakdown would not be represented in the sample.

On the basis of their SPQ scores (see below), 40 participants, the 20 with the highest and the 20 with the lowest scores, were invited to return for further testing. Fourteen of the high scorers responded to the invitation as did 14 of the low scorers, and performance on the shadowing task was assessed for these.

Materials

The SPQ. The SPQ is a 74-item questionnaire, each item requiring a yes/no response. Its nine subscales (minimum number of questions in a subscale being seven) deal with: Ideas of Reference (example item: Do you sometimes feel that people are talking about you?); Excessive Social Anxiety (I feel very uneasy about talking to people I do not know well); Odd Beliefs (Have you had experiences with the supernatural?); Unusual Perceptual Experiences (Have you often mistaken objects or shadows for people, or noises for voices?); Odd Behaviour (People sometimes stare at me because of my odd appearance); No Close Friends (I prefer to keep myself to myself); Odd Speech (I sometimes forget what I am trying to say); Constricted Affect (People sometimes find me aloof and distant); Suspiciousness (I often feel that others have it in for me). The scale is described in detail by Raine (1991) who reports (for an undergraduate population) that 55 per cent of the participants scoring in the top 10 per cent of SPQ scores had a clinical diagnosis of schizotypal personality disorder. (Our use, in the present study, of a 20 per cent cut-off presumably means that a lower proportion of our high scorers would receive such a diagnosis; nonetheless, it may still be anticipated that high scorers should differ from low scorers on relevant cognitive tasks.)

Shadowing task. Material for the shadowing task was selected from two sources. For the relevant (target) passages, extracts were taken from the novel *Howard's End* (E. M. Forster). The irrelevant (distractor) passage was from the statistical handbook *Facts from Figures* (M. J. Moroney). There were two target passages, one presented on its own in a first phase of the test, the other presented along with the distractor in a second phase. Each of the three passages was 60 s in length and consisted of 100 words, read as continuously and monotonously as possible by a female voice. The passages were initially recorded at a set intensity level using an Akai tape-recorder. This master tape was used to generate a test cassette containing, for phase one, a target passage presented on its own. Material for phase two was created by combining the second relevant passage with the distractor passage using a Tascam M06 mixer. Onset of the distractor passage occurred 5 s after the start of the target passage. The test was presented binaurally through headphones. A tape recording was made of the participant's responses.

Procedure

The SPQ scale was given individually to 100 participants with written instructions requesting an answer of yes or no to every item. At this stage they were informed that they might be invited to take part in a further short test when their responses to the questionnaire had been analysed.

The participants selected for the shadowing task were recalled three months later. Participants were tested individually in a quiet room. They were told that they were to listen to a stream of prose through the headphones and to repeat into the microphone everything they heard as they heard it. This test would last for 60 s and would be followed by a 30-s break. There would then be a similar task in which they would again be required to repeat a stream of prose as they heard it. They were told that soon after the start of the passage to be repeated, another would be presented to them simultaneously. They were instructed to ignore the second passage and to concentrate on repeating the first. Finally, they were instructed to make their responses as continuous as possible and to leave no silent gaps. Scoring consisted of counting the number of words correctly repeated. Errors consisted for the most part of omissions, although on occasion incorrect words were reported in phase two, these invariably being intrusions from the distractor passage.

Results

Questionnaire

The mean SPQ score for the entire population of 100 was 23.49 (Raine's, 1991, survey of two undergraduate populations in the United States yielded means slightly in excess of 26 in each case). Table 1 presents separate means for each of the subscales; again, these largely accord with those reported by Raine (1991) with the

exception of that for subscale 1 (Ideas of Reference), which yielded means of 4.33 and 5.19 in his samples. Computation of the correlation between scores on the individual subscales and the overall SPQ score (Table 1) revealed a strong positive correlation in each case, a result that accords with Raine's (1991) findings.

Table 1. Scores from the Schizotypal Personality Questionnaire (group means with SD in parentheses)

| Subscale | Total (<i>N</i> = 100) | Corr. | High scorers (<i>N</i> = 20) | Low scorers (<i>N</i> = 20) |
|-------------|----------------------------|-------|----------------------------------|---------------------------------|
| 1 | 2.99 (2.36) | .74 | 5.95 (1.99) | 1.14 (1.17) |
| 2 | 3.38 (2.42) | .47 | 5.25 (2.51) | 2.40 (1.54) |
| 3 | 1.87 (1.83) | .38 | 2.90 (2.02) | 1.05 (1.36) |
| 4 | 2.56 (1.97) | .63 | 4.65 (1.60) | 1.20 (1.20) |
| 5 | 2.43 (2.24) | .57 | 4.15 (2.21) | 0.40 (0.94) |
| 6 | 1.49 (1.65) | .47 | 2.75 (2.27) | 0.65 (0.86) |
| 7 | 4.61 (3.61) | .67 | 6.85 (1.42) | 1.80 (1.64) |
| 8 | 1.90 (1.57) | .62 | 3.45 (1.79) | 0.55 (0.69) |
| 9 | 2.24 (2.12) | .67 | 4.65 (2.62) | 0.90 (0.98) |
| Total score | 23.49 (10.94) | | 40.60 (6.97) | 10.05 (3.24) |

Note. Corr. (Spearman's *r*) is the correlation between scores on each subscale and the total score. The subscale labels are: 1 = Ideas of Reference; 2 = Excessive Social Anxiety; 3 = Odd Beliefs and Magical Thinking; 4 = Unusual Perceptual Experiences; 5 = Odd or Eccentric Behaviour; 6 = No Close Friends; 7 = Odd Speech; 8 = Constricted Affect; 9 = Suspiciousness.

