Original Article

Interested in Different Things or in Different Ways?

Exploring the Engagement Distinction Between Openness and Intellect

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Abstract: Openness and intellect may differentially predict engagement for two possible reasons. First, engagement with sensory experiences is associated with openness, whereas engagement with abstract information is associated with intellect – a distinction based on *content*. Second, openness reflects affective, and intellect cognitive processing – a distinction based on *affect*. These two positions are contrasted through associations of both openness and intellect with interest in a broad range of stimuli. Participants (N = 191) viewed images of visual art, philosophical quotations, and scientific discoveries and rated them on interest, appraised novelty and understanding. Only openness predicted greater interest in all stimuli types. Appraised understanding mediated the openness-interest relationship for visual art and philosophy, while intellect was associated with greater appraised understanding of science and philosophy. Openness was associated with weaker understanding-interest relationships for visual art, and greater reactivity to novelty for science and philosophy. We conclude that one way to think of the engagement distinction between openness and intellect is in terms of emotional versus cognitive engagement. That is, the aspects reflect engagement in different ways rather than in different things.

Keywords: openness/intellect, interest, emotion-appraisal differences, personality processes, engagement

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The debate whether to call Factor V in Big Five models Openness to Experience or Intellect has seemingly been resolved. The domain has been parsimoniously divided into two aspects – openness and intellect (DeYoung, Quilty, & Peterson, 2007). Openness reflects differences in engagement with perceptual and sensory experiences, while intellect reflects differences in engagement with semantic and abstract experiences (DeYoung, 2015). This distinction suggests that the aspects reflect engagement with distinct stimuli and situations, thus describing engagement in different things. We refer to this as the *content distinction*. An alternative hypothesis is that openness describes individual differences in affective engagement with information, and intellect describes cognitive engagement (Kaufman, 2013). We refer to this as the *affective distinction*. The current study tests these two positions by examining the relationship of the openness and intellect aspects with the emotion of interest. We model the distinction as: (a) a content difference reflecting interest in perceptual content (visual art) versus semantic content (science and philosophy) and (b) an affective difference in the appraisal processes that generate interest.

Differential Cognitive and Affective Correlates of Openness and Intellect

Openness and intellect are distinct in their associations with cognitive abilities and creativity. While both aspects are independently related to verbal intelligence, intellect is independently associated with nonverbal intelligence, working memory, and scientific creativity, whereas openness is associated with implicit learning ability, impulsivity, and artistic creativity (Deyoung, Quilty, Peterson, & Gray, 2014; Kaufman et al., 2014; Nusbaum & Silvia, 2011).

Openness and intellect also differ in terms of emotional states and the appraisal processes that underlie these states. Both aspects predicted greater interest in quotations, with openness reflecting greater reactivity to appraised novelty and intellect reflecting greater understanding (Fayn, Tiliopoulos, & MacCann, 2015). Openness and intellect were both related to greater reactivity to novelty in response to visual art, but only openness was related to greater interest and pleasure (Fayn, MacCann, Tiliopoulos, & Silvia, 2015). Finally, the tendency to experience powerful emotional states is associated with openness, but not

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DOI: 10.1027/1614-0001/a000243

