Psychology of Aesthetics, Creativity, and the Arts
2009, Vol. 3, No. 1, 28–34

1931-3896/09/$12.00 DOI: 10.1037/a0014822

Faith in Intuition Is Associated With Decreased Latent Inhibition in a Sample of High-Achieving Adolescents

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Decreased latent inhibition (LI), reflecting an inability to screen from awareness stimuli previously experienced as irrelevant, has been associated with psychosis. Recent research has suggested, however, that low LI is associated with increased creative achievement in high-functioning individuals (S. H. Carson, J. B. Peterson, & D. M. Higgins, 2003). This study examined the relationship between LI and individual differences in the tendency to rely on intuition to make decisions. Participants scoring higher on a Faith in Intuition factor consisting of items relating to affect tended to have decreased LI. LI was not related to a rational thinking style or to a factor consisting of items relating to a holistic type of intuition. Furthermore, those high in faith in intuition benefitted more from a preexposure condition in which participants received the relevant stimuli in the first phase of the task than did those scoring medium and low in faith in intuition. An explanation is offered for the link between faith in intuition and LI, building on past theory and research on the biological basis of LI and associations with openness to experience and creativity.

Keywords: intuition, latent inhibition, creativity, psychosis, dual-process theory

In recent years, dual-process theories of cognition have become increasingly popular in explaining cognitive, personality, and social processes (Evans & Frankish, 2009). Although individual differences in the controlled, deliberate, reflective processes that underlay System 2 are strongly related to psychometric intelligence (Spearman, 1904) and working memory (Conway, Jarrold, Kane, Miyake, & Towse, 2007), few research studies have investigated individual differences in the automatic, associative, nonconscious processes that underlay System 1. Creativity and intelligence researchers might benefit from taking into account dual-process theories of cognition in their models and research, especially when exploring individual differences in nonconscious cognitive processes.

Here I present new data, using a measure of implicit processing called latent inhibition (LI; Lubow, Ingberg-Sachs, Zalstein-Orda, & Gewirtz, 1992). LI reflects the brain's capacity to screen from current attentional focus stimuli previously tagged as irrelevant (Lubow, 1989). LI is often characterized as a preconscious gating mechanism that automatically inhibits stimuli that have been previously experienced as irrelevant from entering awareness, and those with increased LI show higher levels of this form of inhibition (Peterson, Smith, & Carson, 2002). Variation in LI has been documented across a variety of mammalian species and, at least in other animals, has a known biological basis (Lubow & Gerwirtz, 1995). LI is surely important in people's everyday lives—if people had to consciously decide at all times what stimuli to ignore, they would quickly become overstimulated.

Indeed, prior research has documented an association between decreased LI and acute-phase schizophrenia (Baruch, Hemsley, & Gray, 1988a, 1988b; Lubow et al., 1992). It is known, however, that schizophrenia is also associated with low executive functioning (Barch, 2005). Recent research has suggested that in high-functioning individuals (in this case, Harvard students) with high IQs, decreased LI is associated with increased creative achievement (Carson et al., 2003). Therefore, decreased LI may make an individual more likely to perceive and make connections that others do not see and, in combination with high executive functioning, may lead to the highest levels of creative achievement. Indeed, the link between low LI and creativity is part of Eysenck's (1995) model of creative potential, and Martindale (1999) has argued that a major contributor to creative thought is cognitive disinhibition.

