Opening up Openness to Experience: An appraisal process approach towards understanding individual differences in epistemic engagement.

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Declaration

I hereby certify that this thesis does not contain, without appropriate acknowledgement, any material previously submitted for a degree or diploma in any university. I also certify that this thesis does not contain, to the best of my knowledge, any material previously published or written by another person, except where die reference is made.

Kirill Fayn

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Abstract

This thesis offers new insights into the relationship between epistemic engagement and the personality domain of Openness to Experience. In seeking to better understand this relationship, the unique influence of the lower order aspects of Openness and Intellect on engagement was evaluated. Particularly, the proposal that Openness and Intellect represent individual differences in engagement with diverging information is tested—Openness with sensory and perceptual, and Intellect with abstract and semantic. Additionally, a process-based understanding for the differences between the aspects in the context of engagement with information was sought. Such an understanding can shift Openness/Intellect beyond a descriptive construct, and provide explanations for relationships between the domain and epistemic engagement. Four studies evaluated whether Openness and Intellect were differentially related to interest in various informational stimuli—quotations (study 1), visual art (study 2, 3 and 4), philosophy and science (study 4). Throughout the studies, Openness was the consistent predictor of interest in all stimuli. The influence of Openness on engagement was also consistently qualified by appraisal-emotion contingencies. Particularly, Openness was associated with stronger novelty-interest relationships suggesting a reactivity to novel and complex situations. The implications of this finding for the previously observed relationships between Openness, Cognitive Abilities, and Educational outcomes are discussed. The lack of associations between engagement and Intellect is, in part, explained by the measurement of the construct being misaligned with its conceptualisation. Overall, these findings suggest that a clear engagement distinction between Openness and Intellect in terms of stimulus type is premature. Instead, Openness seems to currently represent the affective engagement aspect of the domain, while Intellect is related to greater understanding, but not interest.

Publications and presentations relating to this thesis

Publications

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Conference presentations

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Table of contents

List of figures and tables

Figures

Tables

"When the determinants of interests are more completely understood, the psychologist will have obtained keys to many of the hither-to unsolved riddles of personality."

– Berdie, 1944, p. 138

Chapter 1: Introduction

If you have ever marveled at human achievement as a species, chances are you were in awe of the consequences of a personality domain labelled Openness/Intellect. Openness/Intellect is arguably the most uniquely human personality domain. This is not to say that non-human animals do not exhibit Openness/Intellect—some do, in the form of curiosity for novel environments (Gosling & John, 1999)—but rather, Openness/Intellect manifests in behaviours that are not found in non-human animals. For example, Openness/Intellect is the best personality predictor of the creation and appreciation of all forms of art, creativity in general, knowledge acquisition, cognitive ability, political affiliations, values, investigative and artistic interests, and many other uniquely human deeds and attitudes (Feist, 1998; Gerber, Huber, Doherty, & Dowling, 2011; Kaufman et al., 2014; Larson, Rottinghaus, & Borgen, 2002; McCrae, 1996; Mccrae & Sutin, 2009; Rawlings, 2003; von Stumm & Ackerman, 2013; Ziegler, Danay, Heene, Asendorpf, & Bühner, 2012).

One of the most researched and consistent relationships associated with Openness/Intellect is engagement with information. Openness/Intellect is proposed to play a crucial role in the development of vocational, leisure and academic interests, and the development of general knowledge and cognitive abilities (Ackerman, 1996; Howard, 1976; Larson et al., 2002; Ziegler et al., 2012). These associations—like many other associations between personality traits and life outcomes—suffer from a relative lack of explanatory mechanisms. One focus of this thesis is to discover the processes by which Openness/Intellect manifests in engagement with different kinds of information. In particular, I aim to uncover how the subsidiary parts of Openness/Intellect uniquely manifest engagement and its processes. That is, I am integrating a descriptive individual differences perspective with a socio-cognitive approach in order to develop a dynamic

understanding of how traits manifest in emotional experiences in response to information (Fleeson & Jayawickreme, 2015; Kuppens & Tong, 2010). In the paragraphs below, I outline why such an endeavour is important to our understanding of personality, and then describe the theory underpinning these questions.

