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The effects of mood, cognitive style, and cognitive ability on implicit learning

Jean E. Pretz [a,*], Kathryn Sentman Totz [a], Scott Barry Kaufman [b,1]

[a] Illinois Wesleyan University, Psychology Department, P.O. Box 2900, Bloomington, IL 61702-2900, USA
[b] Yale University, Psychology Department, P.O. Box 208205, New Haven, CT 06520-8205, USA

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ABSTRACT

In an experiment with 109 undergraduates, we examined the effect of mood, cognitive style, and cognitive ability on implicit learning in the Artificial Grammar (AG) and Serial Reaction Time (SRT) tasks. Negative mood facilitated AG learning, but had no significant effect on SRT learning. Rational cognitive style predicted greater learning on both tasks, but this effect on SRT was mediated by cognitive ability. SRT, but not AG learning was significantly correlated with Math and English scores on the ACT. These findings confirm and contradict previous research. The association of negative mood and rational cognitive style with AG confirms that AG learning is facilitated by systematic, bottom-up processing. However, the lack of converging evidence for the SRT task suggests that the tasks involve different aspects of implicit processing. Theoretical explanations and suggestions for future research are discussed.

1. Introduction

Current theories about the relationship between affect and cognition hold that positive affect leads to assimilation, using top-down processing to incorporate new information into existing knowledge. In contrast, negative affect leads to accommodation, using bottom-up processing to take in new information with less regard for what is currently known (Bless & Fiedler, 2006). Evidence has shown that positive moods increase reliance on schemas and heuristics (e.g., Bodenhausen, Kramer, & Suesser, 1994). Negative moods narrow the focus of attention, increasing analytical processing, causal reasoning, and reliance on systematic processing (Pham, 2007).

1.1. The effect of mood on implicit learning

How does mood affect implicit learning processes? In implicit learning "a person typically learns about the structure of a fairly complex stimulus environment, without necessarily intending to do so, and in such a way that the resulting knowledge is difficult to express" (Berry & Dienes, 1993, p. 2). In general, implicit learning is unconscious and results in abstract, tacit knowledge about complex or hidden covariations in the environment (Reber, 1989; Seger, 1994). Implicit learning has been documented in tasks in which participants are exposed to stimuli that contain patterned information that is not readily obvious. In these tasks, participants tacitly acquire knowledge about the regularity in the stimuli as evidenced by their improved accuracy and reaction time performance, yet without explicit knowledge of the patterns learned.

Within dual process theory (Chaiken & Trope, 1999), implicit learning is a function of the implicit system, whose processing is nonconscious, holistic, effortless, associative, and heuristic. However, the effect of mood on implicit learning is not straightforward. To the extent that the implicit system is associated with heuristic processing, we would predict that positive mood would facilitate implicit learning. Yet to the extent that the implicit mode involves the use of data-driven, bottom-up processing, we would predict that negative mood would facilitate implicit learning. The current study will test these competing hypotheses, exploring an under-researched area in the literature.

To date, little empirical evidence exists to test the effect of mood on implicit learning. Braverman (2006) examined the effect of mood on covariation detection. Participants viewed faces accompanied by Math and verbal test scores and acquired knowledge of a subtle relationship between nose width and test scores. Results showed that participants who had viewed a clip from a sad movie learned the covariation better than those who had viewed a comedic clip.

In contrast, some evidence suggests that negative mood may decrease implicit learning. In one study, participants with moderate to severe depression performed much worse than a group of matched controls on the Serial Reaction Time task (Naismith, Hicke, Ward, Scott, & Little, 2006). Unfortunately, these are the only two studies of which we are aware that tested the effect of mood on implicit learning.

1.2. Individual differences in implicit learning

In addition to manipulating the effect of mood on implicit learning, we can test our predictions by measuring individual differences in

* Corresponding author. Tel.: +1 309 556 3867; fax: +1 309 556 3864.
E-mail addresses: jpretz@iwu.edu (J.E. Pretz), scott.kaufman@yale.edu (S.B. Kaufman).

[1] Please note Scott Barry Kaufman is now affiliated with the Center Leo Apostel for Interdisciplinary Studies, Free University of Brussels and the Department of Psychology, New York University.

