European Journal of Personality
Eur. J. Pers. **19**: 1–16 (2005)
Published online in Wiley InterScience (www.interscience.wiley.com). **DOI**: 10.1002/per.572

Personality, Creativity and Latent Inhibition

GILES ST J. BURCH[1,2]*, DAVID R. HEMSLEY[2], PHILIP J. CORR[3] and CHRISTOS PAVELIS[4]

[1]*Department of Management and Employment Relations, The University of Auckland Business School, New Zealand*
[2]*Department of Psychology, Institute of Psychiatry, King's College London, UK*
[3]*Department of Psychology, University of Wales Swansea, UK*
[4]*Department of Psychology, Goldsmiths College, University of London, UK*

Abstract

The current study set out to investigate the relationship between creativity, multi-dimensional schizotypy and personality more generally. This was achieved by analysing scores on a range of personality scales and measures of creativity, where it was found that the creativity measures were more closely related to asocial-schizotypy than positive-schizotypy. The study also sought to test Eysenck's prediction (1993, 1995) that, given the putative relationship between creativity and psychosis-proneness, high psychosis-prone scoring individuals and high creativity scoring individuals would demonstrate the same cognitive style of 'overinclusiveness' on procedures for latent inhibition. However, the results failed to demonstrate any evidence of a shared 'widening of the associative horizon' between high creativity and high psychosis-prone scorers. The findings are discussed in relation to multi-dimensional schizotypy. Copyright © 2005 John Wiley & Sons, Ltd.

INTRODUCTION

The relationship between personality and creativity has long been of interest to psychologists, and there have been several attempts to describe the 'creative personality'. However, until recently there has not been any attempt to provide a causal model of how personality and creativity are linked. Eysenck (1993, 1995) proposed a causal theory of creative achievement, starting at the level of DNA, through hippocampal formation, cognitive inhibition (e.g. latent inhibition (LI) and negative priming), Psychoticism (P), trait creativity, to creativity as achievement (mediated by IQ and social-cultural variables). Most important to the Eysenckian theory is the notion that the dispositional personality trait of Psychoticism is related to creativity. Evidence for this link comes from the studies that have found a relationship between Psychoticism and current (trait) creativity, as

*Correspondence to: Giles St John Burch, Department of Management and Employment Relations, The University of Auckland Business School, Private Bag 92019, Auckland, New Zealand.
E-mail: g.burch@auckland.ac.nz

Received ???
Accepted ???

measured, for example, by tests of divergent thinking (e.g. Woody & Claridge, 1977) or word association (e.g. Merten, 1993).

Eysenck (1993) suggested that the link between Psychoticism and creativity is characterised by an overinclusive thinking style, which 'may be due to a failure of inhibition, characteristic of psychotics, high-P scorers, creative people and geniuses' (p. 248). Eysenck (1993) went on to suggest that this relationship should be tested experimentally on tasks of selective attention, arguing that a procedure for LI is probably the best candidate for this. LI has been described as the retardation in learning of a stimulus-stimulus association by virtue of the non-reinforced preexposure of one of the stimuli, and has been accounted for in terms of a two-factor process whereby an organism initially encodes stimulus qualities prior to learning any associations with that same stimulus (Lubow, 1989). LI is a robust phenomenon and has been proposed as a behavioural model of the positive symptoms of schizophrenia (see Gray, 1998; Gray, Feldon, Rawlins, Hemsley, & Smith, 1991; Lubow, 2005; Moser Hitchcock, Lister, & Moran, 2000; Weiner, 2003). Subsequently, LI has been widely investigated, with results demonstrating the disruption of LI in those diagnosed with (acute) schizophrenia (e.g. Rascale et al., 2001) and 'normals' scoring highly on measures of positive-schizotypy (e.g. Burch, Hemsley, & Joseph, 2004; Gray, Fernandez, Williams, Ruddle, & Snowden, 2002). LI has also been found to be disrupted in 'normals' administered low doses of the indirect dopamine agonist, amphetamine (e.g. Gray, Pickering, Hemsley, Dawling, & Gray, 1992), which is consistent with the dopamine hypothesis of schizophrenia (see McKenna, 1987).

Given the relevance of LI within the schizophrenia spectrum research, where it has been suggested that the cognitive abnormalities (e.g. attenuated LI) observed in individuals diagnosed with schizophrenia and high positive-schizotypy scorers may 'be seen as related to a weakening of inhibitory processes crucial to conscious attention' (Gray et al., 1991, p. 2), there have been suggestions that this phenomenon should be investigated in creative individuals, for whom it may be expected that an attenuation of the LI effect will also occur (e.g. Eysenck, 1993, 1995). Eysenck (1995) suggested that a common element of the cognitive theories of schizophrenia (describing the failure of individuals diagnosed with schizophrenia to 'filter out' irrelevant stimuli) is the idea that the associative process is disrupted, whereby the cognitive processes of those diagnosed with schizophrenia are disturbed, thus interfering with the ability to attend effectively to relevant stimuli and ignore irrelevant stimuli. Eysenck (1995) has also suggested that there is a widening of the associative horizon in 'schizophrenia', and that this is what is observed in LI, where latent inhibition fails to 'limit associationist spreading'. Thus, the disruption in the LI effect is manifested as improved performance on the task itself; however, this improvement in performance results in a weakness from the point of view of resource allocation.

Given that LI has been found to negatively correlate with Psychoticism (e.g. Baruch, Hemsley, & Gray, 1988a), Eysenck (1993) predicted that LI would also negatively correlate with creativity. However, Claridge (1993), in his critique of Eysenck's model, suggested that Psychoticism does not generally load onto the factor now recognised to be the component of schizotypal personality[1] most related to psychosis-proneness, i.e. that of

[1]There is increasing evidence that schizotypal personality is a multi-dimensional construct, with research from factor-analytic studies (generally) revealing four factors (e.g. Bentall, Claridge, & Slade, 1989; Claridge et al., 1996; Williams, 1994): positive-schizotypy (reflecting the positive symptomatology of schizophrenia), negative-schizotypy (reflecting the negative symptomatology of schizophrenia), asocial-schizotypy (reflecting more anti-social and tough-minded behaviour—with Psychoticism loading onto this factor) and cognitive-disorganisation (reflecting a difficulty with concentration and decision-making).

positive-schizotypy, and thus this poses a problem for Eysenck. Interestingly, Claridge (1993) also pointed out how Psychoticism can also load onto 'anhedonia', which, it would be presumed, would not be a good predictor of motivation, which Eysenck (1993) suggested was necessary for creative achievement. Thus, any study seeking to investigate the relationship between psychosis-proneness and creativity will need to consider the multi-dimensional nature of schizotypy.