Trait taxonomies—such as the Big 5—have largely focussed on *describing* meaningful dimensions of individual differences, such as the domain of Openness/Intellect. Traits are constructs that, by themselves, can only describe the meaningful ways in which someone's behaviour is consistent over time, but not *why* it is consistent, and not *how* traits contribute to such consistency (Hampson, 2012). The social-cognitive perspective focuses on the observation that moment-to-moment behaviour is highly variable (Mischel & Shoda, 1995; Mischel, Shoda, & Mendoza-Denton, 2002), and therefore places a greater emphasis on social-cognitive situational explanations of behaviour. Therefore the trait approach aims to describe consistency in behaviour over time, and the social-cognitive approach aims to explain moment-to-moment variability in behaviour. Both of these approaches to personality have considerable empirical support for their seemingly contrary positions.

Several theoretical positions have taken meaningful steps towards integrating the two approaches (e.g. Fleeson & Jayawickreme, 2015; Kuppens & Tong, 2010). Research based on these approaches suggests that moment-to-moment states are highly variable, yet there is remarkable consistency in the averages, peaks, and distributions of such states (e.g. Baird, Le, & Lucas, 2006; Fleeson, 2001). Therefore, while traditionally opposed, the trait and social-cognitive approaches to personality can be seen as operating at different levels of analysis, and can be used together in a complementary way. Such a merger of the two approaches would facilitate explanations for the way traits manifest in behavioural outcomes. Whole Trait Theory outlines a blueprint for such an integration (Fleeson &

Jayawickreme, 2015). It suggests the study of the relationships between traits and information processing mechanisms associated with variability in moment-to-moment behaviour. This thesis looks at such relationships—between states and social-cognitive processes associated with engagement with information, and the two aspects of the personality domain of Openness/Intellect. An important background to this is the history of how the aspects model was developed, and how it is currently conceptualised.

Openness/Intellect is the most contentious personality domain in the Big Five trait taxonomy and has a shaky and controversial past. Historic disagreements surround its label, nature, cultural equivalence, measurement methods, and existence. Debates on these issues have led to new insights regarding the domain, and recent structural and theoretical developments have helped to clarify some previous disagreements. One of the most enduring and contentious issues—the historic Openness versus Intellect debate (De Raad & Van Heck, 1994; Goldberg, 1994; Johnson, 1994; McCrae, 1990, 1994; Saucier, 1992, 1994; Trapnell, 1994)—has seemingly been resolved by separating the domain into two related yet distinct aspects labelled Openness and Intellect (DeYoung, Quilty, & Peterson, 2007). This arguably brought about an exciting time for Openness/Intellect researchers as the work turned away from label and structural debates, towards a much needed understanding of the mechanisms underlying the domain and its aspects. Thus, the second broad aim of this thesis is to clarify the Openness versus Intellect distinction in the context of engagement with information and the processes that facilitate engagement.

In order to properly introduce this subject the sections that follow will:

(1) provide a short history of the Openness/Intellect domain and detail the disagreements and resolution surrounding the nature and structure of the domain;

(2) review the literature on the distinction between Openness and Intellect and report on the current theory of the distinction;

(3) review literature on the engagement construct for this thesis: the emotion of interest;

(4) demonstrate the overlap between interest and the domain of Openness/Intellect and propose interest as the state of the open-minded;

(5) describe the appraisal account of individual differences in emotions that incorporates the trait and process approach;

(6) describe a social-cognitive model that will be tested throughout the empirical part of this thesis.