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preferences to use implicit and explicit processes. The Rational–Experiential Inventory (REI; Pacini & Epstein, 1999) measures preference for and confidence in experiential (implicit) processing and rational (explicit) processing. Preferences for the experiential mode were found to correlate with heuristic responding in a laboratory gambling task (Pacini & Epstein). Similarly, preference for intuition (as measured by the Myers Briggs Intuitive/Sensate subscale) was found to correlate with implicit learning (Woolhouse & Bayne, 2000).

Our predictions for the effect of cognitive style on implicit learning follow from dual process theory. If positive mood encourages use of heuristic, intuitive processing, then we would expect that participants who prefer experiential processing will have higher implicit learning scores. Similarly, if negative mood encourages use of analytical, systematic processing, then we would expect a positive relationship between preference for rational processing and implicit learning performance.

Notably, the literature has consistently failed to identify individual differences in implicit learning performance. Theoretically, the implicit processing system is evolutionarily old, and researchers have argued that this implies little individual variation in the construct relative to explicit processing (e.g., Reber, 1993). Numerous studies have found only a modest correlation between implicit learning performance and individual differences in cognitive ability (Gebauer & Mackintosh, 2007, 2009; Kaufman et al., 2009; Reber, Walkenfeld, & Hernstadt, 1991). However, as mentioned, some evidence has shown a correlation between an intuitive cognitive style and implicit learning performance (Woolhouse & Bayne, 2000). Recent work by Kaufman et al. (2009) found that SRT significantly correlated with openness to experience and the intuition facet of the Myers Briggs (MBTI). Furthermore, SRT significantly correlated with verbal analogical reasoning, and this relationship remained even after controlling for general cognitive ability. This suggests that individual differences in implicit learning as measured by SRT may predict complex cognition above and beyond the contribution of individual differences in general cognitive ability.

The current study tested competing hypotheses about the effect of mood on implicit learning. In addition, we examined the effects of cognitive style and cognitive ability on implicit learning, providing some evidence for the mechanism that underlies this relationship. Two implicit learning measures were chosen for their widespread use in similar research: the Artificial Grammar task (AG; Reber, 1967) and the Serial Reaction Time task (SRT; Schvanevdeldt & Gomez, 1998). Mood was manipulated using photographs from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1997). Cognitive style was measured using the REI (Pacini & Epstein, 1999), and cognitive ability was approximated using scores on the ACT subscales.

2. Method

2.1. Participants

Participants were 109 undergraduates (39 men) who participated for course credit (mean age = 19.29, *SD* = 1.27). Two participants were removed from the analyses due to scores over three standard deviations from the mean, one on negative mood PANAS score, and one on REI experiential. Thirteen participants were missing AG data due to computer error.

2.2. Materials

2.2.1. Implicit learning measures

In the learning phase of the AG task, participants memorized a series of 20 exemplary letter strings generated by a finite-state grammar (Reber, 1967). In the testing phase, participants viewed letter strings which they judged for conformity to the grammar. The testing stimuli consisted of 26 grammatical letter strings (7 of which were from the original set) and 24 non-grammatical letter strings, which were formed by introducing one or more violations into otherwise grammatical letter strings. Learning was determined by how many letter strings were correctly classified as following the grammar. The critical dependent measure was accuracy on the first half of the test problems (to reduce practice effects). Both blocks demonstrated accuracy levels significantly above chance (both t's > 11.29). The correlation between performance on the blocks was $r = .45$, $p < .0005$.

In the SRT, participants viewed a stimulus at one of several locations on a computer screen and pressed the button corresponding to each box when the stimulus appeared there. Unknown to the participants, the sequence of successive stimuli followed a probabilistic sequence intermixed 15% of the time with an alternate sequence (Schvanevdeldt & Gomez, 1998). Following Kaufman et al. (2009), SRT scores in the current study were calculated by first determining the average effect size in the sample for the difference between mean RT for probable trials and the mean RT for improbable trials over the last three of six blocks (Cohen's $d = .32$). Participants then received a point for each block on which learning was at least as high as the average effect size for the sample. The reliability of this scoring method was very high ($\alpha = .90$).