Table 1 also presents the questionnaire results for the 20 highest scoring and 20 lowest scoring participants. The high cut-off score on the distribution was 34 and the range for the high scorers was 34–57; the low cut-off score was 14 (range 2–14). (Raine, 1991, reports the 10 per cent high and low cut-off scores for his sample as being 41 and 12 respectively; for our sample the equivalent scores were 39 and 10.) It is evident from Table 1 that our high-scoring and low-scoring groups differed substantially on all the subscales of the questionnaire.

Shadowing task

Of the 14 low scoring participants who attended for the shadowing task, one failed to understand the instructions fully and proved unable to perform the first version of the task when no distractor was presented. The results for this person were discarded, leaving an *N* of 13 for this group. All 14 high scoring participants performed the task satisfactorily.

Table 2 shows, for each group, the mean number of words (out of 100) repeated correctly on each of the two versions of the shadowing task. It is clear that for both groups performance on the version without the distractor was much superior to that shown when the distractor was present. There was, however, no sign that the groups

Table 2. Number of correct responses on the shadowing task (group means with SD in parentheses)

| | Phase 1 | Phase 2 |
|--------------|---------------|---------------|
| High scorers | 85.07 (19.31) | 51.00 (16.97) |
| Low scorers | 91.92 (6.33) | 61.62 (11.41) |

Note. The maximum possible in each phase was 100. High scorers came from above the upper 20 per cent cut-off on the SPQ; low scorers came from below the lower 20 per cent cut-off.

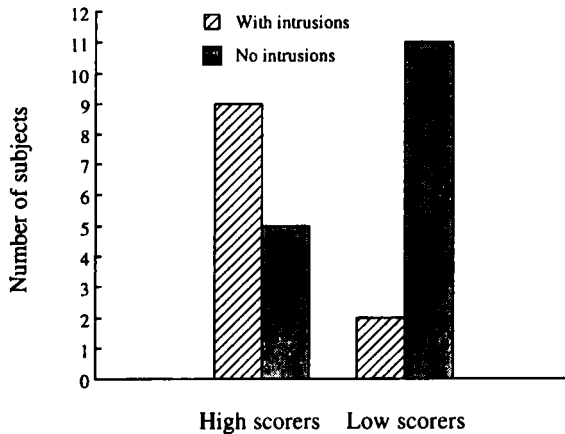


Figure 1. Number of participants making intrusion errors on the shadowing task in the presence of the distractor. High scorers came from above the upper 20 per cent cut-off on the SPQ; low scorers came from below the lower 20 per cent cut-off.

differed in their sensitivity to the presence of the distractor; low scoring participants produced marginally higher scores on both versions of the task. This description of the results was confirmed by an analysis of variance conducted on the data summarized in Table 2. This revealed a significant effect of type of task (presence or absence of distractor; $F(1, 25) = 143.37, p < .01$), but no significant effect of group (high vs. low scorers; $F(1, 25) = 3.17$), and no significant interaction between these factors ($F < 1$).

Although they did not differ in their overall performance, there was a clear difference between the groups in the errors they made on shadowing with the distractor. When low scorers failed to respond correctly it was because they remained silent. High scorers, on the other hand, showed a tendency to report words from the distractor passage. The total number of such intrusions recorded for the high scorers was 30; the total for the low scorers was 3. Figure 1 shows the number of participants in each group falling into the categories: no intrusion errors, one or more intrusion errors. It is evident that high scorers were more likely than low scorers to fall into the latter category and this difference proved to be statistically significant ($\chi^2 = 6.68, p < .05$).

Discussion

The chief finding of this study is that people who yield high scores on a self-report measure of schizotypal personality also show a deficit (by one measure of performance, at least) on a laboratory task designed to assess the ability to maintain attention in the face of distraction. It is known that patients diagnosed as suffering from schizophrenia show a deficit on this same task (Hemsley & Richardson, 1980); our new result, therefore, helps to confirm and extend the parallel between schizotypal personality and schizophrenia itself. Such confirmation has theoretical implications (see below) and also yields certain practical advantages. In particular, the direct study of psychological functioning in schizophrenic patients presents a number of difficulties, among them the possibility that any deficits observed might be a secondary consequence of the therapeutic regimen the patients are undergoing. Studying individuals from the general population who have schizotypal personality characteristics evades these difficulties and could produce information of relevance to our attempt to understand the nature of schizophrenia itself.