Openness/Intellect: Discovery, disagreements, and definitions

The Big Five personality framework, and subsequently the Openness/Intellect domain, was empirically derived via the lexical hypothesis positing that socially relevant individual differences descriptors are encoded in language (Norman, 1963). Allport and Odbert (1936) collated an extensive list of language descriptors, that were later refined and factored by Cattell (1945) to develop his 16 factor personality structure. Efforts to replicate Cattell's structure proved difficult, and five factor solutions eventually dominated the field. The initial discovery of the Openness/Intellect domain is attributed to Fiske (1949) who found five factors of which the fifth was labelled *Inquiring intellect* and described as the trait of the true and curious scientist. The five-factor structure was replicated by Tupes and Christal (1961), who labelled the domain *Culture*. The differences in labels—culture and inquiring intellect—in the early studies was a sign of things to come as debates regarding the label, nature, measurement, and existence of Openness/Intellect have followed the

domain like a bad smell, eventually prompting Goldberg to label the disagreements a "scientific embarrassment" (Goldberg, 1993, p. 27).

Openness versus Intellect: The great debate

Disagreements regarding the label for, and indeed essence of, Openness/Intellect, revolved around two conceptualisations of the domain that are now represented within the compound label. Goldberg's (1981) work, following the lexical tradition, led to the *Intellect* label, while Costa and McCrae (1976) chose the label of *Openness to Experience*. The measurement of Openness to experience was extended beyond the lexical tradition by measuring the construct via questionnaire—based on Coan's (1972) already existing measure—instead of adjectives. The development of Intellect, as a construct, never strayed from the lexical tradition of construct measurement, while Openness to Experience was developed and grew from already existing constructs that were conceived independently of the Big Five. Costa and McCrae drew from the constructs of *openness to feelings* (Rogers, 1961), *absorption* (Tellegen & Atkinson, 1974), *regression in the service of the ego* (Fitzgerald, 1966), *creativity* (MacKinnon, 1960), and *openness to experience* (Coan, 1972). By casting a wide net and assessing Openness to Experience via questionnaires, Costa and McCrae claimed to broaden the construct beyond lexically discovered adjective scales (Robert R McCrae, 1994). This claim proved to be rather contentious with researchers from both sides—Intellect and Openness to Experience—campaigning for their label, conceptualisation and measurement of the construct.

McCrae (1990) argued that the lexical hypothesis may be too rigid to exclusively rely on for theories of personality. Based on Hofstee's (1990) criticism of the lexical tradition, McCrae suggested that lexically based models of personality are laced with ambiguity and misunderstanding of adjective meanings, and translation issues. He proposed that while the

lexicon has been a valuable tool for the discovery of personality structure, it cannot offer the definitive or final word on personality constructs. Further, McCrae argued that Openness to Experience is not adequately represented with single word adjectives. For example, the adjective *artistic* could refer to a person that is sensitive to aesthetic experiences, or it could also indicate an ability-like description of someone that is good at creating art. McCrae argued that the English language does not have adequate adjectives to describe sensitivity—as opposed to ability—to aesthetic experiences as well as the facets of feelings, and fantasy.

This challenge was taken up by Saucier (1992) who proposed and factored a list of adjectives that he believed represented feelings, fantasy and aesthetics. These adjectives were found to relate to Intellect and factored according to the facets they were supposed to measure. Saucier therefore suggested that the distinction between Openness to Experience and Intellect was "much ado about nothing" (p. 385) and that the lexical and questionnaire measurements were a lot more convergent than McCrae (1990) suggested.

Evaluating the adjectives chosen by Saucier to represent the aesthetics facet (imaginative, musical, poetic, unimaginative) does suggest, albeit at face value, that the Openness to aesthetics construct is broader. In my opinion, the adjectives proposed by Saucier assess creative ability, rather than openness to aesthetic experiences. It appears that Saucier's measure would differentiate the creative from the non-creative, but would do little to identify the aesthetically engaged individual. For example, if a person greatly enjoys music and poetry, but lacks the ability to play an instrument or write a poem, such adjectives do not capture their openness. The same criticism can be directed at the adjectives reflecting intelligence that are present in lexical measures of Intellect. The *Openness to ideas* facet—the facet from the Costa and McCrae model that has the greatest

empirical and theoretical overlap with Intellect—assesses *engagement* with ideas, not the ability of the individual. It appears, therefore, that the measurement of Openness to Experience is broader than the measurement of Intellect, not only in the facets it includes, but also in the way it assesses the construct. Thus, through its reliance on the lexicon, Intellect fails to capture the motivational elements of Openness to Experience; instead it primarily assesses a self-reported ability construct.