A concept related to LI is intuition. Jung's (1923/1971, p. 538) original conception of intuition is "perception via the unconscious." Two of the most widely used measures of individual differences in the tendency to rely on an intuitive information-processing style are Epstein's Rational-Experiential Inventory (REI; Pacini & Epstein, 1999) and the Myers-Briggs Type Indicator (MBTI) Intuition/Sensation subscale (Myers, McCaulley, Quenk, & Hammer, 1998). Both of these measures have demonstrated correlations with openness to experience (Keller, Bohner, & Erb, 2000; McCrae, 1994; Pacini & Epstein, 1999), a construct that has in turn shown associations with a reduced LI (Peterson & Carson, 2000; Peterson et al., 2002), as well as with divergent thinking (McCrae, 1987) and creative achieve-

I thank Sheila Bennett for her kind assistance in recruiting participants, Jim Blair and Nikhil Srivastava for computer support, and the administration at Hills Road Sixth Form College for the use of their facilities. I also send my gratitude to Jean Pretz and Colin DeYoung for insightful comments on a draft of this article and to Shelley Carson for the materials for the latent inhibition task.

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ment (Carson, Peterson, & Higgins, 2005; King, Walker, & Broyles, 1996).

Recent research, however, has suggested that each of these intuition scales may measure different aspects of intuition, with MBTI Intuition relating more to a holistic type of intuition that is neutral with regard to affect and REI Experiential being more affectively based, relying more on gut feelings and instinct (Pretz & Totz, 2007). To test whether individual differences in intuitive thinking relate to decreased LI, I administered a LI task along with the REI and two MBTI subscales. The main hypothesis was that intuitive cognitive style is associated with decreased latent inhibition. It is an open question, however, whether different forms of intuition will show the same relationship.

Method

Participants

The 162 participants (51 boys and 111 girls) included in the analyses were ages 16–18 ($M = 16.8$, $SD = 0.64$), and attended a selective sixth-form college (which takes high-achieving students who are in their last 2 years of secondary education) in Cambridge, England. Data were collected for 15 other participants, but 8 were removed from the analysis because they were missing LI scores and 7 were removed from the analysis because they completed the LI task but did not complete at least one of the other measures analyzed below. A superset of this sample was analyzed in an examination of the relation of elementary cognitive abilities to intelligence (Kaufman et al., 2008). Those analyses did not include a measure of LI. The average IQ and working memory of this sample was within the normal range.

Procedure

Because the preexposed condition was the condition of interest for individual differences, the first 121 participants who completed the LI task were assigned to the preexposed condition (but note that only 114 are included in the analysis, as explained above) to ensure adequate power for detecting correlations with other variables. The remaining 48 participants who completed the LI task were assigned to the nonpreexposed condition simply to check for the presence of LI (i.e., as a validity check for the task). In a following test session, all participants completed intuition questionnaires. The LI task was administered during the second 1.5-hr test session (out of three sessions) in groups at PC desktop terminals, and the intuition questionnaires were administered in a following 1.5-hr test session also in groups at PC desktop terminals. Whenever possible, all participants received all tests in the same order. The order was held constant because this study focuses on individual differences and if order had any effect on task performance, then varying the order of the tasks for different participants would have introduced additional noise into the individual-differences data. Each participant earned £20 ($29.29) for their participation in the three testing sessions (which were part of a larger study).

LI (Carson et al., 2003; Lubow et al., 1992)

The LI task used in this study was identical to that used by Carson et al. (2003). All participants were seated at a computer terminal and received auditory instructions through a pair of headphones. In the preexposed phase, participants were presented with 30 nonsense syllables, repeated 5 times with white noise bursts superimposed randomly 31 times over the course of the recording. Participants were instructed to determine how many times they heard the third nonsense syllable (*bim*). Therefore, during this first phase, the white noise bursts were irrelevant to the task.

During the second task, the test phase, the same recording of the syllables was replayed, but participants also watched yellow disks appear one by one in rows on the computer monitor. This time, the white noise bursts were relevant to the task: Each yellow disk appeared before the white noise bursts. Participants were instructed to try to discover the auditory stimulus that caused the yellow disks to appear (the correct answer is the white noise bursts) and to write down their answer and raise their hand when they thought that they had figured out the rule. If participants got an incorrect answer, they continued with the task until either they figured out the correct answer or all the yellow disks were revealed (whichever came first). The individual's score for the task was the number of disks still on the screen when the correct answer was given. In total, there were 31 yellow disks, and thus scores could range from 1 to 31.