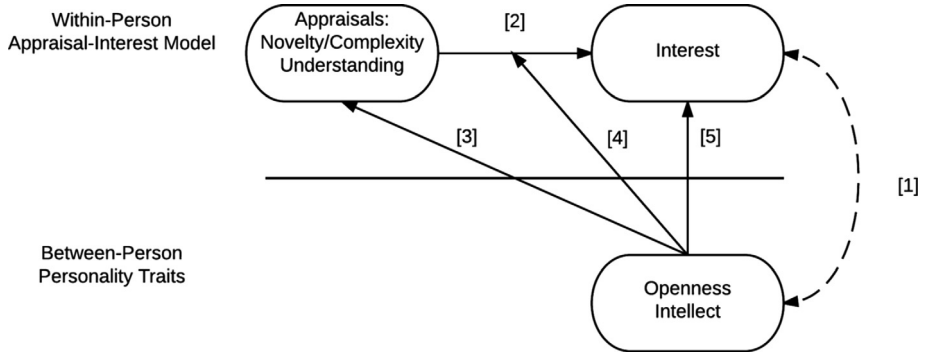


Figure 1. Conceptual model of the effects of openness/intellect on appraisals, interest, and appraisal-interest relationships. Pathway [1] represents the relationship between openness/intellect and interest. Pathway [2] represents the interest-appraisal relationships. Pathway [3] represents the relationship between traits and individual differences in appraisal strengths. Pathway [4] represents the relationship between traits and appraisal-interest contingencies. Pathway [5] represents the relationship between traits and individual differences in interest that are not accounted for by pathways [3] and [4].

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intellect (Silvia & Nusbaum, 2011). In fact, intellect was a negative predictor of the tendency to experience chills, while openness positively predicted tendencies to experience chills and absorption.

These findings provide support to both of the proposed distinctions. The content distinction is primarily supported by the relationships of openness and intellect with artistic and scientific creativity, intelligence, as well as the content of the items that make up the scales. The affect distinction is supported by openness being the more consistent predictor of affective phenomena. Critically, no prior study has directly contrasted the two positions.

Interest as Engagement With Information

Interest is an emotional and motivational state that facilitates exploration, engagement, and learning (Silvia, 2006, 2008). It reflects both the emotional and cognitive aspects of engagement (Ainley, 2012). Interest is a particularly useful construct in evaluating differences between openness and intellect because of its known appraisal structure. Appraisal accounts of emotion propose that emotions are elicited according to the way a person appraises a situation (Ellsworth & Scherer, 2003). The appraisal structure for interest has considerable empirical support – situations appraised as *novel* and *understandable* are experienced as interesting (Silvia, 2005). The novelty appraisal facilitates attention to a situation for further processing. The understanding appraisal in the context of epistemic situations is akin to the *coping potential appraisal*, which reflects estimates of the ability and power to cope with a situation's demands (Ellsworth & Scherer, 2003).

The appraisal approach to studying individual differences in emotional experiences identifies two sources of individual differences in the appraisal-emotion system (Kuppens & Tong, 2010). These are: (1) appraisal strength (e.g., how likely someone is to make a particular appraisal); and (2) the strength of appraisal-emotion relationships (e.g., differences in how strongly an appraisal is coupled with a resulting emotion for a person). The appraisal model for interest and the influences of openness to experience domains and aspects on the appraisal processes is presented in Figure 1. Pathway [1] represents the relationship clarified by appraisal processes. Pathway [2] represents the interest-appraisal relationships. The influence of openness/intellect on interest operates via novelty and/or understanding appraisal strength [3]; as well as via novelty-interest and understanding-interest contingencies [4]. Pathway [5] represents the relationship between openness/intellect and individual differences in interest that are not accounted for by pathways [2] and [3].

Two studies have looked at the unique influence of openness and intellect on the appraisal structure and processes underlying interest. For visual art, openness was related to greater interest, greater appraised understanding of visual art (Figure 1, [3]), and a greater reactivity to novelty appraisals (Figure 1, [4]; Fayn, Tiliopoulos, et al., 2015). For quotations, both openness and intellect were associated with greater interest overall, but the relationship for intellect was mediated by greater appraised understanding (Figure 1, [3]), while openness was related to a lessened reliance on appraised understanding (Figure 1, [4]; Fayn, MacCann, et al., 2015). These findings suggest that openness and intellect may be distinguished through their influence on the processes associated with interest.

The Current Research

The current research tests two different positions on the distinction between openness and intellect in terms of engagement by exploring interest and its processes in response to art, science, and philosophy. The positions were

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contrasted by evaluating (1) the unique influences of openness and intellect on interest in three different categories of stimuli, and (2) the different ways through which openness and intellect influence the appraisal processes that generate interest. Support for the content distinction was evaluated through the following two hypotheses:

Hypothesis 1 (H1): Openness will predict interest in visual art, while intellect will predict interest in philosophy and science.