Trapnell (1994) pointed out some flaws with Saucier's (1992) analysis of the data—the inclusion of three overlapping adjectives artificially inflated the correlations between the new scales and the intellect scale. However, Saucier (1994) subsequently showed that these relationships, when said adjectives were removed, remained high. Trapnell also pointed out that the *openness to fantasy* scale created by Saucier had higher correlations with Neuroticism than with Intellect. A similar point was also raised by McCrae (1994) with regards to the adjective *'sensitive',* which can be interpreted as an openness to feelings adjective, but can also be interpreted as part of Neuroticism. This point highlights an issue inherent in lexical models of personality, where different interpretations of adjectives can lead to misunderstanding and misrepresentation of constructs.

McCrae (1994) also questioned the construct validity of Intellect due to the inclusion of items assessing self-reported intelligence. Some of the items within the scale are adjectives like *intelligent, clever, bright*, which do seem to assess ability rather than personality. This may not be a problem in itself as some have suggested that intelligence should be part of personality models (e. g. DeYoung, 2015). However, as McCrae (1994) and Trapnell (1994) pointed out, the self-assessed ability items tend to load on the Conscientiousness domain, at times as much as on Openness/Intellect. This association is problematic as Conscientiousness is not associated with intelligence (Ackerman &

Heggestad, 1997; S. von Stumm, Hell, & Chamorro-Premuzic, 2011), therefore the self-assessed ability part of Intellect does not necessarily reflect ability.

John Johnson, (1994) contributed to the Openness versus Intellect debate with a nuanced analysis that focused on identifying facets that shared the least amount of variance with other domains. He took advantage of the Abridged Big 5 Circumflex (AB5C) model that maps adjectives based on their secondary loading on domains other than those that the adjective assesses (W. K. Hofstee, de Raad, & Goldberg, 1992). For example, the Intellect measure of the Openness/Intellect domain is classified as a blend of Openness/Intellect and Conscientiousness, reflecting the overlap discussed above. Johnson demonstrated that the factor-pure facets—those showing the least overlap with other domains—from the Openness to Experience measure were the openness to ideas and aesthetics facets. These NEO facets also have the highest overlap with the Intellect construct as was pointed out by Saucier (1994), and corresponded to his conclusions that Openness to Experience and Intellect measurements reflect two peripheral aspects of the broad domain most clearly defined by *imagination*. Johnson concluded that the two factor pure facets—ideas and aesthetics—reflect interests and engagement with different types of situations: interest in truth versus beauty.

The debates regarding the nature and label of Openness/Intellect quieted down for a while, with research seemingly preferring the questionnaire conceptualisation of the domain (John, Naumann, & Soto, 2008). More than a decade after the somewhat feisty debate, a new measure of Openness/Intellect was developed (DeYoung et al., 2007) that drew upon genetic evidence suggesting two aspects to every Big Five domain (Jang, Livesley, Angleitner, Riemann, & Vernon, 2002). The Big Five Aspect Scales split the domain (and each of the other personality domains) into two distinct yet related aspects—Openness and

Intellect (DeYoung et al., 2007). Openness was primarily associated with the NEO facets of aesthetics, feelings and fantasy, and Intellect with AB5C facets of quickness and intellect and the NEO facet of ideas. At this stage, DeYoung seemingly resolved an age-old debate regarding the nature and label of factor V by appeasing both sides and suggesting that it is Openness *and* Intellect. Since the proposal of this new level of the personality hierarchy (Figure 1.1, aspects) research has gone into understanding how the aspects of Openness and Intellect differ from each other.

