Which schizotypal dimensions abolish latent inhibition?

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**Objective.** To evaluate which dimensions of schizotypy are associated with a reduction in latent inhibition (LI), akin to that seen in schizophrenia.

**Design.** LI was compared in low and high scorers on the four dimensions of the OLIFE questionnaire (Mason, Claridge, & Jackson, 1995), with the predictions that the unusual experiences and impulsive non-conformity subscales would be associated with loss of LI, while the introvertive anhedonia subscale would not be.

**Methods.** A total of 80 healthy volunteers completed a visual LI task. Half of these participants were pre-exposed to the conditioning stimulus; the others were not. The primary outcome measure was the number of trials taken to learn the task.

**Results.** LI was reduced for the dimensions of unusual experiences, impulsive non-conformity and cognitive disorganization. There was no effect of introvertive anhedonia. The effect of unusual experiences and impulsive non-conformity upon LI was mediated via changes in the pre-exposure group and not in the non-pre-exposed group. Conversely, high scorers on the cognitive disorganization scale showed slower learning in non-pre-exposure, but with no effect upon stimulus pre-exposure. As the unusual experiences and impulsive non-conformity scales were correlated, we examined if either of these was primary. Analysis showed unusual experiences to be primary, with impulsive non-conformity not contributing significant additional independent variance.

**Conclusions.** Our results support the proposition that the cognitive processes underlying the mediation of LI are related to the genesis of unusual experiences in schizotypy and, by extension, the positive symptoms of schizophrenia.

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Dysfunction of cognitive systems has long been recognized in patients with schizophrenia. Prominent among these is the notion of a dysfunction in the ‘attentional’ system (McGhie & Chapman, 1961). In an attempt to quantify this dysfunction, many attentional tasks have been developed (for reviews, see Maruff & Currie, 1996; Nestor & O’Donnell, 1998). In each of these tasks, the hypothesized attentional dysfunction leads to poorer performance for its owner. This is unfortunate as poorer performance on these tasks in a schizophrenic group could arise owing to many other non-attentional factors (e.g. poor motivation, medication effects, etc.). Thus interpretation of poor performance in patient groups is ambiguous. One task, however, has utilized the hypothesized deficit in attention in schizophrenia to predict better performance in the patient group. In a latent inhibition (LI) paradigm, participants are pre-exposed to a stimulus without consequence (this is termed the ‘pre-exposure phase’). Later, in the test phase, the same stimulus predicts some consequence. Learning of this relationship is impaired in the pre-exposed group compared with a non-pre-exposed control group.

Theories of LI postulate an attentional mechanism underlying this task (Gray, Feldon, Rawlins, Hemsley, & Smith, 1991; Lubow & Gerwitz, 1995; Mackintosh, 1975), whereby the pre-exposure of the stimulus leads to less attention being paid to it (though see Bouton (1993) and Killcross, Dickinson & Robbins (1994) for alternative theoretical accounts). If there is an attentional dysfunction in patients with schizophrenia, this may lead to an inability to screen the irrelevant stimuli from awareness. For patients in the pre-exposure group of the LI task, a failure to screen out the irrelevant (i.e. pre-exposed) stimulus would result in faster learning of the now relevant stimulus–consequence relationship in the test phase. It is difficult to attribute ‘better’ performance in the schizophrenic pre-exposed group to generalized deficits; therefore an attentional interpretation seems the most parsimonious.

In line with the notion that there is an attentional dysfunction in schizophrenia, LI has been found to be abolished in people in an acute phase of a schizophrenic illness (Baruch, Hemsley, & Gray, 1988a; Gray, Hemsley, & Gray, 1992; Gray, Pilowsky, Gray, & Kerwin, 1995; but see also Swerdlow, Braff, Hartston, Perry, & Geyer, 1996; Williams et al., 1998). Interpretation of LI in schizophrenic patients clearly is hampered by the use of anti-psychotic medication, or can suffer from low power if strict criteria are imposed to obtain first-episode, never-medicated, acute patients, as used by Gray et al. (1995). For example, one interpretation of the failure of Swerdlow et al. (1996) to find abolished LI in acute schizophrenic patients is that the majority of the sample were in the acute phase of an otherwise chronic illness and had been maintained on long-term neuroleptic medication. This group is obviously different from the never-medicated, or recently medicated, groups used by Baruch et al. (1988a) and Gray et al. (1992, 1995). These difficulties in interpretation owing to medication effects, and in patient selection and recruitment, have led to exploration of LI in other related populations without such associated difficulties, such as the first-degree relatives of schizophrenic patients (Serra, 1995) and high schizotypal individuals (see below). These studies have proved valuable in corroborating evidence gleaned from the schizophrenic population.