Hypothesis 2 (H2): The influence of openness on interest in visual art will be qualified by its influence on the appraisal processes associated with interest. The influence of intellect on interest in science and philosophy will be qualified by its influence on the appraisal processes associated with interest.

Support for the affective distinction was evaluated through the following two hypotheses:

Hypothesis 3 (H3): Openness will be associated with greater interest in response to all three stimuli while controlling for intellect. Intellect will not predict additional variance in interest. Note that Hypotheses 1 and 3 are competing hypotheses.

Hypothesis 4 (H4): The influence of openness on interest in all stimuli will be qualified by its influence on the appraisal processes associated with interest. Intellect will not influence the appraisal processes associated with interest. Note that Hypotheses 4 and 2 are competing hypotheses.

Method

Participants and Design

The sample consisted of 191 participants (148 female) from various degrees who took part in the study for credit (Mean age = 19.27 years, *SD* = 3.70). The sample included students with various majors: 18.1% Physical Sciences, 7.7% Arts, 22.5% Psychology, 21.4% Health Sciences, 9.3% Business/Economics, 3.8% Social Sciences, 10.4% were undecided, and 6.6% had majors that did not fit into the categories presented as they were mixtures of more than one category. Nine people were excluded from the final sample due to finishing the study too quickly to have engaged with it seriously.

Procedure

The study was conducted in groups ranging from one to ten participants. All stimuli and personality scales were presented through MediaLab (Jarvis, 2004) on individual computer screens in research laboratories. After providing consent participants completed individual differences assessments, followed by viewing and rating 30 stimuli (10 visual art; 10 science stories from an online science reporting site [SlashDot.com]; 10 philosophical quotations).

For each participant, all the stimuli were presented in a different random order. Each stimulus could be viewed for as long as desired. The stimuli consisted of ten contemporary visual art images by various artists (e.g., Kandinsky, Ryden, Magritte), 10 philosophy quotations (e.g., "It is because human needs are contradictory that no human life can be perfect. That does not mean that human life is imperfect. It means that the idea of perfection has no meaning."), and 10 scientific stimuli that were short explanations of recent scientific findings in different areas of research (e.g., artificial intelligence, evolution, virtual reality, linguistics). The stimuli are provided in the Electronic Supplementary Material, ESM 1.

Measures

Big Five Personality

The five domains of personality were assessed using the Big Five Aspects Scales (BFAS; DeYoung et al., 2007) which splits each domain into two related aspects. The scale consists of 100 items (10 per aspect) on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*).

Interest and Appraisals

After the presentation of each stimulus, people were asked to self-report their interest and appraisals. For interest, people were asked "Did you find this stimulus. . ." followed by items for *interesting, boring* (reverse coded). Each scale used a 7-point (1 = *not at all* to 7 = *very much*) scale. Participants were also asked if they would like more information for each stimulus, which was answered with a binary NO/YES scale. Appraisals were assessed using 7-point bipolar scales (*Simple-Complex*, *Common-Unusual*, *Hard to Understand-Easy to Understand*, *Comprehensible-Incomprehensible*). These items have been widely used in past interest research (e.g., Silvia, 2005, 2013).

Results

Data Reduction and Analysis

Internal consistencies for the BFAS openness (.82) and intellect (.79) scales were good. Between-person predictors (openness and intellect) were both standardized and modeled concurrently to evaluate their unique influence on interest. Multilevel models were used to estimate

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Table 1. Pearson's correlations of openness, intellect, and aggregated interest and appraisals

				Art			Science			Philosophy		
	M	*SD*	Int	Interest	U	N	Interest	U	N	Interest	U	N
Open	37.81	6.16	.48** [.36, .59]	.37** [.24, .49]	.34** [.21, .47]	−.19* [−.33, −.05]	.39** [.26, .51]	.16* [.01, .30]	.01 [−.13, .16]	.43** [.30, .54]	.35** [.22, .48]	−.12 [−.26, .02]
Int	34.72	5.44		.15* [.01, .29]	.21*** [.06, .34]	−.18* [−.32, −.04]	.30** [.16, .43]	.25** [.11, .39]	−.10 [−.25, .05]	.29** [.16, .42]	.34** [.20, .46]	−.09 [−.23, .06]