Whilst Eysenck (1993) believed divergent thinking tests to be direct measures of trait creativity, others view them as cognitive skill tests and suggest that, whilst they correlate with personality models of creativity, they are actually separate predictors of 'creativity' (e.g. James & Asmus, 2001). It has also been pointed out how divergent thinking and creativity have become synonymous, and that divergent thinking is only one aspect of creative thinking, which, it has been suggested, has certainly been inflated in terms of its importance (King & Anderson, 1995). Thus, other factors need to be taken into account when considering the relationship between schizotypy and creativity, for example Openness and creative personality. Openness to Experience, characterised by an open attitude to new and novel ideas, originality, imagination and intellectual curiosity (Costa & McCrae, 1992), has been found, perhaps unsurprisingly, to correlate with creativity (e.g. McCrae, 1987). Therefore, should a relationship between creativity and schizotypy exist, it would be expected that Openness may be similarly related to LI. Whilst Peterson and colleagues (Carson, Peterson, & Higgings, 2003; Peterson & Carson, 2000; Peterson, Smith, & Carson, 2002) have recently demonstrated a relationship between LI and Openness, Wuthrich and Bates (2001) found no relationship between LI and *any* of the 'Big Five', including Openness. An alternative to Openness as a measure of trait creativity is Gough's Creative Personality Scale (CPS; Gough, 1979), used to assess traits (believed to be) related to creative ability. The CPS has been found to correlate with Openness and divergent thinking (e.g. McCrae, 1987; Piedmont, McCrae, & Costa, 1991). Peterson et al. (2002) also found CPS scores to be negatively related to LI, which suggests that any investigation into the relationship between LI and creativity also needs to take account of these factors. The aims of the current study were therefore to investigate the relationship between creativity, multi-dimensional schizotypy and personality (more generally), through investigating the relationship of a range of personality measures and divergent thinking tests, and also the relationship of these variables with LI, for which it was hypothesised that LI would negatively correlate with creativity.

METHOD

Participants

One hundred (latent inhibition-naïve) undergraduate students volunteered to take part in the study (67 female; 33 male; mean age = 22.9 years; $SD = 5.16$). Exclusion criteria included any history of mental health problems, illicit drug use or alcohol dependency. All the participants had normal (or corrected-to-normal) vision and were paid £10 for their participation in the study.

Psychometric measures & divergent thinking tests

A range of psychometric instruments were included in the study to provide a comprehensive picture of the relationship between personality, creativity and LI:

1. The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason, Claridge, & Jackson, 1995), a multi-dimensional measure of schizotypal personality demonstrating sound psychometric properties (see Burch, Steel, & Hemsley, 1998; Mason et al., 1995), made up of scales of positive-schizotypy (Unusual Experiences; UnEx), disorganised-schizotypy/social anxiety (Cognitive Disorganisation; CogDis), asocial-schizotypy (Impulsive Nonconformity; ImpNon) and negative-schizotypy (Introvertive Anhedonia; IntAn). The Schizotypal Personality Scale (STA; Claridge & Broks, 1984) is also included in the O-LIFE.
2. The NEO-FFI (Costa & McCrae, 1992), a well-established measure of the 'Big Five' factors of personality, comprising scales of Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A) and Conscientiousness (C).
3. The EPQ-R (Eysenck & Eysenck, 1991[Q1]), the Eysenck's measure of personality, comprising scales of Neuroticism (N), Extraversion (E) and Psychoticism (P). Q1
4. The Creative Personality Scale (CPS; Gough, 1979), a measure of 'creative personality', developed from the Adjective Check List (Gough & Helibrun, 1965) and cross-validated on a sample in excess of over 1700.
5. The Trait (STAI/T) and State (STAI/S) scales of the Strait-Trait Anxiety Inventory (STAI; Spielberger, 1983).
6. Wechsler Abbreviated Scale of Intelligence (Full Scale IQ two subtest (FSIQ—2; Vocabulary and Matrix Reasoning; WASI; Wechsler, 1999), a brief and reliable measure of intelligence, providing an estimated IQ score against the WAIS—III (Wechsler, 1997).
7. The Instances and Uses tests of divergent thinking from Wallach and Kogan (1965) divergent thinking battery. The Uses and Instance tests were chosen to maintain consistency with Green and William (1999) recent investigation into the relationship between divergent thinking and negative priming. Green and Williams' rationale for selecting these two sub-tests was that 'evidence suggests that these particular sub-tests provide the most unambiguous measure of the 'overinclusive' cognitive process under investigation' (p. 265). Instructions for the two tests followed the original format of Wallach and Kogan (1965). For each test, the number of unique responses (relative to all responses within the current sample) and total number of responses were noted.

Apparatus

The LI procedure was presented on a Digital HiNote Ultra 2000 laptop computer, with a 14.1-inch TFT XGA colour LCD display. An external response keypad was attached to the computer, with six response buttons correspondingly positioned and labelled with the stimuli letters presented in the LI task.

Procedure

The participants completed the psychometric measures along with a reaction time-based within-participants procedure for LI. Order of administration of the psychometrics and divergent thinking task was counterbalanced, with half the sample completing the questionnaires/tests prior to the LI task and the other half after completing the procedure.

Latent inhibition—preexposure phase

The procedure employed in the current study was the recently developed and validated within-participants reaction time LI procedure (De la Casa & Lubow, 2001), with each

participant being presented with both non-preexposed (NPE) and preexposed (PE) stimuli.

All the participants were positioned approximately 50 cm from the computer screen, with a response pad positioned to either the left- or right-hand side of the computer, depending on which was the dominant hand. The preexposure phase comprised a tracking task, during which the participant was asked to look at a series of six letters, 'A' (alphabetically) through to 'F' on the computer screen. The letters were all coloured black. One of the letters was randomly replaced by a black square and the participant was asked to press the key on the response pad that corresponded to the 'replaced' letter as quickly as possible. The black square appeared two seconds following commencement of the trial, which was subsequently terminated when the participant hit any of the response keys. The inter-stimulus interval was 750 milliseconds. At the beginning of the task the following instructions were presented to each participant on the computer screen:

> 'You are going to participate in a visual-motor task. On the computer screen, six letters (from 'A' to 'F') will appear. Sometimes a black square will cover up one of the letters. Your task will be to press the key corresponding to the covered letter. You must make your response using the letters A to F located on the keypad. We will begin with some sample trials. Press any key to begin'.