Participants in the nonpreexposed condition had the same two tasks, except there were no white noise bursts in the preexposure phase of the task. The nonpreexposed condition is often introduced into LI studies as a control so that the experimenter can compare differences between a condition in which LI occurs and a condition in which there are no stimuli for LI to act on (i.e., there is nothing to inhibit that is relevant at a later point in time).

Intuition

Myers-Briggs Type Indicator (MBTI). The MBTI is based on Jung's (1926) theory of psychological types and measures individual differences in personality. The two subscales of the MBTI that were administered for this study were the Thinking/Feeling and Intuition/Sensation subscales. "Thinking" individuals are described as analytical, logical, and intellectual. "Feeling" individuals are described as preferring feelings over analysis. "Intuitive" individuals are described as concentrating on patterns and possibilities rather than concrete details, whereas a "sensing" person is more concerned with details and facts than an intuitive person. These are thought to be opposites. Prior research has shown that the Intuition/Sensation and Thinking/Feeling subscales are not strongly correlated ($r = .13$; Myers et al., 1998).

Rational-Experiential Inventory (REI). The REI (Pacini & Epstein, 1999) was designed to measure the two different aspects of Epstein's rational–experiential model of personality (Epstein, 1994). The REI is a 40-item questionnaire consisting of two subscales—the Rational and Experiential Inventories. The Rational Inventory attempts to quantify an individual's ability and preference for relying on logic and analysis in making decisions and solving problems. The Experiential Inventory estimates the degree to which an individual prefers and has the ability to rely on intuition or hunches when making decisions. Both subscales consist of 20 items.

Results

Table 1 shows the correlations among all of the intuition measures and LI scores in both the preexposed and the nonpreexposed conditions, as well as the descriptive statistics for each of the tasks and the reliabilities of the personality measures. Because LI scores were bimodal rather than normally distributed (see Figure 1), all correlations with LI were conducted using Spearman's rho as the correlation coefficient. Also, all significance levels for correlations with LI were one-tailed.

Lower LI scores in the preexposed condition were significantly correlated with higher scores on both REI Experiential subscales and on MBTI Feeling. Lower LI scores were not correlated with either REI Rational subscale. The findings for those in the nonpreexposed condition showed the opposite trend: Participants with higher scores on the two REI Experiential subscales required more trials to correctly identify the rule during the test phase, and the correlation with MBTI Feeling approached significance ($p = .09$). Interestingly, in the nonpreexposed condition, those with higher MBTI Intuition scores required fewer trials to correctly identify the rule during the test phase.

To assess LI's relationship to the different types of intuition as identified by Pretz and Totz (2007), I first factor analyzed all the items included in the REI Experiential subscale using principal-axis factoring with a direct oblimin rotation (see Table 2).

On the basis of an examination of the scree plot and interpretability considerations, two factors were extracted. The first REI Experiential factor consisted of items resembling a general faith in intuition, such as "I like to rely on my intuitive impressions." The items that loaded on to the second factor consisted mostly of the subset of items on the REI Experiential subscale that related to a faith in feeling, such as "I tend to use my heart as a guide for my actions." Lower LI scores in the preexposed condition significantly correlated with higher scores on both REI Experiential factors. Again, the correlations with LI scores in the nonpreexposed condition showed the reverse pattern: Those scoring higher on both REI Experiential factors in the nonpreexposed condition required more trials to correctly identify the rule during the test phase (see Table 2).

Table 3 shows the correlations among the two REI Experiential factors and the MBTI Feeling, Intuition, and REI Rational Favorability subscales. Consistent with Pretz and Totz (2007), MBTI Intuition/Sensation was significantly correlated with REI Rational Favorability, whereas the REI Faith in Feeling factor was significantly correlated with MBTI Feeling. As expected, the correlation between MBTI Feeling and the REI Faith in Feelings factor was higher that between MBTI Thinking/Feeling and the more general REI Faith in Intuition factor. Even so, the REI Faith in Intuition factor is also significantly correlated with MBTI Thinking/Feeling.