On the assumption that psychotic tendencies exist on a continuum (Claridge et al., 1996a), it is predicted that those individuals who score highly on measures of schizotypy, but who do not experience psychotic symptoms, should show comparable patterns of cognitive deficits/benefits to patients with schizophrenia (although not necessarily to the same extent). Therefore, individuals with high schizotypy scores should show a reduced LI effect compared with those with low scores. This hypothesis has been tested on a number of occasions (Allan et al., 1995; Baruch, Hemsley, & Gray,
The majority of these studies do indeed support the above hypothesis. However, the measures of schizotypy, and the LI tasks used, vary from study to study. Moreover, more recent work on the nature of schizotypy has revealed that the concept is not a single dimension, but that several factors are dissociable. Bentall, Claridge, and Slade (1989) combined a large battery of scales used previously to assess schizotypal traits—the combined schizotypal traits questionnaire (CSTQ). Factor analysis of the data from a large number of participants has revealed four factors: unusual experiences, cognitive disorganization, introvertive anhedonia and impulsive non-conformity (see also Claridge et al., 1996b).

As the CSTQ included many previous questionnaires used to measure schizotypy, it was long (420 items) and highly repetitive. Therefore, Mason et al. (1995) developed a new scale, the Oxford–Liverpool Inventory of Feelings and Experiences (OLIFE), for evaluating schizotypal traits that reliably measures the same four factors as the CSTQ but with fewer items (160) and less repetition.

Recent research has shown strong similarities between the multidimensionality of schizotypal traits and the multidimensionality of schizophrenic symptoms (Vollema & van den Bosch, 1995). Thus, the four factors measured by the OLIFE reflect the symptom clusters found in schizophrenia, and model the heterogeneity of the illness. For example, Liddle (1987) found three symptom clusters in chronic schizophrenia, namely ‘reality distortion’ reflecting positive symptoms (e.g. hallucinations and delusions); ‘psychomotor poverty’ reflecting negative symptoms (e.g. flat affect); and ‘disorganization’ (e.g. derailment of thought and distractibility). Three of the four factors of the OLIFE appear to correspond to these three symptom clusters found in schizophrenia (unusual experiences, introvertive anhedonia and cognitive disorganization, respectively). In addition, studies (Claridge et al., 1996a, b; Mason, 1995; Mason et al., 1995) have identified a fourth factor, impulsive non-conformity. Impulsive non-conformity measures tendencies towards violent, self-abusive and reckless behaviour. This scale is more akin to the formulation of schizotypy as propounded by Eysenck in his psychoticism scale, contained within the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975). Indeed, impulsive non-conformity and the psychoticism scale of the EPQ have seven items in common.

The aim of the present study was to investigate the relationship between the four schizotypal factors measured by the OLIFE and LI. Interpretation of previous research on schizotypy and LI has been hampered by the use of different conceptions and measures of schizotypy, which may or may not correspond with each other. It is hoped that with the advent of the OLIFE, the different dimensions of schizotypy, and their relationship to cognitive dysfunction, can be isolated and examined. As discussed previously, research on LI in schizophrenia has found that LI is abolished in acute, but not chronic, patients. Patients with acute schizophrenia tend to show a greater preponderance of positive symptoms. As illness progresses, patients tend to show increasing negative symptoms (often termed the negative defect state) and concomitant reduction in positive symptoms (Ellenbroek & Cools, 2000), although there is

1 The psychoticism scale included within the EPQ (1975) includes items that measure impulsiveness. Later versions of the EPQ/EPI have reassigned the impulsivity items to other scales. It is unclear whether high scores on all versions of the psychoticism scale would produce similar disruption of LI.
considerable heterogeneity in the progression of the illness. It is unclear how the incidence and severity of thought disorder fluctuate throughout the course of the illness.