2.2.2. Cognitive style measure

The REI (Pacini & Epstein, 1999) consists of 40 items, ten for each of the four subscales: rational favorability ($\alpha = .83$), rational ability ($\alpha = .80$), experiential favorability ($\alpha = .78$), and experiential ability ($\alpha = .80$). Favorability refers to preference for that mode of thought, while ability indicates a belief in one's personal ability to successfully use that mode. Responses were given on a 5-point Likert scale, and means on each subscale were calculated.

2.2.3. Cognitive ability measure

Standardized test scores on four subtests of the ACT (English, Mathematics, Reading, and Science) were obtained as a proxy for cognitive ability from 76 participants (71% of the sample). These multiple-choice tests measure cognitive abilities such as critical thinking, reasoning, and problem solving in each of the subject areas.

2.2.4. Mood manipulation

To induce mood, participants viewed photographs from the IAPS (Lang et al., 1997). Participants in the positive mood condition were shown pleasant pictures such as smiling families, beautiful nature scenes, and food. The mean valence rating for positive pictures was 7.25, while the mean arousal rating was 4.79. (Both ratings were on a 9-point scale, with 1 being unpleasant/not at all arousing and 9 being pleasant/highly arousing.) Participants in the negative mood condition saw images of drug use, disease, war, and death (mean valence = 2.75, mean arousal = 5.47). Participants in the neutral condition were shown mundane pictures, such as everyday objects and landscapes (mean valence = 5.00, mean arousal, 3.60).

Following the mood induction, participants completed the Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). Participants rated 20 emotion words (10 positive, 10 negative) on a scale of 1 to 5 (1 being very slightly or not at all, 5 being extremely) to indicate the extent to which they felt that emotion at the moment. The positive and negative subscales of the PANAS were reliable ($\alpha = .87$, $\alpha = .92$, respectively).

2.3. Procedure

Testing was conducted individually in 45-minute sessions. Participants completed the cognitive style measure, and then viewed 50 affective photos according to their experimental condition. Each photograph was displayed for 5 s, with at 1.5 s pause in between. Following mood induction, participants completed the mood check-list. Participants then completed the AG and SRT, counterbalanced across participants.

3. Results

The manipulation check on mood was successful (see Fig. 1).

Correlations were performed among the implicit learning tasks, cognitive style measures, and cognitive ability measures (see Table 1). The results showed that both AG and SRT scores were weakly related to scores on REI rational ability. There was no association between implicit learning and preference experiential processing. Implicit learning was weakly correlated with negative mood, though this relationship was only marginally statistically significant for AG scores ($p = .052$). SRT (but not AG) was correlated with ACT Math and ACT English scores.

To examine the independent effect of mood on implicit learning, a univariate ANCOVA was conducted on each implicit learning task, including REI rational ability as a covariate. Results showed that mood had a significant effect on AG learning, $F(2, 89) = 6.39$, $p = .003$. REI rational ability was a significant covariate, $F(1, 89) = 8.69$, $p = .004$. Post hoc analyses showed that participants in the negative mood condition outscored those in the positive ($p = .029$) and neutral ($p = .001$) mood conditions.

In the SRT, the effect of mood was marginally significant, $F(2, 103) = 2.48$, $p = .089$. REI rational ability scores maintained a significant effect, $F(1, 103) = 5.30$, $p = .023$. Although mood did not have a significant effect, the pattern of means showed that the highest implicit learning scores were obtained by participants in the negative mood condition. Means are presented in Table 2.

To better understand the effect of REI rational ability on implicit learning, analyses were conducted to test the possibility that cognitive ability mediated this relationship. ACT scores were used as a proxy measure of ability. As shown in Table 1, correlations with ACT subscales showed that both Math and Science scores were moderately correlated with rational ability, and ACT Math and English subscales were correlated with SRT scores. AG scores were not significantly related to any ACT subscales. Because ACT Math was related to both REI rational ability and SRT, mediational analyses were conducted. The results showed that when ACT Math was considered a mediator, the significant relationship between REI rational ability and SRT was reduced to $r = .153$, $p = .194$. In contrast, ACT Math was marginally significantly correlated with SRT after controlling for REI rational ability, $r = .219$, $p = .059$. This suggests that there is no direct relationship between REI rational ability scores and SRT performance. This finding contrasts with the results for AG learning, which was unrelated to ACT scores. AG learning was directly predicted by REI rational ability scores, and no mediation was present.