Notes. $N = 182$; Int = Intellect; U = Aggregated Understanding Appraisals; N = Aggregated Novelty Appraisals; Int = Intellect; Open = Openness; Confidence intervals are reported in square brackets.
*$p < .05$, **$p < .01$, ***$p < .001$ (all two-tailed).

between-person effects, within-person effects, and their interactions (Nezlek, 2008; Silvia, 2007). Within-person predictors (appraisals of novelty and understanding) were centered at each person's own mean and entered into the models simultaneously. Separate multilevel models were analyzed for each stimulus type. The analyses were conducted with Mplus 7, using maximum likelihood with robust standard errors. All coefficients are unstandardized regression weights; some, where noted, are logistic effects.

Descriptive Statistics and Bivariate Correlations

Bivariate relationships are reported in Table 1. For interpreting effect sizes, we use the common guidelines (Cumming, 2012) of $r = 0.10/0.30/0.50$ as small/medium/large. A large relationship was found between openness and intellect, replicating previous findings (e.g., DeYoung et al., 2007). Openness had medium to large relationships with interest in art, science, and philosophy, while the relationships between intellect and interest were small (art) to medium (science and philosophy). Openness was positively related to appraisals of understanding for art (medium-large), philosophy (medium-large), and science (small). Intellect was also related to greater appraised understanding of art (small), science (medium), and philosophy (medium). Both openness and intellect were associated with less appraised novelty in response to art (small), and unrelated to novelty appraisals in response to science and philosophy.

Between-Person Relationships of Openness/Intellect Aspects With Interest

To test the unique influence of openness and intellect on interest in science, philosophy, and art, both aspects were used as predictors of aggregated interests across the three stimulus types (Figure 2). Openness, but not intellect, was associated with greater interest in response to art, science, and philosophy, supporting the affective, as opposed to content, distinction between the aspects. That is, this result supports Hypothesis 3 rather than Hypothesis 1.

This unique role of openness was also replicated for the information request questions.[1] A logistic model found that openness significantly predicted the likelihood of wanting more information about images, $b = .52$, $SE = .17$, $p = .002$, 95% CI [0.20, 0.85], philosophical quotations, $b = .43$, $SE = .15$, $p = .003$, 95% CI [0.14, 0.71], and scientific findings, $b = .40$, $SE = .13$, $p = .004$, 95% CI [0.14, 0.66]. Intellect, in contrast, did not significantly predict wanting

[1] An issue with this measure is that there was no control for previous exposure to the stimulus. This would be an important control for future studies.

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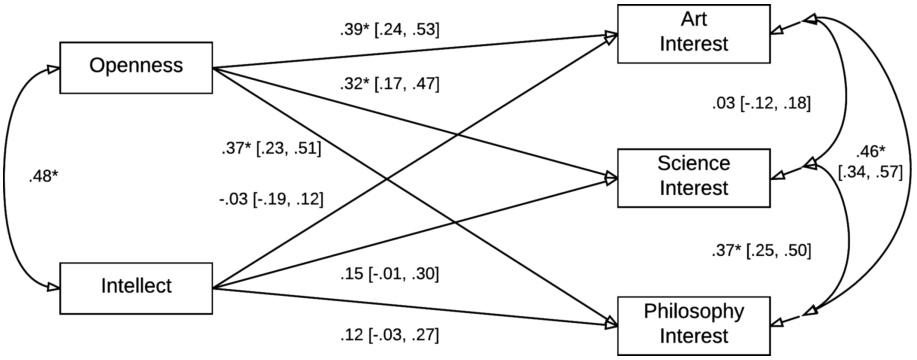


Figure 2. Path model representing between-person relationships between openness, intellect, and interest in art, science, and philosophy. *$p < .001$ (two-tailed).