Following three practice trials the participants were asked if they understood the nature of the task and subsequently entered into the preexposed phase, which comprised the tracking task for another 30 trials for which the background was coloured either yellow or green (the preexposed stimuli). The coloured (preexposed) background was counterbalanced yellow and green between participants (see Appendix 1). The position of the six letters remained constant throughout.

Latent inhibition—test phase

The test phase (which was the same for all participants) commenced immediately. The participants were presented the following instructions on the computer screen:

> 'From now on there will be a rule that permits you to predict the position at which the black square will appear. You must try to discover that rule. You must press the key corresponding to the letter where you think that the black square will appear, but BEFORE it appears. After your response, the correct window will turn black. Try to get as many correct responses as possible by discovering the rule. To begin, press any key'.

The test phase comprised 90 trials, divided into 15 blocks of six. During each trial, the black square replaced one of the six letters. Within each block, during one of the trials the green background was present (the *preexposed stimulus (PE)* for the participants who had been presented with the green background during the preexposure phase, or the *non-preexposed stimulus (NPE)* for the participants who had been presented with the yellow background during the preexposure phase). During another trial, the yellow background was present (the *preexposed stimulus (PE)* for the participants who had been presented with the yellow background during the preexposure phase, or the *non-preexposed stimulus (NPE)* for the participants who had been presented with the green background during the preexposure phase). For the remaining four trials there was a neutral, non-coloured background. (See Appendix 1 and 2 for the position of letters and background, which were displayed across the computer screen).

The order of presentation was randomised for each participant, although the position of the six letters remained constant throughout. When the green background was present, the black square would appear over the letter 'D' position; when the yellow background was present, the black square would appear over the letter 'F' position. The presentation position of the black square was counter-balanced for preexposed and non-preexposed colours between the 'D' and 'F' positions. When there was no background colour, the black square randomly appeared in *any* of the four remaining letter positions: 'A', 'B', 'C' or 'E'. Thus, only the green or yellow backgrounds predicted the impending position of the black square. For each trial, the six letters were presented and the participants had to press a response button corresponding to the position in which they predicted the black square would appear. On pressing one of the six response buttons, the black square immediately appeared in one of the six letter positions for a period of one second, at which point the trial ended. The dependent variable was the reaction time (RT) (between onset of the trial and response) for each correct and incorrect trial for both the green and yellow (PE or NPE) backgrounds.

RESULTS

In order to confirm the validity of the present task as a procedure for latent inhibition, the sample were dichotomised into high and low schizotypy groups based upon a median split of Unusual Experiences (UnEx)[2] scores (median = 11). Mean reaction times to both the NPE and PE stimuli for both the high and low schizotypy groups are shown in Figure 1.

Whilst a mixed 2×2 ANOVA (PE vs. NPE; UnEx) revealed no main effect of preexposure ($F(1, 98) = 0.05$; $p = 0.82$) or UnEx ($F(1, 98) = 1.05$; $p = 0.31$), a significant two-way interaction between preexposure and UnEx was revealed ($F(1, 98) = 13.16$);

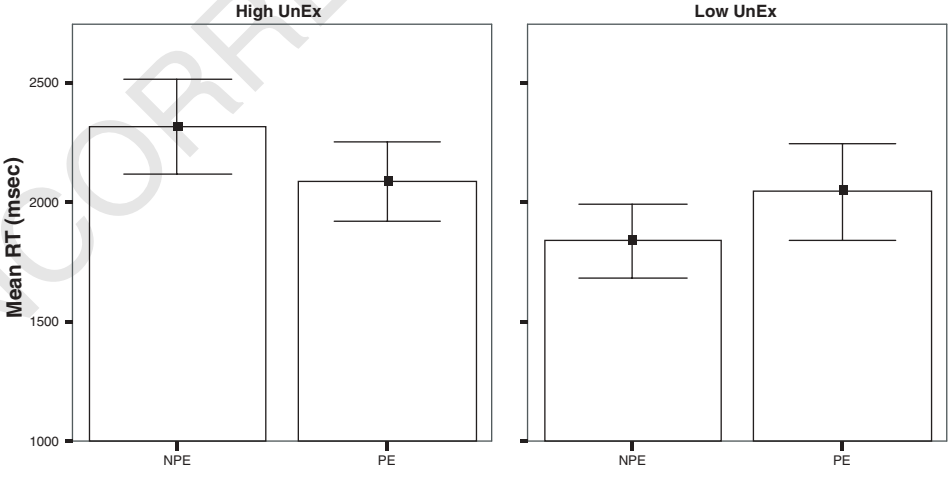


Figure 1. Mean reaction times (RT) in milli-seconds (ms) to the non-preexposed (NPE) and preexposed (PE) stimuli, for the high and low Unusual Experiences groups. Error bars represent ± 1 standard error of the mean.

[2]Disruption of latent inhibition has been demonstrated previously in high Unusual Experiences scorers on more traditional trials-to-criterion LI procedures (e.g. Burch et al., 2004; Gray et al., 2002), and is recognised as a reliable and valid scale of positive-schizotypy.

$p < 0.001$). These findings suggest the typical relationship between LI and schizotypy, i.e. a disrupted latent inhibition effect in the high schizotypy group but not the low schizotypy group. However, the failure to establish a significant main effect of preexposure is inconsistent with other schizotypy studies (e.g. Lubow & De la Casa, 2002). This is the result of a cross-over in the interaction, where there is an inhibition effect in the low schizotypy group and a facilitation effect in the high schizotypy group, thereby cancelling out the main effect. It should also be noted that whilst LI is disrupted in the high UnEx group, there appears to be a wider impairment in basic associative learning for this group, with slower reaction times to both the NPE and the PE stimuli compared with the low schizotypy scoring group—a finding noted previously in the LI research (e.g. Serra, Jones, Toone, & Gray, 2001). Clearly this is something that warrants further explicit investigation.