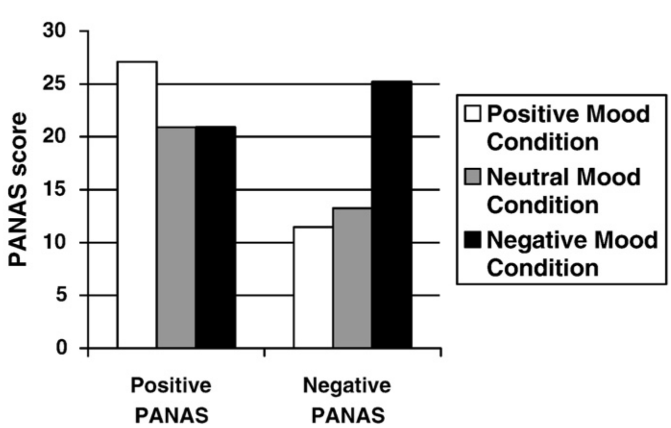

Fig. 1. Scores on PANAS by mood condition. Note: A repeated measures ANOVA showed the expected interaction of PANAS mood scores and mood condition, $F(2, 104) = 46.09$, $p < .001$. Participants in the positive mood condition were more positive than participants in the other conditions, and participants in the negative mood condition were more negative than participants in the other conditions. Participants in the neutral mood condition were significantly more positive than negative in mood.

4. Discussion

In this experiment, mood was manipulated, and cognitive style and cognitive ability were measured, to examine their effects on implicit learning in AG and SRT tasks. Results showed that negative mood caused an increase in AG learning, although there was no significant effect of mood on SRT learning. A positive relationship was found between rational cognitive style and both measures of implicit learning; however, this relationship was mediated by ACT Math scores for SRT learning. AG scores were directly predicted by rational cognitive style and unrelated to cognitive ability measures.

These findings provide converging evidence that negative mood facilitates systematic, analytical, bottom-up processing, and that this type of processing leads to superior performance on AG tasks. The results for SRT learning were less conclusive. Although the two tasks are both categorized as measures of implicit learning, these findings show that different processes may be involved in each. In addition, no correlation was found between the two tasks in the current experiment.

4.1. Different kinds of implicit processes?

A similar lack of correspondence between implicit learning tasks was shown in a recent study by Gebauer and Mackintosh (2007). This was viewed as a preliminary finding, but our evidence lends support to the view that implicit learning is not a unitary construct. The experience of completing each of these tasks is unique. In AG, participants must memorize letter strings, a relatively effortful task that may encourage analytical processing and monitoring. In contrast, the SRT task takes less effort, and less time is possible for conscious monitoring. Participants merely press keys corresponding to locations on the screen as fast as possible, and the probabilistic nature of the sequence makes it difficult to discover. For this reason, evidence of learning in SRT is much more likely to be implicit than in AG. These differences may underlie the lack of correlation between the tasks, as well as the differential effect of mood on them. To the extent that AG learning relies on more explicit processes, it is logical that negative mood and rational cognitive style would be associated with superior performance.

Notably, our prediction that implicit learning would be enhanced by positive mood and intuitive cognitive style was not supported by these data. This prediction, based on dual process theory, could call into question dozens of other studies that have found positive mood to increase reliance on the implicit system in terms of heuristics and schemas. An alternative explanation of this finding, however, is that the kind of implicit processing involved in implicit learning is distinct from the kind of implicit processing involved in heuristics. Our previous work has made a theoretical distinction between holistic and heuristic aspects of implicit processing (Pretz & Totz, 2007; Pretz, 2008). Holistic processing is the result of a holistic, Gestalt-like perception of a problem. In contrast, heuristic or inferential aspects of implicit processing rely on processes that were once analytical but have become automatic through extensive practice and experience.

We predict that mood may have differential effects on these two types of implicit processing. The previous literature suggests that heuristic processing will be facilitated by positive mood, and the lack of support for that effect in the current experiment suggests that neither implicit learning task involved the use of heuristic processing. Implicit learning may represent holistic aspects of implicit processing, providing evidence for this theoretical distinction. Pretz and Totz

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Table 1
Correlations among implicit learning tasks, cognitive style subscales, and ACT scores.