On the basis of Pretz and Totz's (2007) methodology, the two REI Experiential factors, the two MBTI subscales, and the REI Rational Favorability subscale were factor analyzed using principal-axis factoring with a direct oblimin rotation to obtain multiple intuition factors (see Table 4). An examination of the scree plot and interpretability considerations led to the extraction of three factors. Loading onto the first factor were the two REI Experiential factors and MBTI Feeling. To be consistent with Pretz and Totz (2007), this factor was labeled *Faith in Intuition.* Loading onto the second factor were the REI Rational Favorability and MBTI Intuition subscales. To be consistent with Pretz and Totz (2007), this factor was labeled *Holistic Intuition.* Loading onto the third factor was the REI Faith in Feeling factor and the MBTI Feeling subscale. To be consistent with Pretz and Totz (2007), this factor was labeled *Affective Intuition.* Lower LI scores in the preexposed condition were significantly correlated with higher scores on both the Faith in Intuition and Affective Intuition factors. LI was not related to the Holistic Intuition factor. Once again, the opposite pattern emerged for those in the nonpreexposed condition: Those scoring higher on the Faith in Intuition factor required significantly more trials to correctly identify the rule during the test phase, and the correlation with the Affective Intuition factor approached significance ($p = .10$; see Table 4).

Prior research has demonstrated a higher mean in the preexposed condition than in the nonpreexposed condition (Carson et al., 2003; Peterson & Carson, 2000), suggesting intact LI at the group level of analysis. An analysis of covariance (ANCOVA) with the Faith in Intuition factor as a covariate showed no significant main

Table 1
Correlations Among REI and MBTI Subscales and LI Scores

Subscale	1	2	3	4	5	6	7	8
1. REI Rational Favorability	—							
2. REI Rational Ability	.45**	—						
3. REI Experiential Favorability	.03	−.22**	—					
4. REI Experiential Ability	−.13	.03	.67**	—				
5. MBTI Intuition	.23**	−.13	.21**	−.03	—			
6. MBTI Feeling	−.27**	−.39**	.44**	.26**	.18*	—		
7. LI Preexposed	.03	−.02	−.18*	−.22**	−.13	−.22**	—	
8. LI Nonpreexposed	−.13	−.14	.31*	.36**	−.28*	.20	—	—
N	162	162	162	162	161	161	114	48
M	3.6	3.3	3.4	3.2	18.6	9.0	13.1	13.9
SD	0.63	0.59	0.53	0.59	5.3	5.9	11.7	10.9
Reliability (Cronbach's α)	.82	.80	.79	.82	.85	.88	—	—

Note. Correlations with LI were calculated using Spearman's rho. REI = Rational–Experiential Inventory; MBTI = Myers-Briggs Type Indicator; LI = latent inhibition.
* $p < .05$. ** $p < .01$, one-tailed.