Analysis of the number of correct number of responses on the LI procedure was also conducted for both the high and low schizotypy groups. It was found that for the low schizotypy group, mean correct responses for the NPE and PE conditions were: NPE = 5.67 ($SD = 3.47$); PE = 5.84 ($SD = 3.84$), whilst for the high schizotypy group mean correct responses were: NPE = 5.65 ($SD = 3.17$); PE = 6.28 ($SD = 3.38$). A mixed 2×2 ANOVA (PE vs. NPE; UnEx) revealed neither any main effect of preexposure ($F(1, 98) = 2.92$; $p = 0.09$), UnEx ($F(1, 98) = 0.10$; $p = 0.76$), nor an interaction between preexposure and UnEx ($F(1, 98) = 0.94$; $p = 0.33$). These findings therefore failed to demonstrate an LI effect on the current procedure using correct responses as the dependent variable, and are consistent with De la Casa and Lubow (2001) and Lubow and De la Casa (2002), who also failed to establish a within-subject correct response-based effect in a series of studies. Lubow and De la Casa (2002, p. 82) concluded that 'the dissociation between RT and correct response ... can be accounted for by the relative difficulty of the within-subject task', and go on to suggest that the reaction time is a more sensitive measure than the correct responses, and is required to detect LI on this procedure.

Means and standard deviations for the personality, IQ and creativity variables are shown in Table 1, along with their correlations with LI, where LI is expressed as the difference in reaction time scores between the PE and NPE conditions; PE *minus* NPE.[3] Correlations between the personality, IQ and creativity variables are shown in Table 2.

Given the large number of variables, in order to reduce these in subsequent analysis, and thus reduce inflated alpha levels associated with multiple correlations, data were entered into a principal components analysis (PCA), and saved factor scores employed in subsequent analysis. Such an approach is advocated by Tabachnick and Fidell (2001), who suggested that factor scores can be used to replace larger numbers of independent variables in a multiple regression, especially important given to the smaller sample size of the current study ($n = 100$). All personality variables were included in the PCA, along with WASI scores and a combined uniqueness score derived from summating the uniqueness scores of the Uses and Instances tests [it has been suggested that uniqueness is 'more central to creativity' than fluency (e.g. Stravridou & Furnham, 1996, p. 150)]. Thus, the *n*-cases:*n*-variables ratio was 100:18, or 5.6:1, an acceptable ratio for factor analysis; Hair, Anderson, Tatham and Black (1995) suggest that the minimum acceptable ratio is 5:1. The Kaiser–Meyer–Olkin (KMO) measure of sampling

[3]This approach was adopted in order to provide a continuous variable for latent inhibition, thereby reducing a possible loss of power associated with dichotomising a continuous variable, and subsequent Type II error.

Table 1. Descriptive statistics of personality, divergent thinking, WASI and LI (difference) scores, and Pearson's correlations with latent inhibition ($n = 100$)

	Mean	SD	Latent inhibition *r*
Latent inhibition	−39.55	630.68	
Unusual experiences (UnEx)	12.21	6.55	**−0.31****
Cognitive disorganisation (CogDis)	12.13	5.66	−0.11
Impulsive nonconformity (ImpNon)	9.54	3.82	0.00
Introvertive anhedonia (IntAn)	4.99	3.74	−0.07
STA	17.41	7.10	**−0.24****
Neuroticism (N; NEO)	24.43	8.87	**−0.18***
Extraversion (E; NEO)	29.90	6.35	0.11
Openness (O; NEO)	32.48	6.39	−0.02
Agreeableness (A; NEO)	30.47	5.91	−0.03
Conscientiousness (A; NEO)	29.93	7.57	−0.12
Psychoticism (P; EPQ-R)	7.66	4.19	0.00
Extraversion (E; EPQ-R)	14.63	4.85	0.13
Neuroticism (N; EPQ-R)	13.09	5.52	−0.10
CPS	3.74	3.26	**0.21***
State anxiety (STAI/S)	35.81	8.65	−0.07
Trait anxiety (STAI/T)	42.15	9.40	−0.13
Instances total	55.91	44.58	**0.22***
Uses total	55.15	37.07	**0.21***
Instances uniqueness	5.27	2.19	**0.22***
Uses uniqueness	8.74	2.39	**0.20***
WASI	111.19	11.54	**0.24****

*$p < 0.05$; **$p < 0.01$ (one-tailed). Significant relationships highlighted in bold.

adequacy was 0.75, indicating the suitability of this data for factor analytic procedures. Following Tabachnick and Fidell (2001) recommendation, Bartlett (1954) test of sphericity was not used since the *n*-cases:*n*-variables ratio was greater than 5:1, and thus would likely be significant even if the correlations were very low. An initial solution without rotation was computed and subsequent examination of the Scree Plot (Cattell, 1966) indicated a five-factor solution. Thus, a second analysis was computed using Direct Oblimin (oblique) rotation. Oblique rotation was chosen as there was no reason to believe that the underlying factors would not necessarily be related to each other; thus, an orthogonal rotation might generate an artificial solution (Rust & Golombok, 1999). Loadings of variables, eigenvalues and variance statistics are displayed in Table 3.

With all the variables entered into the analysis, the solution extracted five distinct factors, which accounted for 72% of the total variance. The cut-off point for inclusion of a variable onto a factor was 0.45. It can be seen that all variables loaded at and above this level onto the five-factor solution, with minimal cross-loadings. The factor loadings appear to be relatively unambiguous, and make intuitive sense in terms of their representation of dimensions of personality as we presently understand them within a psychological framework, with Factor 1 representing what we have labelled 'Neuroticism'; Factor 2, 'Social Intelligence'; Factor 3, 'Extraversion'; Factor 4, 'Creativity' and Factor 5, 'Positive-Schizotypy'. The five factor scores were saved using the regression method and regressed onto LI (expressed as the difference in reaction time scores between the PE and NPE conditions; PE *minus* NPE).