	1	2	3	4	5	6	7	8	9	10	11	12
1. SRT	(107)											
2. AG	.127	(93)										
3. Mood condition†	.212*	.202	(107)									
4. REI rational ability	.219*	.269**	.014	(107)								
5. REI rational favorability	.161	.146	−.082	.455***	(107)							
6. REI experiential ability	.052	.016	.090	.168	−.026	(107)						
7. REI experiential favorability	−.009	.055	.047	−.192*	−.070	.524***	(107)					
8. ACT Composite	.172	.072	.072	.280**	.301**	.018	−.176	(89)				
9. ACT Math	.270*	.204	.212	.301**	.255*	.085	−.128	.802***	(76)			
10. ACT Science	.035	.124	−.057	.328**	.218	.028	−.221	.773***	.580***	(76)		
11. ACT English	.242*	.094	.127	.049	.131	−.066	−.005	.642***	.402***	.244*	(76)	
12. ACT Reading	.104	.158	−.009	.100	.108	−.030	−.280*	.714***	.355**	.396***	.380**	(76)

N per measure on diagonal in parentheses.
*** $p<.001$.
** $p<.01$.
* $p<.05$.
† Mood was coded as follows: 1 = positive, 2 = neutral, 3 = negative.

(2007) found that MBTI intuition tapped holistic aspects of intuition, and prior research has indeed shown a correlation between implicit learning and MBTI intuition (Kaufman et al., 2009; Woolhouse & Bayne, 2000), providing support for this argument.

4.2. Individual differences in implicit learning

Our findings regarding the correlation between implicit learning and cognitive style suggest that meaningful individual differences in implicit learning may exist. We found that rational cognitive style was correlated with both AG and SRT scores. This contradicts the few existing studies in the literature that have found a correlation between experiential cognitive style and individual differences in implicit processing (Pacini & Epstein, 1999; Woolhouse & Bayne, 2000). Again, this unexpected pattern of relationships may be due to the particular kind of implicit processing under investigation.

These findings also contribute to a significant body of literature on the relationship between general cognitive ability and implicit learning performance. We found that AG learning was unrelated to cognitive ability, confirming previous research, yet we found weak but significant correlations between SRT learning and scores on two ACT subscales. Because of this inconsistency with the literature and our use of a proxy measure of cognitive ability, this finding is tentative. Nevertheless, it is possible that while earlier studies have relied on traditional measures of intelligence, the ACT may relate more to acquired knowledge and skills, which could be what is related to individual differences in implicit learning in the current study. Recent research has found a consistent relationship between SRT scores and measures of cognitive ability (Gebauer & Mackintosh, 2009; Kaufman et al., 2009). Specifically, Kaufman et al. (2009) found that verbal analogical reasoning and processing speed were related to individual differences in SRT learning, even when controlling for general cognitive ability.

Table 2
Mean implicit learning scores by mood condition adjusted for REI rational ability scores.

Mood condition	Artificial Grammar ($N=93$)	Serial Reaction Time task ($N=107$)
Positive	32.51 (.588)	1.33 (.217)
Neutral	31.36 (.607)	1.72 (.220)
Negative	34.38 (.597)	2.03 (.226)

REI rational ability $M=3.83$ for AG analysis and $M=3.80$ for SRT analysis.

5. Conclusions

This paper reports a single experiment with theoretically-driven predictions and provocative findings. The experimental design enabled us to make conclusions about the causal effect of mood on implicit learning, and the correlational aspects of the design allowed us to test hypotheses about possible mechanisms underlying this relationship. Some findings are consistent with previous work, yet others challenge assumptions that are pervasive in the literature. Our results have implications for the theoretical understanding of implicit processing, suggesting that there may be heuristic and holistic aspects of implicit cognition. In addition, these findings suggest that even if Reber (1993) is correct that individual variation is less on implicit than explicit tasks, whatever variation does exist may be meaningful and worthy of further investigation. In fact, we found that individual differences in both cognitive ability and cognitive style were associated with variability in implicit learning scores. We hope that future work in this area will help to make more explicit our understanding of implicit learning and its relation to affective and differential variables.

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References

Berry, D. C., & Dienes, Z. (1993). *Implicit learning: Theoretical and empirical issues.* Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.