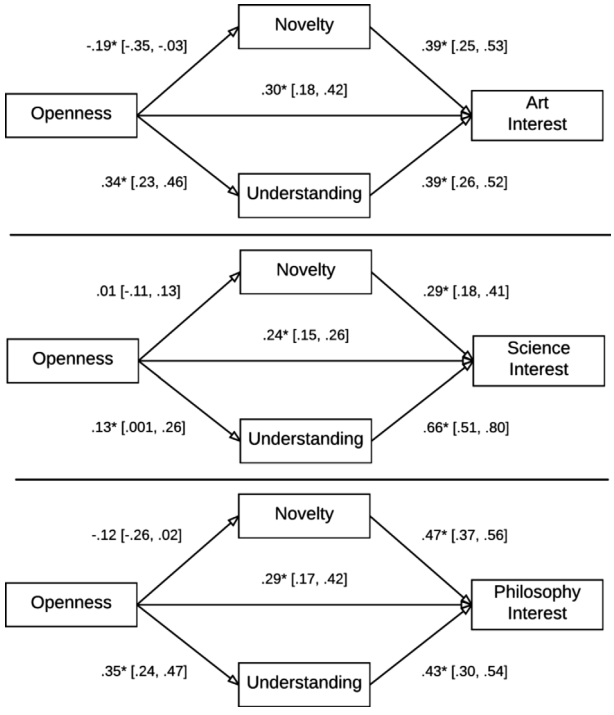


Figure 3. Appraisal strength mediation models of understanding on the relationships between openness, intellect, and interest. *$p < .001$ (two-tailed).

more information about images, $b = -.07$, $SE = .16$, $p > .05$, 95% CI [−0.39, 0.20], philosophical quotations, $b = .05$, $SE = .15$, $p > .05$, 95% CI [−0.25, 0.35], and scientific findings, $b = .06$, $SE = .15$, $p > .05$, 95% CI [−0.23, 0.35].

In short, openness and intellect diverged in their relationships with interest and information request choices for all three stimuli types: openness significantly predicted all of them, and intellect predicted none.

Between-Person Appraisal Strength and Openness/Intellect Aspects

Path models were used to test whether appraisal strength mediated the openness-interest relationships (Figure 3). These models tested whether the influence of openness on interest was mediated by appraisal tendencies (see Figure 1, pathway [3]). The significance of the indirect effects was assessed using bootstrapping procedure with unbiased estimators (Hayes, 2009). The models generated 5,000 bootstrapped resamples with bias-corrected and adjusted confidence intervals. Figure 3 shows the path model results for art, science, and philosophy.

For art, the relationship between openness and interest was mediated by greater appraised understanding (point estimate = .134; 95% CI [0.067, .200]). Intellect was not related to interest or the appraisals. These findings support both content and affective positions.

For science, the relationship between openness and interest was mediated by greater appraised understanding (point estimate = .094; 95% CI [0.004, 0.184]). These findings support the affective distinction.

For philosophy, the relationship between both openness and interest was mediated by greater appraised understanding (point estimate = .152; 95% CI [0.079, 0.192]). These findings support the affective distinction.

These findings suggest that the relationship between openness and interest in all three stimuli groups is partially explained by greater appraised understanding. Controlling for intellect within these models only changes the mediation for science stimuli. In the presence of intellect, openness has a direct relationship to interest in science, but no significant relationship with appraised understanding, and thus no significant mediation.

Within-Person Appraisal-Interest Contingencies and Openness/Intellect Aspects

Random intercept and slope multilevel models were used to test the unique influences of openness and intellect on the within-person intercepts and appraisal-interest relationships. Separate models were tested for each stimulus type, thus, each model tested whether (a) overall interest in each

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Table 2. Multilevel random slopes and intercepts model results for art, science, and philosophy

	Art			Science			Philosophy		
Within-Person Predictors									
Understanding	.37*** [.31, .43]			.56*** [.49, .62]			.48*** [.42, .53]		
Novelty	.42*** [.36, .48]			.23*** [.16, .29]			.26***[.20, .33]		
Between-Person Predictors	Intercept	N	U	Intercept	N	U	Intercept	N	U
Openness	.34*** [.20, .48]	−.01 [−.07, .06]	−.08* [−.15, −.01]	.27*** [.14, .40]	.07* [.01, .13]	−.06 [−.13, .01]	.35*** [.20, .49]	.09* [.02, .15]	> −.01 [−.07, .06]
Intellect	−.04 [−.18, .11]	.04 [−.04, .12]	> −.01 [−.08, .07]	.12 [−.03, .25]	.03 [−.03, .10]	< .01 [−.07, .08]	.09 [−.07, .25]	.03 [−.04, .09]	−.03 [−.08, .03]