Table 2. Pearson correlation coefficients between personality variables, divergent thinking and IQ ($n = 100$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21
1. UnEx	—																			
2. CogDis	0.50**	—																		
3. IntAn	0.27**	0.43**	—																	
4. ImpNon	0.41**	0.31**	0.05	—																
5. STA	0.88**	0.74**	0.35**	0.37**	—															
6. N[1]	0.34**	0.68**	0.29**	0.30**	0.53**	—														
7. E[1]	−0.20*	−0.39**	−0.61**	0.11	−0.30*	−0.33**	—													
8. O[1]	0.36**	0.03	−0.14	0.27**	0.22*	0.16	−0.12	—												
9. A[1]	−0.20*	−0.19	−0.33**	−0.41**	−0.21*	−0.21*	0.25*	0.04	—											
10. C[1]	−0.08	−0.35**	−0.18	−0.41**	−0.17	−0.29**	0.17	−0.07	0.35**	—										
11. P[2]	0.23*	0.07	0.26*	0.55**	0.14	0.02	−0.16	0.23*	−0.58**	−0.47**	—									
12. E[2]	−0.13	−0.41**	−0.59**	0.25*	−0.28**	−0.38	0.78**	−0.05	0.09	0.08	0.03	—								
13. N[2]	0.37**	0.80**	0.36**	0.21*	0.56**	0.72**	−0.34**	0.03	−0.25*	−0.16	−0.05	−0.37**	—							
14. CPS	−0.05	−0.29**	−0.22*	0.26**	−0.14	−0.23*	0.31**	0.25*	0.08	0.06	0.20*	0.33**	−0.42**	—						
15. STAI/S	0.21*	0.39**	0.20*	0.03	0.33**	0.41**	−0.32**	0.02	−0.12	−0.08	−0.08	−0.23*	0.42**	−0.29**	—					
16. STAI/T	0.37**	0.62**	0.40**	0.23*	0.48**	0.73**	−0.51**	0.17	−0.37**	−0.24**	0.17	−0.37**	0.68**	−0.29**	0.55**	—				
17. WASI	−0.22*	−0.31**	−0.15	−0.02	−0.28**	−0.19	0.11	0.28**	0.00	0.06	0.14	0.09	−0.28**	0.24**	−0.19	−0.13	—			
19. Instances (total)	−0.23*	−0.11	−0.14	0.18	−0.23*	0.07	0.17	0.05	0.00	0.08	−0.07	0.21*	−0.04	0.32**	−0.01	0.05	0.20*	—		
20. Uses (total)	−0.13	−0.12	−0.03	0.23*	−0.17	0.06	0.14	0.13	−0.15	0.09	0.07	0.16	−0.01	0.35**	−0.06	0.10	0.24**	0.81**	—	
21. Instances (uniqueness)	−0.18	−0.19	−0.20	0.10	−0.24*	−0.06	0.20*	0.14	0.04	0.15	−0.04	0.29**	−0.11	0.31**	−0.08	−0.02	0.37**	0.85**	0.69**	—
22. Uses (uniquences)	−0.11	−0.16	−0.04	0.26**	−0.18*	0.00	0.16	0.17	−0.18	0.09	0.14	0.18	−0.07	0.37**	−0.04	0.09	0.35**	0.76**	0.95**	0.70**

*$p < 0.05$; **$p < 0.01$ (two-tailed).
[1]NEO FFI.
[2]EPQ-R.

Table 3. Oblimin rotated factor loadings for the five factor solution ($n = 100$)

	Factor 1, neuroticism	Factor 2, social intelligence	Factor 3, extraversion	Factor 4, creativity	Factor 5, positive-schizotypy
Neuroticism (EPQ-R)	0.88				
Neuroticism (NEO)	0.85				
Trait anxiety	0.84				
Cognitive disorganisation	0.80				
State anxiety	0.67				
Psychoticism		−0.83			
Agreeableness		0.78			
Impulsive non-conformity		−0.71			0.50
Conscientiousness		0.71			
Extraversion (EPQ-R)			0.90		
Extraversion (NEO)			0.90		
Introvertive anhedonia			−0.74		
Uniqueness (combined)				0.76	
WASI				0.76	
CPS				0.53	
Unusual experiences					0.87
STA	0.57				0.78
Openness to experience				0.52	0.66
Eigenvalue	5.75	2.71	1.76	1.50	1.31
Percentage of variance	31.97	15.05	9.79	8.31	7.30
Cumulative variance	31.97	47.02	56.81	65.12	72.42

Only loadings above 0.45 are shown for clarity.

A standard regression was calculated with LI as the dependent variable and the saved factor scores as the independent (predictor) variables at Step 1, with the model reaching formal significance, $R^2 = 0.12$ ($F(5, 99) = 2.61$; $p = 0.03$, and Creativity and Positive-Schizotypy revealed as significant predictors (see Table 4).

Interactions between the key variables (Creativity, Social Intelligence and Positive-Schizotypy) were also entered into the equation at Step 2, where the overall model failed to reach formal significance, $R^2 = 0.15$ ($F(9, 99) = 1.73$; $p = 0.09$), although Creativity and Positive-Schizotypy were retained significant predictors (see Table 5). However, the regression coefficients show Positive-Schizotypy to be negatively related to LI and Creativity to be positively related—inconsistent with theoretical prediction. Neither any variable, nor any of the interactions between the key variable, were revealed as predictors.

Table 4. Standard multiple regression on latent inhibition (Step 1) ($n = 100$)[Q3] Q3

	Standardised regression coefficient	
	β	t
Factor 1 (neuroticism)	−0.04	−0.29
Factor 2 (social intelligence)	−0.13	−1.06
Factor 3 (extraversion)	0.07	0.69
Factor 4 (creativity)	**0.23**	**2.32***
Factor 5 (positive-schizotypy)	**−0.23**	**−2.27***

*$p < 0.05$.

Table 5. Standard multiple regression on latent inhibition (Step 2) ($n = 100$)

	Standardised regression coefficient	
	β	t
Factor 1 (neuroticism)	−0.04	−0.40
Factor 2 (social intelligence)	−0.13	−1.17
Factor 3 (extraversion)	0.05	−0.51
Factor 4 (creativity)	0.29	2.41*
Factor 5 (positive-schizotypy)	−0.24	−2.32*
Creativity × positive schizotypy	−0.06	−0.47
Social intelligence × creativity	−0.03	−0.20
Positive schizotypy × social intelligence	−0.06	−0.61
Positive schizotypy × social intelligence × creativity	−0.15	−1.16

*$p < 0.05$.