Bless, H., & Fiedler, K. (2006). Mood and the regulation of information processing and behavior. In J. P. Forgas (Ed.), *Affect in social thinking and behavior* (pp. 65−84). New York: Psychology Press.

Bodenhausen, G. V., Kramer, G. P., & Suesser, K. (1994). Happiness and stereotypic thinking in social judgment. *Journal of Personality and Social Psychology*, *66*(4), 621−632.

Braverman, J. (2006). The effect of mood on detection of covariation. *Personality and Social Psychology Bulletin*, *31*(11), 1487−1497.

Chaiken, S., & Trope, Y. (Eds.). (1999). *Dual-process theories in social psychology* New York: Guilford.

Gebauer, G. F., & Mackintosh, N. J. (2007). Psychometric intelligence dissociates implicit and explicit learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*(1), 34−54.

Gebauer, G.F., & Mackintosh, N.J. (2009). Implicit learning and intelligence: A principal components analysis. Manuscript submitted for publication.

Kaufman, S.B., DeYoung, C.G., Gray, J.R., Jiménez, L., Brown, J., & Mackintosh, N. (2009). Implicit learning as an ability. Manuscript submitted for publication.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). International Affective Picture System (IAPS): Technical manual and affective ratings : NIMH Center for the Study of Emotion and Attention Retrieved July 15, 2008 from http://www.unifesp.br/dpsicobio/adap/instructions.pdf.

Naismith, S. L., Hickie, I. B., Ward, P. B., Scott, E., & Little, C. (2006). Impaired implicit sequence learning in depression: A probe for frontostriatal dysfunction? *Psychological Medicine*, *36*(3), 313−323.

Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, *76*(6), 972−987.

Pham, M. T. (2007). Emotion and rationality: A critical review and interpretation of empirical evidence. *Review of General Psychology*, *11*, 155−178.

Pretz, J. E. (2008). Intuition versus analysis: Strategy use and experience in complex everyday problem solving. *Memory and Cognition*, *36*(3), 554−566.

Pretz, J. E., & Totz, K. S. (2007). Measuring individual differences in affective, heuristic, and holistic intuition. *Personality and Individual Differences*, *43*(5), 1247−1257.

Reber, A. S. (1967). Implicit learning of artificial grammars. *Journal of Verbal Learning and Verbal Behavior*, *6*, 855−863.

Reber, A. S. (1989). Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General*, *118*, 219−235.

Reber, A. S. (1993). *Implicit learning and tacit knowledge: An essay on the cognitive unconscious.* New York: Oxford Psychology Series.

Reber, A. S., Walkenfeld, F. F., & Hernstadt, R. (1991). Implicit and explicit learning: Individual differences and IQ. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *17*, 888−896.

Schvanevdeldt, R. W., & Gomez, R. L. (1998). Attention and probabilistic sequence learning. *Psychological Research*, *61*, 175−190.

Seger, C. A. (1994). Implicit learning. *Psychological Bulletin*, *115*(2), 163−196.

Watson, P., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063−1070.

Woolhouse, L. S., & Bayne, R. (2000). Personality and the use of intuition: Individual differences in strategy and performance on an implicit learning task. *European Journal of Personality*, *14*(2), 157−169.

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Corrigendum

Corrigendum to "The effects of mood, cognitive style, and cognitive ability on implicit learning" [Learn Individ Differ, 20 (2010) 215–219. doi: 10.1016/j.lindif.2009.10.003]

Jean E. Pretz[a,*], Kathryn Sentman Totz[a], Scott Barry Kaufman[b]

[a] Illinois Wesleyan University, Psychology Department, P.O. Box 2900, Bloomington, IL 61702-2900, USA
[b] Yale University, Psychology Department, P.O. Box 208205, New Haven, CT 06520-8205, USA

Subsequent to the publication of our findings, we discovered an error in the scoring of the Serial Reaction Time task. We corrected this error and note some changes in our results (see Tables 1 and 2). In contrast to earlier findings, SRT scores were correlated with REI experiential ability as well as REI rational ability scores. This supports our initial hypothesis that preference for experiential (intuitive) processing would be positively related to implicit learning. Corrected SRT scores were no longer related to mood condition or cognitive ability. Our findings no longer confirm other studies that have documented a relationship between implicit learning and cognitive ability.