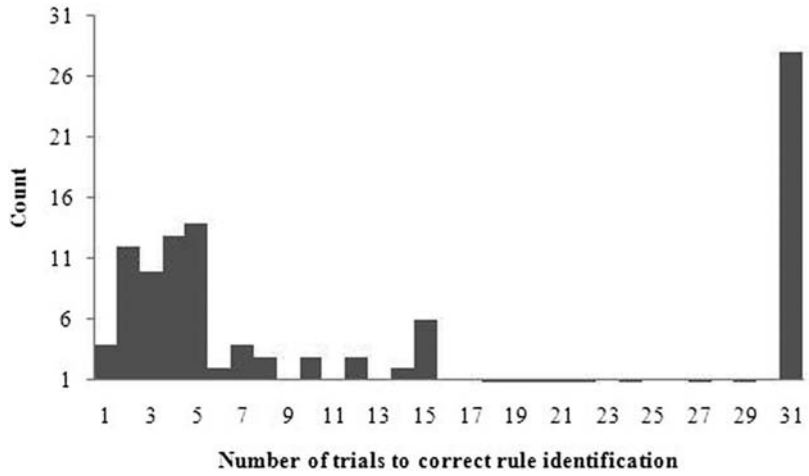

Figure 1. Bimodal distribution of latent inhibition scores in the preexposed condition ($N = 114$).

effect of condition, but a significant interaction of condition with Faith in Intuition, $F(1, 161) = 7.9$, $p < .01$.[1] To further investigate the nature of this interaction, the Faith in Intuition factor was split into three equal groups (high, medium, and low) and the interaction between level of faith in intuition and mean number of trials to correct rule identification was graphically analyzed for both the preexposed and the nonpreexposed conditions (see Figure 2). Interestingly, those low in faith in intuition showed intact LI (i.e., did better in the preexposed condition than in the nonpreexposed condition), whereas those high in faith in intuition demonstrated no LI (i.e., did worse in the preexposed condition than in the nonpreexposed condition). Those in the medium group also demonstrated no LI, but showed no difference between the conditions.

Discussion

The results of the current study suggest that faith in intuition, as assessed by the REI and the MBTI Thinking/Feeling subscale, is associated with decreased LI. Furthermore, a factor consisting of abstract, conceptual, holistic thought is not related to LI. Consistent with Pretz and Totz (2007), exploratory factor analysis revealed a distinction between a factor consisting of REI Experiential and MBTI Thinking/Feeling and a factor consisting of MBTI Intuition/Sensation and REI Rational Favorability. This further supports Epstein's (1994) theory that the experiential system is directly tied to affect. The finding that MBTI Intuition/Sensation and REI Rational Favorability loaded on the same factor supports the idea that the type of intuition that is being measured by these tasks is affect neutral and more related to abstract, conceptual, holistic thought than to the gut feelings that are part of the Faith in Intuition factor (Pretz & Totz, 2007).

Because prior research has demonstrated an association between openness to experience and decreased LI and both measures of intuition have demonstrated correlations with openness to experience, this raises the possibility that each type of intuition may relate to different aspects of the openness to experience construct. Indeed, Pacini and Epstein (1999) found that even though both REI Rational and REI Experiential significantly correlated with openness to experience, only REI Experiential significantly correlated with a measure of emotional expressivity.

Therefore, the association between faith in intuition and decreased LI may have to do with an openness to the affective cues that the participants built up through the first phase of the LI task. Those who tend to have faith in their gut feelings may have been more likely to trust their emotions relating to the white noise burst during the second phase and therefore discovered the underlying rule more rapidly than those who relied more on a rational cognitive style and disregarded their gut feelings. That those with a high faith in intuition were aided by the preexposure, whereas those with a low faith in intuition were not is further suggested by the interaction analyses (see Figure 2), in which it is clear that those high in faith in intuition were faster to identify the rule in the preexposed condition relative to those low and medium in faith in intuition.

Interestingly, I also found that those with a higher faith in intuition took longer to correctly identify the rule in the nonpreexposed condition. This suggests that it may require sufficient time for knowledge to be acquired implicitly through extensive exposure to a pattern before the gut feelings can provide a guide to behavior. This possibility should be further investigated in future research.

The current study adds to a growing literature on the potential benefits of a decreased LI for creative cognition. Hopefully, with further research on the biological basis of LI, as well as its associated behaviors, including interactions with IQ and working memory, we can develop a more nuanced understanding of creative cognition. There is already promising theoretical progress in this direction (Peterson et al., 2002).