DISCUSSION

In relation to the findings pertaining to LI, whilst positive-schizotypy was found to be (negatively) related to LI; divergent thinking, CPS scores and the *Creativity* factor scores were found to be (positively) related with LI. These findings are in the *opposite* direction to that predicted by Eysenck. It is interesting to note that Unusual Experiences was not found to be (positively) related to either divergent thinking or CPS scores, whilst Impulsive Nonconformity was found to be (positively) correlated with divergent thinking (Uses) scores and CPS scores, and Psychoticism (positively) correlated with CPS scores. These findings suggest that the relationship between creativity and schizotypy may actually be with asocial-schizotypy, reflecting a propensity to endorse socially undesirable responses rather than a relationship with 'psychosis-proneness' *per se*, as previously suggested by, for example, Brod (1997)[Q1] and Gough (1993). The results also failed to reveal a relationship between Openness and LI. Therefore, the current findings fail to provide any support for Eysenck's predictions, or indeed substantiate the findings of Peterson (Carson et al., 2003; Peterson & Carson, 2000; Peterson et al., 2002), although they are consistent with Wuthrich and Bates' (2001) failure to find a relationship between LI and Openness. It is not clear as to why this should be. Whilst it may be suggested that creativity is more closely related to asocial-schizotypy, rather than positive-schizotypy, this does not explain the failure in the current study to demonstrate a relationship between asocial-schizotypy and LI, and the measures of creativity and LI, as shown by Peterson et al. However, it is interesting to note that IQ was found to negatively correlate with Unusual Experiences, a finding similar to that of Burch et al. (2004), who found a negative relationship between Unusual Experiences and verbal IQ. Whilst Burch et al. (2004) did not find an effect of IQ on LI, such a relationship was revealed in the current study, with IQ positively correlated with LI—a relationship similar to that found with divergent thinking and CPS scores. Perhaps the current findings could be explained by the lower IQ score with the current sample, where creativity has not separated out sufficiently enough from IQ to provide any meaningful distinction between these two variables with LI. It has been suggested that IQ and creativity separate out at a level probably in excess of 120 (Rushton, 1990[Q1]); mean IQ in the Peterson studies was in excess of 120.

As described in the Results section, another issue with the current study in relation to LI is the failure to establish a significant main effect of preexposure. It was suggested that this

was the result of a cross-over in the interaction, with an inhibition effect in the low schizotypy group and a facilitation effect in the high schizotypy group. Whilst such a facilitation effect in the high schizotypy group is unusual, it is consistent with the theoretical literature (see, e.g. Burch et al., 2004; Hemsley, 1993, 1994), and has been observed previously in acute schizophrenics (see Baruch, Hemsley, & Gray, 1988b; Gray, Hemsley, & Gray, 1992). This facilitation effect is possibly the result of a sample excessively skewed towards the upper end of schizotypy: the Unusual Experiences mean score in the current study was 12.21, which is higher than the reported mean in other studies, e.g. Gray et al. (2002) who reported a mean score of 8.81; and Steel, Hemsley, and Jones (1996)[Q1] who reported a mean score of 9.08. However, should the high schizotypy scores in the current study be used to explain this failure to find a latent inhibition effect across the sample, due care should be taken in generalising the current findings. Perhaps at this stage it is necessary to take account of criticisms of LI itself, for example, Claridge (1993) questions whether LI is 'high-level' enough to detect any differences between these groups. For example, as Claridge (1993, p. 187) wrote:

> '—his [*Eysenck's*] attempt to provide a biological basis for the psychosis-creativity connection—I have to express a sense of disappointment . . . Here the prominence he gives to the latent-inhibition paradigm seems particularly ill-judged' . . . 'This criticism is, if anything, sharpened by Eysenck's attempt to extrapolate the paradigm to creativity. Ironically, it is precisely the proposed association between creativity and psychosis that provides one of the strong arguments against latent inhibition as a comprehensive model for schizophrenia, added to which is the fact that the model is very much predicated on a neurological-disease view of psychosis, drawing heavily on neuropathological data—hardly a promising beginning for a theory of creativity!'

Thus, it may be that procedures for LI may not be quite as 'ideal' for investigating this relationship as Eysenck suggested. However, given the prominence of LI within the schizophrenia research over the past 12 years, this criticism becomes less convincing. It may be that the particular procedure employed in the current study is not as robust or reliable as others used in LI research; support for this may come from the current failure to replicate an overall LI effect with this procedure. Further research exploring the validity of the LI procedure employed in this study is recommended.

However, despite these concerns, the current findings *are* consistent with others across the literature, which have failed to demonstrate a relationship between divergent thinking/creativity and 'attentional processing', i.e. failing to demonstrate a shared overinclusive cognitive style between high schizotypy scorers and high creativity scorers (e.g. Stavridou & Furnham, 1996; Green & Williams, 1999). Thus, the current study lends support to Green and Williams (1999) suggestion that divergent thinking (or indeed, 'creativity' more widely) may not be associated with the same attentional mechanisms that are associated with cognitive inhibition as those observed in high schizotypes. Note should also be taken of Dudek's (1993) critique of Eysenck's model, in which she suggested that it was wrong of Eysenck to develop this model on the basis of 'inference'. She suggested that overinclusiveness makes creative synthesis very difficult, and that it is unlikely that creative individuals have a shared cognitive style of overinclusiveness in any pathological sense.

Interestingly, in the current factor analysis, none of the schizotypy scales loaded onto the *Creativity* factor, and the only link between positive-schizotypy and creativity appeared to be Openness, which loaded onto both *Creativity* and *Positive-Schizotypy*. This is consistent with Rawlings and Freeman's (1997) factor structure, which revealed a 0.45

loading of Unusual Experiences onto Openness. Thus, if positive-schizotypy is more closely aligned with Openness to Experience then this (given the findings in relation to divergent thinking) suggests that Openness (as a measure creative personality) may be related to positive-schizotypy, whilst divergent thinking (as a measure of ideational [or creative] expression) may be more closely related to asocial-schizotypy. Clearly further investigation is required in order to explore this relationship in more detail.

Finally, it is also interesting to note that whilst Neuroticism (NEO PI-R) was associated with LI, Neuroticism (EPQ-R), the two anxiety scales and the Neuroticism factor were not found to be significantly related with LI. This is in contrast with previous findings in the literature. Whilst Baruch (1988) failed to reduce latent inhibition in those classified as anxious according to Gray's (1970) anxiety dimensions (non-anxious [high extraversion + low neuroticism]; anxious [low extraversion + high neuroticism]), Braunstein-Bercovitz (2000) found reduced latent inhibition in participants scoring highly on the State-Trait Anxiety Inventory (trait anxiety sub-scale). Similar findings were also obtained in two studies investigating the relationship between stress and latent inhibition (Braunstein-Bercovitz, Dimentman-Ashkenazi, & Lubow, 2001), where it was found that latent inhibition was attenuated in the highly stressed groups. This is an area that warrants further investigation, if, as Braunstein-Bercovitz, Rammsayer, Gibbons and Lubow (2002) have suggested, it may in actuality be anxiety that modulates latent inhibition, rather than 'psychosis-proneness'.