Unfortunately there has been no study looking directly at the relationship between the three symptom types (Liddle, 1987; Liddle & Barnes, 1990) and the reduction of LI. This makes it difficult to formulate specific predictions about the OLIFE dimensions and LI. However, if a preponderance of positive symptoms is associated with acute schizophrenia and negative symptoms with chronic schizophrenia, we predicted that LI would be reduced in individuals scoring highly on the unusual experiences factor of the OLIFE, but not on the introvertive anhedonia factor. No \textit{a priori} predictions can be made in relation to the cognitive disorganization factor because of the lack of clear association between thought disorder and the acute vs. chronic stage of the illness. LI was predicted to be reduced in individuals scoring highly on the impulsive non-conformity factor because of its similarity to the psychoticism scale of the EPQ. Indeed, Bentall \textit{et al.} (1989) report that this fourth factor is mainly accounted for by the P-scale of the EPQ. The psychoticism scale has previously been shown to be associated with reduced LI (Baruch \textit{et al.}, 1988b; De la Casa \textit{et al.}, 1993; Lipp & Vaitl, 1992; Lubow \textit{et al.}, 1992; but also see Lipp \textit{et al.}, 1994).

Similar difficulties in interpretation of the LI-schizotypy literature may be apparent owing to the questionable validity of some versions of the ‘LI’ tasks used. One advantage of the LI task in examining the cognitive deficits in schizophrenia is that LI can be measured in both humans and animals. This allows the neurochemical and neuroanatomical substrates of the paradigm to be examined, and provides insights into the neurological correlates of the disease. However, this is only a strength of the paradigm if we can be sure that what we measure in the human is the same psychological process as that measured in the animal. Most tasks reported in the literature have not considered this, making interpretation of the results problematic. The LI task in the present study has strong credibility in this regard as it has been shown to be context-specific (Gray \textit{et al.}, 2001), which parallels findings of context dependency of LI in the rat (Bennett, Wills, Oakeshott, & Mackintosh, 2000; Honey & Good, 1993).

Methods

Participants and design
Eighty healthy participants took part in the experiment. They were paid or received course credit for their participation. Participants ranged in age from 16 to 51 years old ($M = 21.83 \pm 7.89$ years) and comprised 16 males and 64 females. Participants were assigned at random to one of two groups, pre-exposed (PE) vs. not pre-exposed (NPE). In addition, each participant completed the OLIFE questionnaire after the experimental section of the study.

Stimuli and apparatus
The stimuli in the pre-exposure phase consisted of trigrams of three unrelated letters. The letters were in capital format, measured 1 cm $\times$ 1 cm, and were separated by 1 mm. For those in the PE group, these trigrams were surrounded by a white equilateral
triangle of side 7.5 cm presented concurrently with the trigram. All stimuli were exposed for 1.5 s and were separated by .25 s.

In the test stage, the trigrams were once again presented. All trigrams were surrounded by either the triangle described above or, an upside-down equilateral pentagon of side 4.5 cm. In addition, a white counter was continually present in the top right corner of the screen.

**Procedure**

In the first stage of the experiment, the participants were taken into the test room and seated in front of the screen. They were then provided with instructions about the first phase of the experiment. Stage 1 consisted of a series of 80 trigrams (40 different trigrams presented twice each in a pseudo-random order, such that all 40 were presented before any repetition). The participants’ task was to choose one trigram and count how many times it was presented: this was the masking task. For half the participants (PE group) the trigrams were surrounded by the triangle; for the other half (NPE group) the trigrams were presented by themselves. At the end of this task, the participant was asked how many times the chosen trigram had appeared. Any participant that reported more than three repetitions would have been excluded from analysis because of poor attention being paid to the stimuli, but none did.

All participants started the test phase (Stage 2) after a delay of 2 min between pre-exposure and test. In Stage 2, participants were once again given instructions on the task to be performed. They were told that their task was to discern the rule that guides when the counter in the top right of the screen is incremented, and that the rule is related to the information that they see on the screen. A series of up to 160 trigrams (40 trigrams four times each) was then presented, each for 1.5 s. On 140 of the trials, the inverted pentagon surrounded the trigram. On the remaining 20 trials (randomly interspersed), it was surrounded by the triangle. On these trials, the counter was incremented 1.5 s after the onset of the presentation of the trigram and triangle (i.e. coincidental with the offset of these items).