[1] Because measures of psychometric intelligence and working memory were acquired for all participants in the current study, these variables were examined as additional covariates in the analysis of covariance. The effect of interest remained the same when controlling for these variables. This is consistent with Peterson et al. (2002), who found that their effects were not the result of differences in IQ.

Table 2
Factor Analysis of Rational–Experiential Inventory Experiential Items

Item	Faith in intuition	Faith in feeling
33. Using my "gut feelings" usually works well for me in figuring out problems in my life.	**.70**	**.48**
29. I don't have a very good sense of intuition. (R)	**.65**	.25
23. I don't like situations in which I have to rely on intuition. (R)	**.64**	.35
8. I like to rely on my intuitive impressions.	**.60**	.39
20. I often go by my instincts when deciding on a course of action.	**.59**	**.54**
39. Intuition can be a very useful way to solve problems.	**.58**	.26
6. When it comes to trusting people, I can usually rely on my gut feelings.	**.58**	**.44**
37. I hardly ever go wrong when I listen to my deepest "gut feelings" to find an answer.	**.58**	**.44**
13. I suspect my hunches are inaccurate as often as they are accurate. (R)	**.55**	.21
10. I believe in trusting my hunches.	**.54**	**.45**
21. My snap judgments are probably not as good as most people's. (R)	**.52**	.21
19. I can usually feel when a person is right or wrong, even if I can't explain how I know.	**.49**	.18
2. If I were to rely on my gut feelings, I would often make mistakes. (R)	**.48**	.35
25. I trust my initial feelings about people.	**.42**	**.43**
27. I don't think it is a good idea to rely on one's intuition for important decisions. (R)	**.45**	**.51**
4. I generally don't depend on my feelings to help me make decisions. (R)	.31	**.68**
12. I think it is foolish to make important decisions based on feelings. (R)	.37	**.66**
35. I tend to use my heart as a guide for my actions.	.29	**.64**
16. I would not want to depend on anyone who described himself or herself as intuitive. (R)	.17	.34
31. I think there are times when one should rely on one's intuition.	.28	.28
Correlation with latent inhibition preexposed ($N = 114$)	$-.18^{*}$	$-.24^{**}$
Correlation with latent inhibition nonpreexposed ($N = 48$)	$.32^{*}$	$.26^{*}$

Note. $N = 162$. Factor loadings over .4 are in bold. Reverse-scored items are marked (R). $\lambda 1 = 6.28$ (31.4% variance); $\lambda 2 = 1.68$ (8.4% variance). Total Variance Explained: 39.8%. Correlations with latent inhibition (LI) were calculated using Spearman's rho, one-tailed.
$^{*}p < .05$. $^{**}p < .01$.

Peterson et al. (2002) and Peterson and Carson (2000) found a significant relationship between low LI and three personality measures relating to an approach-oriented response and sensation-seeking behavior: openness to experience, psychoticism, and extraversion. Peterson et al. found that a combined measure of openness and extraversion (which was referred to as *plasticity*) provided a more differentiated prediction of decreased LI.

Peterson et al. (2002) argued that individual differences in a tendency toward exploratory behavior and cognition may be related to the activity of the mesolimbic dopamine system and predispose an individual to perceive even preexposed stimuli as interesting and novel, resulting in low LI. Moreover, under stressful or novel conditions, the dopamine system in these individuals will become more activated and the individual will instigate exploratory behavior. Under such conditions, decreased LI could help the individual by allowing him or her more options for reconsideration and thereby more ways to

Table 3
Correlations Among Rational–Experiential Inventory (REI) Experiential Factors and Myers-Briggs Type Indicator (MBTI) Subscales

Variable	1	2	3	4
1. REI Faith in Intuition factor	—	162	161	161
2. REI Faith in Feeling factor	$.62^{**}$	—	161	161
3. MBTI Intuition	.06	.14	—	161
4. MBTI Feeling	$.24^{**}$	$.55^{**}$	$.18^{*}$	—

Note. N above diagonal.
$^{*}p < .05$. $^{**}p < .01$.