In reviewing the current findings, and the results in the literature more generally, there does appear to be 'some' consistency in the failure to support Eysenck's hypothesis. However, it is essential that for any future studies, we are conceptually clear about the dimensions of schizotypy and creativity that we are measuring, and the role of IQ in this relationship.

ACKNOWLEDGEMENTS

The authors would like to thank Gonzalo De la Casa for his assistance with the procedure employed in the study, and also to three anonymous reviewers for their constructive comments on an earlier draft of this paper.

REFERENCES

Bartlett, M. S. (1954). A note on the multiplying factors for various chi square approximations. *Journal of the Royal Statistical Society, 16*(B), 296–298.

Baruch, I. (1988). *Differential performance of acute and chronic schizophrenics in a latent inhibition task and its relevance for the dopamine hypothesis and the dimensional view of psychosis.* Unpublished PhD Thesis. University of London.

Baruch, I., Hemsley, D. R., & Gray, J. A. (1988a). Latent Inhibition and 'psychotic-proneness' in normal subjects. *Personality and Individual Differences, 9*, 777–783.

Baruch, I., Hemsley, D. R., & Gray, J. A. (1988b). Differential performance of acute and chronic schizophrenics in a latent inhibition task. *Journal of Nervous and Mental Disease, 176*, 598–606.

Bentall, R. P., Claridge, G. S., & Slade, P. D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. *British Journal of Clinical Psychology, 28*, 363–375.

Braunstein-Bercovitz, H. (2000). Is the attentional dysfunction in schizotypy related to anxiety? *Schizophrenia Research*, 255–267.

Braunstein-Bercovitz, H., Dimentman-Ashkenazi, I., & Lubow, R. E. (2001). Stress affects the selection of relevant from irrelevant stimuli. *Emotion, 1*, 182–192.
Braunstein-Bercovitz, H., Rammsayer, T., Gibbons, H., & Lubow, R. E. (2002). Latent inhibition deficits in high-schizotypal normals: Symptom-specific or anxiety-related? *Schizophrenia Research, 53*, 109–121.
Burch, G. St. J., Steel, C., & Hemsley, D. R. (1998). Oxford-Liverpool Inventory of Feelings and Experiences: Reliability in an Experimental Population. *British Journal of Clinical Psychology, 37*, 107–108.
Burch, G. St. J., Hemsley, D. R., & Joseph, M. H. (2004). Trials-to-criterion latent inhibition in humans as a function of stimulus pre-exposure and positive-schizotypy. *British Journal of Psychology, 95*, 179–196.
Carson, S. H., Peterson, J. B., & Higgins, D. M. (2003). Decreased latent inhibition is associated with increased creative achievement in high-functioning individuals. *Journal of Personality and Social Psychology, 85*, 499–506.
Cattell, R. B. (1966). The Scree test for the number of factors. *Multivariate Behavioural Research, 1*, 141–161.
Claridge, G. (1993). When is Psychoticism Psychoticism? And how does it really relate to creativity? *Psychological Inquiry, 4*, 184–188.
Claridge, G. S., & Broks, P. (1984). Schizotypy and hemisphere function I: Theoretical consideration and the measurement of schizotypy. *Personality and Individual Differences, 5*, 633–648.
Claridge, G., McCreery, C., Mason, O., Bentall, R., Boyle, G., Slade, P., & Popplewell, D. (1996). The factor structure of 'schizotypal' traits: A large replication study. *British Journal of Clinical Psychology, 35*, 103–115.
Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO PI-R): Professional Manual.* Odessa: Psychological Assessment Resources, Inc.
De la Casa, L. G., & Lubow, R. E. (2001). Latent inhibition with a response time measure from a within-subject design: Effects of number of preexposures, masking task, context change and delay. *Neuropsychology, 15*, 244–253.
Dudek, S. Z. (1993). Creativity and psychoticism: An overinclusive model. *Psychological Inquiry, 4*, 190.
Eysenck, H. J. (1993). Creativity and personality: Suggestions for a theory. *Psychological Inquiry, 4*, 147–178.
Eysenck, H. J. (1995). *Genius: The natural history of creativity.* Cambridge: Cambridge University Press.
Gough, H. G. (1979). A creative personality scale for the adjective check list. *Journal of Personality and Social Psychology, 37*, 1398–1405.
Gough, H. G. (1993). The assessment piece of the creativity pie. *Psychological Inquiry, 4*, 196–200.
Gough, H. G., & Heilbrun, A. B., Jr. (1965). *Adjective check list manual.* Palo Alto, CA: Consulting Psychologists Press.
Gray, J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behaviour Research and Therapy, 8*, 249–266.
Gray, J. A. (1998). Integrating schizophrenia. *Schizophrenia Bulletin, 24*, 249–266.
Gray, J. A., Feldon, J., Rawlins, J. N. P., Hemsley, D. R., & Smith, A. D. (1991). The neuropsychology of schizophrenia. *Behavioural and Brain Sciences, 14*, 1–84.
Gray, N. S., Hemsley, D. R., & Gray, J. A. (1992). Abolition of latent inhibition in acute, but not chronic, schizophrenics. *Neurology and Psychiatry and Brain Research, 1*, 83–89.
Gray, N. S., Pickering, A. D., Hemsley, D. R., Dawling, S., & Gray, J. A. (1992). Abolition of latent inhibition by a single 5 mg dose of *d*-amphetamine in man. *Psychopharmacology, 107*, 425–430.
Gray, N. S., Fernandez, M., Williams, J., Ruddle, R. A., & Snowden, R. J. (2002). Which schizotypal dimensions abolish latent inhibition? *British Journal of Clinical Psychology, 41*, 271–284.
Green, M. J., & Williams, L. M. (1999). Schizotypy and creativity as effects of reduced cognitive inhibition. *Personality and Individual Differences, 27*, 263–276.
Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis* (4th ed.). New Jersey: Prentice Hall.
Hemsley, D. R. (1993). A simple (or simplistic?) cognitive model for schizophrenia. *Behaviour Research and Therapy, 31*, 633–645.