Participants attempted to determine the rule that predicted the counter increment. Participants were required to press the spacebar whenever they felt that the counter increment would occur, in the time interval between the onset of the presentation and the increment of the counter (1.5 s). Any press after the counter increment was counted as incorrect. The participants were provided with feedback, in the form of a ‘yes’ or ‘no’ appearing on the screen, .5 s after any such press. This press did not alter the counter score. The task finished when the participant had produced five consecutive correct responses, or when the counter had reached its maximum of 20 (i.e. after 160 trials). The learning score was taken as the first of these five consecutive correct responses and could thus vary from a minimum of 1 to a maximum of 20. The score of 20 was awarded to any participant who failed to get five consecutive correct responses.

**Results**

**Analysis**

Changes in LI could occur because of changes in the PE group, changes in the NPE group, or indeed a combination of both (Gray *et al.*, 1992; Lubow, 1997). Previous
publications on the effect of schizotypy upon the reduction of LI have not always established which of these effects underpins this reduction. However, this information is essential if we are to understand the nature of the effect of schizotypy and schizophrenia upon LI. The hypothesis of an *attentional* dysfunction in schizophrenia and high schizotypy predicts that the changes should take place in the PE group only. Changes in the NPE group would merely reflect slower *associative learning* as a function of personality. Therefore, not only were our data analysed for significant interactions, but also the *a priori* hypotheses were examined separately (Keppel, 1991, p. 165) to assess the changes in the PE group and changes in the NPE group for each subscale of the O-LIFE.

Analysis of data from LI experiments is prone to two statistical problems. Firstly, with the PE condition several participants will fail to reach criterion and be awarded a maximum score. Thus the scores for this group often do not fit a normal distribution. Secondly, another reason why scores may not fit a normal distribution is that participants performing the LI paradigm tend to learn the task either rapidly or not at all (usually mapping on to the NPE and PE groups). This leads to a bimodal distribution with very few participants achieving learning scores in the mid-range. Therefore, concordant with the majority of other studies of LI, we compared the means of our groups using non-parametric statistics. For the assessment of main effects and interactions, we adopted the technique recommended by Conover and Iman (1981). This technique involves rank transformations of the learning scores and then analysis through parametric ANOVA methods. Conover and Iman (1981) show that this approach works well despite the violation of some of the assumptions of ANOVA. The *a priori* predictions of the differences between groups were analysed using Mann-Whitney *U*-tests.

Using median splits to form groups from a continuous variable generally results in a loss of power relative to using the continuous variable itself, increasing the possibility of a Type II error. We therefore also analysed our data by assessing the magnitude of correlation of our learning score against each personality dimension, for our two groups separately (PE vs. NPE; again a non-parametric statistic, Spearman’s rho, was used). The size of the correlations between the PE and NPE groups was then assessed statistically for significant differences using the method described by Howell (1997, pp. 261–262).

### Schizotypy scores

Table 1 shows the mean, median and SDs of the schizotypy scores obtained in our sample. One-way ANOVA revealed no significant differences between the PE and NPE condition for any of the schizotypy subscales or age (*p* > .05), indicating the absence of any sampling biases across groups.

**Table 1.** Mean, SDs and ranges of the O-LIFE scores (*N* = 80)

<table>
<thead>
<tr>
<th></th>
<th>Unusual experiences</th>
<th>Cognitive disorganization</th>
<th>Introverted anhedonia</th>
<th>Impulsive non-conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>8.81</td>
<td>10.58</td>
<td>4.06</td>
<td>7.69</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>7.00</td>
<td>10.00</td>
<td>3.00</td>
<td>7.00</td>
</tr>
<tr>
<td><strong>SD</strong></td>
<td>6.63</td>
<td>5.55</td>
<td>4.27</td>
<td>3.76</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>0–26</td>
<td>1–23</td>
<td>0–22</td>
<td>2–18</td>
</tr>
</tbody>
</table>
Latent inhibition results

Table 2. Spearman’s Rank correlations (N = 40 between the O-LIFE subscales and the learning scores for the pre-exposed and non-pre-exposed groups)

<table>
<thead>
<tr>
<th></th>
<th>Unusual experiences</th>
<th>Introvertive anhedonia</th>
<th>Cognitive disorganization</th>
<th>Impulsive non-conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-exposed</td>
<td>-.388*</td>
<td>-.053</td>
<td>-.210</td>
<td>-.330*</td>
</tr>
<tr>
<td>Not pre-exposed</td>
<td>.234</td>
<td>.180</td>
<td>.439**</td>
<td>.201</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01.