Table 4
Factor Analysis of Rational–Experiential Inventory (REI) Experiential Factors and Myers-Briggs Type Indicator (MBTI) Subscales

Factor	Faith in intuition	Holistic intuition	Affective intuition
REI Faith in Feeling factor	**.90**	.11	**.51**
REI Faith in Intuition factor	**.71**	.03	.18
REI Rational Favorability	−.07	**.58**	−.32
MBTI Intuition	.11	**.50**	.18
MBTI Feeling	**.43**	.02	**.89**
Correlation with LI preexposed ($N = 114$)	$-.24^{**}$	−.08	$-.21^{*}$
Corelation with LI nonpreexposed ($N = 48$)	$.31^{*}$	−.18	.19

Note. $N = 161$. Factor loadings over .4 are in bold. $\lambda 1 = 2.04$ (40.7% variance); $\lambda 2 = 1.24$ (24.9% variance); $\lambda 3 = 0.90$ (18.0% variance). Total Variance Explained: 83.6%. Correlations with latent inhibition (LI) were calculated using Spearman's rho, one-tailed.
$^{*}p < .05$. $^{**}p < .01$.

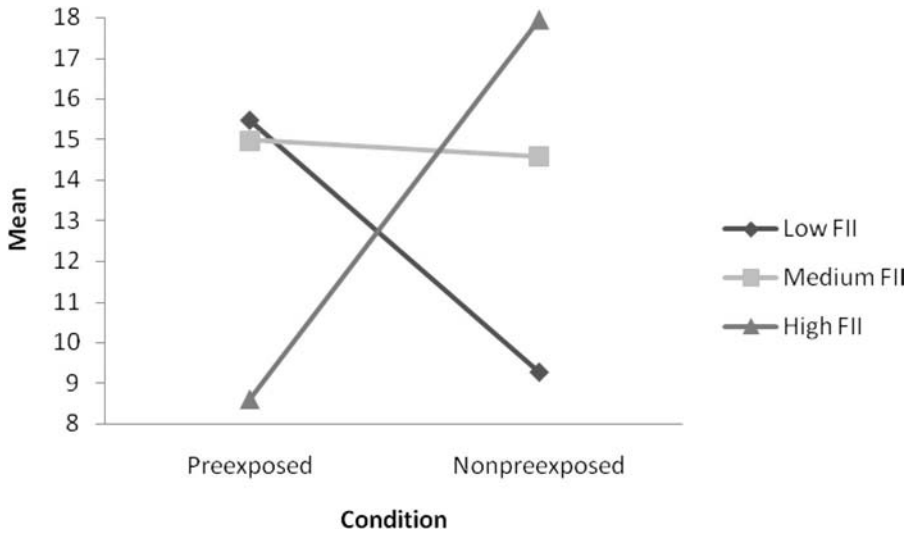

Figure 2. Interaction between faith in intuition (FII) and mean number of trials to correct rule identification in the preexposed and nonpreexposed conditions.

resolve the incongruity. It could also be disadvantageous in that the stressed individual risks becoming overwhelmed with possibilities. Research has shown that the combination of high IQ and reduced LI predicts creative achievement (Carson et al., 2003). Therefore, the individual predisposed to schizophrenia may suffer from an influx of experiential sensations and possess insufficient executive functioning to cope with the influx, whereas the healthy individual low in LI and open to experience (particularly an openness and faith in his or her gut feelings) may be better able to use the information effectively while not becoming overwhelmed or stressed out by the incongruity of the situation. Clearly, further research will need to investigate these ideas, but an understanding of the biological basis of individual differences in different forms of implicit processing and their relationship to openness to experience and intuition will surely increase our understanding of how certain individuals attain the highest levels of creative accomplishment.

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Received November 7, 2008
Revision received November 26, 2008
Accepted November 26, 2008 ■