Hemsley, D. R. (1994). Perceptual and cognitive bases for schizophrenic symptoms. In A. S. David, & J. C. Cutting (Eds.), *The Neuropsychology of Schizophrenia.* Hove: Lawrence Erlbaum Associates.

James, K., & Asmus, C. (2001). Personality, cognitive skills, and creativity in different life domains. *Creativity Research Journal, 13*, 149–159.

King, N., & Anderson, N. (1995). *Innovation and change in organizations.* London: Routledge.

Lubow, R. E. (1989). *Latent inhibition and conditioned attention theory.* Cambridge: Cambridge University Press.

Lubow, R. E. (2005). The construct validity of the animal-latent inhibition model of selective attention deficits in schizophrenia. *Schizophrenia Bulletin, 31*, 139–153.

Lubow, R. E., & De la Casa, G. (2002). Latent inhibition as a function of schizotypality and gender: Implications for schizophrenia. *Biological Psychology, 59*, 69–86.

Mason, O., Claridge, G., & Jackson, M. (1995). New scales for the assessment of schizotypy. *Personality and Individual Differences, 18*, 7–13.

McCrae, R. R. (1987). Creativity, divergent thinking and openness to experience. *Journal of Personality and Social Psychology, 52*, 1258–1265.

McKenna, P. (1987). Pathology, phenomenology and the dopamine hypothesis of schizophrenia. *British Journal of Psychiatry, 151*, 288–310.

Merten, T. (1993). Word association responses and psychoticism. *Personality and Individual Differences, 14*, 837–839.

Moser, P. C., Hitchcock, J. M., Lister, S., & Moran, P. M. (2000). The pharmacology of latent inhibition as an animal model of schizophrenia. *Brain Research Reviews, 33*, 275–307.

Peterson, J. B., & Carson, S. (2000). Latent inhibition and Openness in a high achieving student population. *Personality and Individual Differences, 28*, 323–332.

Peterson, J. B., Smith, K. W., & Carson, S. (2002). Openness and extraversion are associated with reduced latent inhibition: Replication and commentary. *Personality and Individual Differences, 33*, 1137–1147.

Piedmont, R. L., McCrae, R. R., & Costa, P. T. (1991). Adjective Check List scales and the five-factor model. *Journal of Personality and Social Psychology, 60*, 630–637.

Rascle, C., Mazas, O., Vaiva, G., Tournant, M., Raybois, O., Goudemand, M., & Thomas, P. (2001). Clinical features of latent inhibition in schizophrenia. *Schizophrenia Research, 51*, 149–161.

Rawlings, D., & Freeman, J. L. (1997). Measuring paranoia/suspiciousness. In G. Claridge (ed.), *Schizotypy: Implications for illness and health.* Oxford: Oxford University Press.

Rust, J., & Golombok, S. (1999). *Modern psychometrics* (2nd ed.). London: Routledge.

Serra, A., Jones, S. H., Toone, B., & Gray, J. A. (2001). Impaired associative learning in chronic schizophrenics and their first-degree relatives: A study of latent inhibition and the Kamin blocking effect. *Schizophrenia Research*, 273–289.

Spielberger, C. D. (1983). *State-trait anxiety inventory.* California: Mind Garden, Inc.

Stavridou, A., & Furnham, A. (1996). The relationship between psychoticism, trait-creativity and the attentional mechanism of cognitive inhibition. *Personality and Individual Differences, 21*, 143–153.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn and Bacon.

Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children*. New York: Holt, Rhinehart and Winston.

Wechsler, D. (1997). *Wechsler adult intelligence scale* (3rd ed.). San Antonio, TX: The Psychological Corporation.

Wechsler, D. (1999). *Wechsler abbreviated scale of intelligence.* San Antonio: The Psychological Corporation; Harcourt Brace & Company.

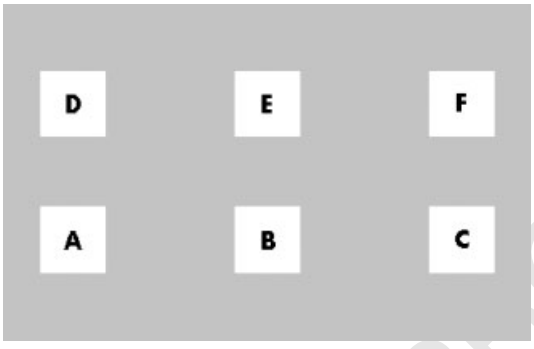
Weiner, I. (2003). The 'two-headed' latent inhibition model of schizophrenia: Modelling positive and negative symptoms and their treatment. *Psychopharmacology, 169*, 257–297.

Williams, L. M. (1994). The multidimensional nature of schizotypal traits: A cluster analytic study. *Personality and Individual Differences, 16*, 103–112.

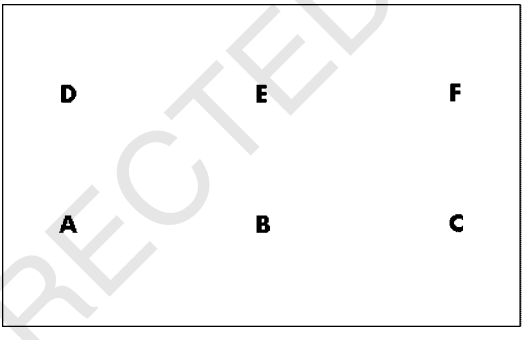
Woody, E., & Claridge, G. (1977). Psychoticism and thinking. *British Journal of Social and Clinical Psychology, 16*, 241–248.

Wuthrich, V., & Bates, T. C. (2001). Schizotypy and latent inhibition: Non-linear linkage between psychometric and cognitive markers. *Personality and Individual Differences, 30*, 783–798.

APPENDIX 1. A PREEXPOSED TRIAL (BACKGROUND EITHER GREEN OR YELLOW).



APPENDIX 2. A NON-COLOURED (NEUTRAL) TRIAL ON THE LI TASK.



Author Query Form (PER/572)

Special Instructions: Author please write responses to queries directly on Galley proofs.

Q1: Author: Reference is not cited in the reference list—please check.

Q2: Author: Please check the change made in the year for the ref. Gray et al. in this footnote.

Q3: Author: Please provide the significance of the values given is bold in the table body.