Figure 1. Mean trials taken to learn the association between the triangle stimulus and the increment of the counter plotted as a function of whether the participant scored low or high on the subscales of the O-LIFE questionnaire. Pre-exposed condition is represented by the open bars and the non-pre-exposed condition by the filled bars. The error bars represent ±1 standard error of the mean. (A) For the subscale of Unusual Experiences, (B) for the subscale of Cognitive Disorganization, (C) for the subscale of Introvertive Anhedonia, and (D) for the subscale of Impulsive Non-conformity.

Unusual experiences (UE)
Data from the subscale of the OLIFE corresponding to UE were used to perform a median split (median = 7) of the participants. Those lower than the median were assigned to the ‘low’ group (N = 37) and those above it to the ‘high’ group (N = 39).
Those scores corresponding exactly to the median were discarded \((N = 4)\). Figure 1A shows the mean learning scores for these groups in the two conditions. ANOVA on the ranked scores showed a significant main effect of condition \((F(1,72) = 18.47, p < .001)\), but no significant main effect of group \((F(1,72) = 1.57, p > .1)\). There was a trend towards an interaction \((F(1,72) = 3.08, p < .08)\). For the PE group, the high UE scorers learnt significantly faster than the low UE scorers \((z = 1.71, p < .05)\). For the NPE group, there was no significant difference between high and low UE scorers \((z = .74, p > .1)\).

Spearman’s Rank correlations were performed between the UE score and the learning score for the PE and NPE groups separately (see Methods section). Correlation coefficients are shown in Table 2. In line with the ANOVA, UE scores were significantly negatively associated with learning score for the PE group, whereas there was no significant association for the NPE group. The correlation coefficients between the PE and NPE groups were significantly different \((z = 2.80, p < .01)\).

Thus, as we hypothesized, low UE scores are associated with slower learning in the PE group, but not in the NPE group. High UE scorers show a reduced LI effect, which is due to differences in the PE group, but not the NPE group.

Cognitive disorganization (CD)
A median split (median = 10) of the participants was performed based on the CD score. Figure 1B shows the mean learning scores for these groups in the two conditions. ANOVA on the ranked scores showed a significant main effect of condition \((F(1,68) = 13.68, p < .001)\), but no significant main effect of group \((F(1,68) = 1.02, p > .1)\). There was a significant interaction \((F(1,68) = 7.45, p < .01)\). As we had made no predictions for the CD scale the following tests are two-tailed. For the PE group, there was no significant difference between high and low CD scorers \((z = .85, p > .1)\). For the NPE group, the high CD scorers learnt significantly slower than the low CD scorers \((z = 2.67, p < .01)\).

Spearman’s correlations were performed between the CD score and the learning score for the PE and NPE groups separately; these are shown in Table 2. In line with the ANOVA, CD was not significantly associated with learning score for the PE group, whereas there was a significant positive association for the NPE group. The correlation coefficients between the PE and NPE groups were significantly different \((z = 3.55, p < .001)\).

Therefore we have found that LI is reduced for high CD scorers. However, this effect was due to slower learning for the higher CD scorers in the NPE condition, rather than any effect in the PE group.

Introvertive anhedonia (IA)
A median split (median = 3) of the participants was performed based on the IA score. Figure 1C shows the mean learning scores for these groups in the two conditions. ANOVA on the ranked scores showed a significant main effect of condition \((F(1,66) = 12.53, p < .001)\), but no significant main effect of group \((F(1,66) = .40, p > .1)\) or interaction \((F(1,66) = 1.65, p > .1)\).

Spearman’s correlations were performed between the IA score and the learning score for the PE and NPE groups separately and are shown in Table 2. In line with the results of the ANOVA, there were no significant correlations for the learning score and the IA scores, and no significant difference between the correlations \((z = 1.01, p > .1)\).
Thus, as predicted, PE and NPE scores did not differ with score on the IA scale. Hence, LI is not altered by this dimension of personality.

**Impulsive non-conformity (IN)**

A median split (median = 7) of the participants was performed based on the IN score. Figure 1D shows the mean learning scores for these groups in the two conditions. ANOVA on the ranked scores showed a significant main effect of condition ($F(1,68) = 21.46, p < .001$), a marginally significant main effect of group ($F(1,68) = 3.09, p = .08$) and a significant interaction ($F(1,68) = 6.97, p < .01$). For the PE group, the high IN scorers learnt significantly faster than the low IN scorers ($z = 2.36, p < .01$). For the NPE group, there was no significant difference between high and low IN scorers ($z = .70, p > .1$).