Unfortunately, the theoretical implications of the present results are not straightforward. Although participants with high schizotypy scores showed performance on the shadowing task that differed from that shown by participants with low scores, they did not show the pattern of deficit that has previously been observed in schizophrenic patients. The patients studied by Hemsley & Richardson (1980) showed an overall deficit on the shadowing in the presence of a distractor, repeating fewer words correctly than did controls. Our schizotypic participants were only very slightly inferior to controls on this measure—they differed in that, whereas the control participants (those with low schizotypy scores) did not respond during those periods when the target passage was not being shadowed correctly, our schizotypic participants tended to respond with words from the distractor passage at such times.

Hemsley & Richardson (1980; see also Hemsley, 1982, 1987) interpreted their results in terms of the suggestion that schizophrenia involves a deficit in the pigeon-holing mechanism postulated by Broadbent (1971)—a form of attention (response-selection) whereby certain categories of response are made more likely to occur on the basis of information supplied by prior input. For their control participants, this mechanism would ensure that analysis of the content of the shadowed message would act to increase the ease with which the representations of semantically related words would subsequently be activated. Schizophrenic participants, with a dysfunction in this mechanism, can be expected to perform less well.

With only slight modification, however, it is possible to apply this analysis successfully to the findings reported here. We need to suppose, not that the response-selection mechanism is lacking in schizophrenia but that it is functioning in an insufficiently selective way. Broen suggested some time ago (e.g. Broen, 1968), that schizophrenia is characterized by a problem of response disorganization in which there is an erosion of the normal difference in strength between dominant and competing responses. Applied to our experimental situation this would mean that the response bias established by the initial segment of the to-be-shadowed message might extend not only to words that were semantically closely related, but to others that

were less closely associated. If the participant's dysfunction is severe (as would be the case in schizophrenia itself), the tendency to respond to certain words from the distractor passage might be as strong as the tendency to respond to words from the target passage, and an overall deficit in performance would result. With a less severe dysfunction (as in our schizotypic participants), some differential between words from the target passage and words from the distractor passage might be maintained. These participants could thus be expected to perform as well as controls in their shadowing of the target passage; but they can also be expected to respond, on occasion, to words from the distractor passage, at times when the input would be insufficient to evoke any response at all in controls. Thus the schizotypic participants would have a normal overall score for words correctly reproduced but would make intrusion errors rather than just errors of omission.

The suggestion that schizophrenia, at least in the acute form, might involve a 'loosening of associations' has had a long history since it was first introduced. The interpretation offered for the result reported here implies that the phenomenon is also present in schizotypic individuals. A further implication is that such individuals can be expected to show, to a degree, the various disorders of thought and (or) language that are present in schizophrenia and have been attributed to a dysfunction in the inhibitory processes that suppresses inappropriate association in normal people. Certainly, 'odd speech' is proposed by DSM-III-R as one of the diagnostic criteria for schizotypal personality disorder, but direct studies of the phenomenon in sufferers from the disorder are hard to come by. There are, however, a number of studies of the first-degree relatives of schizophrenics that may be relevant. A well-known example is that by Wynne, Ryckoff, Day & Hirsch (1958), which found that the parents of schizophrenics tend to show disordered communication. As Hirsch & Leff (1975) have pointed out, the observations that led to this conclusion can be explained in terms of the tendency on the part of the parents of schizophrenics simply to make more utterances in response to the projective tests that were used. In this they show a parallel to our schizotypal participants, who also responded more (making intrusion errors) than did controls. In both cases there appears to be a tendency to respond rather than remain silent; but this is not to dismiss either set of findings as artifactual. The tendency to respond more readily is something that itself needs to be explained—and it is just what might be expected under the hypothesis that for these participants a given set of cues tends to activate a wider range of associates than is the case for controls.

Given the fact that both the diagnosis schizophrenic and the categorization schizotypic are likely to encompass a wide range of different subtypes, it may prove difficult to discern a single 'core deficit' lying at the heart of them. It is worth noting, however, that after an extensive review of the literature, Nuechterlein & Dawson (1984) conclude that the bulk of the experimental findings on dysfunctions of information processing in schizophrenic disorders could be interpreted in terms of the assumption that the participants were suffering from a reduced processing capacity for task-relevant cognitive operations. One possible source of this reduction, they suggest, might be a heightened tendency to devote capacity to task-irrelevant stimuli. The new results reported here are in accord with this assumption.

Finally, acknowledging the likelihood that the population having high scores on

schizotypy scales may not be homogenous suggests new possible lines for research. In a recent report, Raine, Reynolds, Lencz, Scerbo, Triphon & Kim (1994) describe a factor analysis of the SPQ which yielded results supporting a three-factor model, the factors being *disorganization* (odd speech and behaviour), *interpersonal* (e.g. constricted affect, social anxiety) and *cognitive-perceptual* (e.g. ideas of reference, magical thinking). Rather than selecting participants having high scores on the full SPQ, further studies aimed at analysing information-processing deficits in schizotypy might usefully concentrate on those who showed extreme scores on those aspects of the scale thought to detect operation the cognitive-perceptual factor.

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