Table 7.1.2
Correlations among implicit learning tasks, cognitive style subscales, and ACT scores.

	1	2	3	4	5	6	7	8	9	10	11	12
1. SRT	(107)											
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12. ACT Reading	−.051	.158	−.009	.100	.108	−.030	−.280*	.714***	.355**	.396***	.380**	(76)

Note: ***$p < .001$, **$p < .01$, *$p < .05$. †Mood was coded as follows: 1 = Positive, 2 = Neutral, 3 = Negative. N per measure on diagonal in parentheses.

Table 7.1.3
Mean implicit learning scores by mood condition adjusted for REI scores.

Mood condition	Artificial grammar ($N = 93$)	Serial reaction time task ($N = 107$)
Positive	32.51 (.588)	1.91 (.189)
Neutral	31.36 (.607)	1.94 (.189)
Negative	34.38 (.597)	1.82 (.189)

Note: REI rational ability included as a covariate ($M = 3.83$) for AG analysis. REI rational ability ($M = 3.80$) and REI experiential ability ($M = 3.55$) included as covariates for SRT analysis.

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* Corresponding author. Tel.: +1 309 556 3867; fax: +1 309 556 3864.
E-mail address: jpretz@iwu.edu (J.E. Pretz).

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Corrigendum

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Jean E. Pretz[a,*], Kathryn Sentman Totz[a], Scott Barry Kaufman[b]

[a] Illinois Wesleyan University, Psychology Department, P.O. Box 2900, Bloomington, IL 61702-2900, USA
[b] Yale University, Psychology Department, P.O. Box 208205, New Haven, CT 06520-8205, USA

Subsequent to the publication of our findings, we discovered an error in the scoring of the Serial Reaction Time task. We corrected this error and note some changes in our results (see Tables 1 and 2). In contrast to earlier findings, SRT scores were correlated with REI experiential ability as well as REI rational ability scores. This supports our initial hypothesis that preference for experiential (intuitive) processing would be positively related to implicit learning. Corrected SRT scores were no longer related to mood condition or cognitive ability. Our findings no longer confirm other studies that have documented a relationship between implicit learning and cognitive ability.

Table 7.1.2
Correlations among implicit learning tasks, cognitive style subscales, and ACT scores.

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1. SRT	(107)											
2. AG	.090	(93)										
3. Mood condition†	−.032	.202	(107)									
4. REI rational ability	.227*	.269**	.014	(107)								
5. REI rational favorability	.150	.146	−.082	.455***	(107)							
6. REI experiential ability	.233*	.016	.090	.168	−.026	(107)						
7. REI experiential favorability	.112	.055	.047	−.192*	−.070	.524***	(107)					
8. ACT composite	.050	.072	.072	.280**	.301**	.018	−.176	(89)				
9. ACT Math	.088	.204	.212	.301**	.255*	.085	−.128	.802***	(76)			
10. ACT Science	.000	.124	−.057	.328**	.218	.028	−.221	.773***	.580***	(76)		
11. ACT English	.061	.094	.127	.049	.131	−.066	−.005	.642***	.402***	.244*	(76)	
12. ACT Reading	−.051	.158	−.009	.100	.108	−.030	−.280*	.714***	.355**	.396***	.380**	(76)

Note: *** $p < .001$, ** $p < .01$, * $p < .05$. †Mood was coded as follows: 1 = Positive, 2 = Neutral, 3 = Negative. N per measure on diagonal in parentheses.

Table 7.1.3
Mean implicit learning scores by mood condition adjusted for REI scores.

Mood condition	Artificial grammar ($N = 93$)	Serial reaction time task ($N = 107$)
Positive	32.51 (.588)	1.91 (.189)
Neutral	31.36 (.607)	1.94 (.189)
Negative	34.38 (.597)	1.82 (.189)

Note: REI rational ability included as a covariate ($M = 3.83$) for AG analysis. REI rational ability ($M = 3.80$) and REI experiential ability ($M = 3.55$) included as covariates for SRT analysis.

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* Corresponding author. Tel.: +1 309 556 3867; fax: +1 309 556 3864.
E-mail address: jpretz@iwu.edu (J.E. Pretz).

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