Spearman’s correlations were performed between the IN score and the learning score for the PE and NPE groups separately and are shown in Table 2. In line with the ANOVA, IN was negatively significantly associated with learning score for the PE group, whereas there was no significant association for the NPE group. The differences between the correlation coefficients between the PE and NPE groups was marginally significant ($z = 1.56, p = .06$).

Thus as we hypothesized, low IN scores are associated with slower learning in the PE group, but not in the NPE group. High IN scorers show a reduced LI effect, which is due to differences in the PE group, but not the NPE group.

**Relationship between UE, IN and LI**

Our results suggest that both UE and IN have similar effects upon LI in that high scorers on these scales show reduced LI because of faster learning in the PE condition. These two personality dimensions show a significant correlation ($r = .36, p < .01$) in our sample that is in line with previous work (e.g. Mason et al., 1995). It is therefore of interest to establish if either the UE–LI or IN–LI relationship is the primary one, with the other being significant simply because of the shared variance between these personality measures. To assess this, both the UE and IN variables were entered into a multiple regression analysis with the learning scores for the PE group as the dependent variable. Of the total variance of the learning scores, 22% was accounted for by both independent variables ($R = .46$). For UE, the regression equation was found to be significant ($\beta = -.46, t = -2.61, p < .05$); however, for IN, the regression equation was not significant ($\beta = -.02, t = -.10, p > .1$). This indicates that the primary schizotypy-dependent variable influencing LI is UE.

**Discussion**

**LI and schizotypy**

Our finding of reduced LI on schizotypy scales is in line with previous reports (Allan et al., 1995; Baruch et al., 1988b; Braunstein-Bercovitz & Lubow, 1998; De la Casa et al., 1993; Della Casa, Hofer, & Feldon, 1999; Della Casa, Hofer, Weiner, & Feldon 1999; Hofer et al., 1999; Lipp et al., 1994; Lipp & Vaitl, 1992; Lubow et al., 1992; Williams et al., 1998). These previous reports treated schizotypy as a unidimensional construct and therefore tended to use a single measure (most often either the psychoticism scale of
the EPQ or the STA/STQ). One exception to this is the study by Allan et al. (1995), who measured STA, STB and the psychoticism scale of the EPQ. They found that LI was significantly reduced for high scorers on all three scales. Recently, it has become increasingly apparent that schizotypy is not unidimensional but includes at least three or four independent factors (Claridge et al., 1996b; Vollema & van den Bosch, 1995), mapping on to the heterogeneity of schizophrenic symptoms. No previous studies have attempted to examine which of these schizotypal dimensions are responsible for the reduction of LI. Our findings of reduced LI for high scorers on the unusual experiences and the impulsive non-conformity scales are not inconsistent with the findings of Allan et al. (1995), given that both STA and STB contain subelements of these factors. However, the current findings are the first evidence that LI is reduced by the schizotypal dimensions of unusual experiences and impulsive non-conformity. Interestingly, an analysis investigating which of these factors was primary in reducing LI indicated that unusual experiences accounted for the majority of the variance of learning scores in the PE group and that, when the effect of unusual experiences was controlled for, impulsive non-conformity no longer reached significance. Thus LI appears to have something to do with reality distortion symptoms in schizophrenia.

A more recent study (Peterson & Carson, 2000) has shown reduction of auditory LI by a number of individual difference factors. Most notably high scorers on the openness scale of the NEO were found to reduce LI because of faster learning in the PE group. Interestingly, the openness scale is strongly related to unusual experiences (Mason & Claridge, 1997), and this finding is therefore consistent with the current study. In addition, Gibbons and Rammsayer (1999), using an almost identical LI paradigm to the current study, found that measures of impulsive unsocialized sensation seeking were significantly associated with LI by being significantly positively associated with learning in the PE (but not NPE) groups. Interestingly, regression analysis showed that there were independent contributions to LI for the psychoticism scale of the EPQ and the disinhibition subscale of Zuckerman’s Sensation Seeking Scale. This finding, viewed in conjunction with the current findings, may indicate that there may be effects on LI of sensation seeking that are not secondary to either positive schizotypy (i.e. unusual experiences) or reckless behaviour and risk taking (as defined by impulsive non-conformity and the psychoticism scale of the EPQ—which as previously discussed are both highly correlated).