Notes. $N = 182$; U = Understanding Appraisals; N = Novelty Appraisals; Confidence intervals are reported in square brackets. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$ (all two-tailed).

person's mean level of novelty and understanding appraisals (intercept), and (b) idiosyncratic within-person variance in appraisal-interest contingencies (slopes) can be explained by between-person differences in openness and intellect. Intraclass correlation coefficients suggested a substantial amount of between-person variance for art (.25), science (.22), and philosophy (.23).

The results for the random slopes and intercept models are presented in Table 2. At the within-person level, interest was positively predicted by novelty and understanding appraisals for all three stimulus types, which replicate the previously observed appraisal structure for various stimuli, and extends this structure for philosophical and scientific stimuli.

Openness was distinct from intellect in its associations with differences in appraisal-interest relationships for all three stimuli supporting the affect distinction (Hypothesis 4 rather than Hypothesis 2). Openness, but not intellect, predicted larger intercepts (Figure 1, [5]), and appraisal-interest relationships (Figure 1, [4]) for all three stimuli provided further support for the affective distinction. For art stimuli, openness was related to weaker understanding-interest relationships. Considering the slope and intercept findings together, those higher in openness experienced more interest overall, and particularly in difficult to understand stimuli. This finding replicates a previously discovered relationship with the domain of openness/intellect (Silvia, Henson, & Templin, 2009), and suggests that this effect is particular to openness rather than intellect.

Openness also predicted larger intercepts and reactivity to novelty in the experience of interest in response to science and philosophy stimuli. Those higher in openness reacted to novelty with greater interest compared to those lower on openness. Considering the intercept and slope findings together, those higher in openness experienced more interest overall, and particularly in novel and complex stimuli. Intellect did not predict any of the intercepts or appraisal-interest relationships. The results for science and philosophy stimuli support the affective distinction between openness and intellect, rather than the content distinction, and suggest processes that facilitate openness-interest relationships.

Discussion

The current study tested two positions on the engagement distinction between openness and intellect – two aspects of the broad domain of openness/intellect. The content distinction based on information type predicted that openness and intellect would reflect greater engagement with visual versus semantic stimuli. The affective distinction predicted that only openness would be related to interest in all stimuli.

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Our results supported the affective distinction. Openness consistently predicted interest in all three types of stimuli, while intellect was not uniquely associated with interest in the stimuli. The relationship between openness and interest for all stimuli types was qualified by the influence of openness on processes associated with interest. These findings have implications for our understanding of how the aspects differ in terms of engagement, and suggest an affective distinction between openness and intellect.

Openness/Intellect and Processes of Engagement

Openness, as opposed to intellect, moderated within-person appraisal processes, suggesting processes associated with the greater interest reported by those higher in openness. For visual art, openness was associated with greater interest overall, but particularly in difficult to understand art. This finding provides an explanation for why taste in abstract art is a lot more individualized than real-world images (Vessel & Rubin, 2010). When art is easily understood – such as representational art – interest of open versus closed people is similar, but when art is difficult to understand – such as abstract art – different standings on openness contribute to a greater distribution of aesthetic appreciation.

For verbal stimuli, openness was associated with greater reactivity to novelty in the experience of interest. This finding supports the notion that the core of openness is appreciation and seeking of new and particularly cognitively complex experiences. Intellect, while not related to interest, was associated with greater understanding of verbal stimuli. These findings are intriguing in their implications for relationships between openness/intellect and learning. The domain of openness/intellect is associated with better educational outcomes (Poropat, 2009). This is particularly apparent for Need for Cognition (von Stumm, Hell, & Chamorro-Premuzic, 2011) – a construct linked to intellect rather than openness. Further, a recent finding suggests that intellect is associated with greater cognitive resource allocation (Smillie, Varsavsky, Avery, & Perry, 2016), which may be a process that facilitates understanding of complex stimuli. Since both interest and understanding facilitate learning, future studies should analyze the unique influences of openness and intellect on academic performance and engagement.