Cognitive disorganization also reduces LI but owing to the less interesting effect of slowed learning in the NPE condition. Introvertive anhedonia has no effects upon LI. Thus not all dimensions of schizotypy are associated with reduced LI, and those that are can be predicted from a consideration of the schizophrenia LI literature.

The reduction of LI in schizophrenic patients has been put forward as a model for integrating the cognitive and neural concomitants of the positive symptoms of acute schizophrenia (Gray et al., 1991). The reduction of LI was never proposed to be a model of negative symptoms in chronic schizophrenia, given the robust finding that LI is intact in this group (Baruch et al., 1988a; Gray et al., 1992; Swerdlow et al., 1996; Williams et al., 1998). Our findings for negative schizotypy (introvertive anhedonia) are consistent with the notion that negative schizophrenic symptoms are not related to a reduction in LI, and the findings for positive schizotypy (unusual experiences) are consistent with an effect of positive schizophrenic symptoms on LI. Some people have argued that the reduction in LI in acute schizophrenia is due to the short-term effects of neuroleptic medication (Williams et al., 1998). Importantly, our results and those from other schizotypy studies rule out any possibility of a drug-confounded reduction of LI.
Our results support the proposition that the cognitive processes underlying the mediation of LI are related to the genesis of positive symptoms, be these mild schizotypal experiences in the healthy population or full-blown psychotic episodes in schizophrenia.

These results highlight an interesting paradox between the schizotypal and schizophrenia literature. In the schizophrenia literature, reduction of LI seems to be a state marker: it is abolished only in acute, unmedicated patients but is intact in chronic, medicated patients. For schizotypy, however, a reduction in LI must, by definition, be a trait marker. One obvious possibility is that LI is a trait marker in both schizotypy and schizophrenia, but that treatment with neuroleptic medication in chronic schizophrenic patients normalizes the effect. However, Gray et al. (1995) found that in drug-naïve schizophrenic patients, LI was abolished for those with a duration of illness of less than 12 months but was intact for those patients with a duration of illness of greater than 12 months. Therefore, the reinstatement of the LI effect in chronic schizophrenia cannot simply be due to medication effects. Clearly, whether reduced LI is a state or trait marker needs further clarification.

Unexpectedly, the cognitive disorganization subscale was found to predict slower learning in the NPE group. There was no difference in speed of learning for the PE group. The cognitive disorganization scale describes difficulties with attention and concentration, together with a sense of purposelessness and social anxiety (Mason et al., 1995). It is unclear why this effect was obtained and what its implications may be. Regardless, an effect on NPE implies alterations in basic associative learning and not about LI per se. However, a simple alteration in basic associative learning might also be expected to affect the PE group as well as the NPE group (thus leading to a main effect of cognitive disorganization but no interaction with pre-exposure). Yet it is notable that some previous studies of reduced LI in schizotypy (Lubow et al., 1992) and in schizophrenia (Gray et al., 1992) have shown changes in the NPE group alongside changes in the PE group. Why these changes occur should be investigated further.

The impulsive non-conformity scale of the OLIFE measures a propensity towards reckless behaviour, impulsiveness and risk taking. As such it appears to have much in common with the psychoticism scale of the EPQ (Eysenck & Eysenck, 1975), which has often been shown to be associated with changes in LI (Baruch et al., 1988b; Lubow et al., 1992). The psychoticism scale is not obviously related to the symptoms of schizophrenia and thus lacks face validity (which may explain why some schizotypy studies have omitted it). However, perhaps some of the behavioural characteristics measured by impulsive non-conformity correspond to the bizarre behaviour symptoms included in many standardized symptom rating scales (e.g. SAPS; Andreasen, Arndt, Allinger, Miller, & Flaum, 1985). However, it has been suggested that the scale is more akin to a measure of psychopathy and criminality rather than schizophrenia (Zuckerman, Kuhlman, & Camac, 1988).

In conclusion we have demonstrated that only certain dimensions of schizotypy are associated with reductions in LI. These findings offer the possibility of a more sophisticated understanding of the cognitive changes associated with psychosis and those who may be prone to it.

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References


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