Affective Distinction Between Openness and Intellect

Our results implicate openness as the aspect that best explains individual differences in interest in response to both visual and abstract stimuli. Our findings extend the growing consensus that openness/intellect is another domain – apart from extraversion and neuroticism – that reflects individual differences in the propensity to experience emotions (Shiota, Keltner, & John, 2006; Silvia, Fayn, Nusbaum, & Beaty, 2015), and this tendency seems to be particular to the openness aspect of the domain. While extraversion and neuroticism are the best personality predictors of positive and negative affect, openness appears to reflect emotional engagement with epistemic situations. As suggested by McCrae and Costa (1997), "open people are not only *able* to grasp new ideas, they *enjoy* doing so" (p. 832).

One possible reason for the lack of association between interest and intellect is the lack of purely engagement items in the scale. While theoretically tied with other measures of intellectual engagement (DeYoung, 2015), the measurement of intellect is different from measures that assess similar constructs such as the Curiosity and Exploration Inventory (Kashdan et al., 2009), Typical Intellectual Engagement (Goff & Ackerman, 1992), and another conceptualization of Intellect (Mussel, 2013). All the other measures explicitly avoid items that assess self-reported ability, while the intellect measure is primarily made up of items that do. By casting a wide net, the intellect measure may have drifted away from assessing an intellectual engagement construct, toward a self-assessed measure of intelligence. While not problematic in itself, our findings suggest that the current conceptualization of intellect as describing individual differences in engagement with abstract information may need further clarification in terms of what sort of engagement the aspect is describing. The role of intellect in engagement does not appear to be associated with greater affective engagement, but may rather manifest in greater understanding and resources allocated to cognitive tasks (Smillie et al., 2016).

Limitations and Future Directions

Fine-grained distinctions between similar constructs are interesting. We are particularly curious to see the distinctions between intellect-based constructs such as need for cognition, typical intellectual engagement, openness to ideas, and intellect. As previously demonstrated, strong correlations between two similar constructs – openness to ideas and need for cognition – do not mean that the two constructs will have the same associations (Fleischhauer et al., 2010). We are particularly curious to see whether constructs, other than openness and intellect, that measure cognitive engagement, would be associated with affective responses to information. Similarly, future research should integrate openness and intellect into the theoretical framework described by Mussel (2013). Openness may fit within

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the creativity part of the framework, and extend the framework to include affective engagement, while integrating the ability items of intellect would lead to further understanding of the construct.

A limitation that may have affected our results is the lack of control for previous exposure to the stimuli presented to the participants. Given that openness and intellect are both independently associated with crystallized intelligence, it is possible that those higher on these aspects were more likely to be previously exposed to the stimuli.

Conclusion

We sought to test two distinct positions on the engagement distinction between openness and intellect by evaluating their role in interest in response to a broad range of visual and abstract stimuli. The content distinction predicted that the aspects would diverge in interest in visual versus verbal stimuli. In contrast, the affective distinction predicted that openness but not intellect was the basis for differences in affective engagement. We found support for the affective distinction as only openness was related to interest, while intellect only predicted greater appraised understanding of the verbal stimuli. This study adds to the growing consensus that when studying openness/intellect, it is best to consider the aspects of openness and intellect separately as they often predict distinct psychological phenomena. Our findings suggest that the distinction between openness and intellect may be more nuanced than just representing engagement with different types of content. We propose openness to be the affective aspect of the openness/intellect domain, reflecting a propensity to experience interest in response to a broad range of informational situations. Thus, openness and intellect do not necessarily reflect engagement in different things, but rather, in different ways.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at http://dx.doi.org/10.1027/1614-0001/a000243

ESM 1. Text (docx).
Overview of art stimuli, philosophy stimuli, and science stimuli.

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Received August 30, 2016
Revision received April 5, 2017
Accepted April 10, 2017
Published online November 10, 2017

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