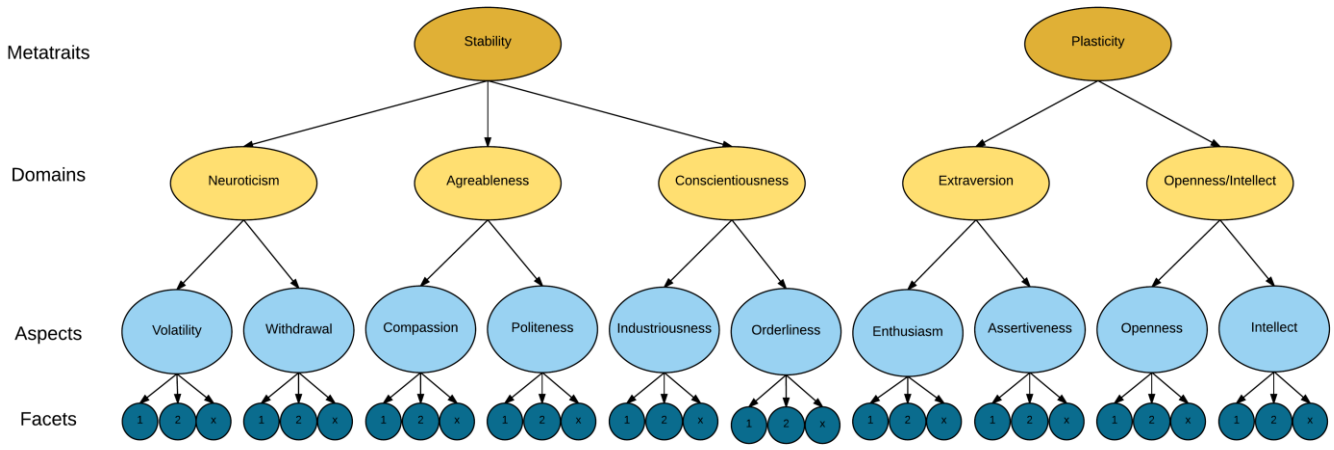

Figure 1.1. Hierarchical model of personality based on the Big Five.

Openness and Intellect: Together yet apart

While Openness and Intellect are part of the same domain, their overlap is small enough (r between .3-.6) to suggest the possibility of differential correlates and mechanisms. Since the conception of the Openness and Intellect scales, several studies have shown differential relationships between the aspects and a number of diverse psychological variables including cognitive abilities, creativity, and affective phenomena. Thus, a story regarding the differences between Openness and Intellect has started to emerge.

The most researched correlates of the aspects of Openness and Intellect are those with cognitive abilities. Openness and Intellect were double dissociated in terms of their

relationships with working memory and implicit learning ability (Kaufman et al., 2010). Intellect was associated with greater working memory capacity, while Openness was related to the ability to non-consciously detect complex patterns of information. Nusbaum and Silvia (2011) found that Intellect, but not Openness, was related to fluid intelligence. This finding has been replicated (Deyoung, Grazioplene, & Peterson, 2012) and extended to include verbal and nonverbal intelligence relationships (Deyoung, Quilty, Peterson, & Gray, 2014). At the bivariate level, Openness and Intellect were associated with greater general intelligence (g), and while both are found to relate to verbal intelligence, only intellect was associated with nonverbal intelligence (Deyoung et al., 2014). When modelled concurrently, both aspects predicted unique variance in verbal intelligence, but only Intellect was associated with g and nonverbal intelligence. These findings were consistent across a student and adult sample. Relationships between the Openness/Intellect aspects and intelligence suggested that Openness and Intellect both explain unique variance in verbal intelligence, but differential relationships to non-verbal intelligence, and implicit learning abilities.

Openness/Intellect is the best personality predictor of creative abilities and outputs (Feist, 1998), and the aspects of Openness and Intellect have been observed to have differential associations with creativity. Nusbaum and Silvia (2011) found Openness, but not Intellect, was related to artistic creative output. Extending this finding to scientific creativity, two studies have reported a double dissociation, with Intellect predicting scientific creative output and Openness relating to creative achievements in the arts (Kaufman, 2013; Kaufman et al., 2014). The larger of these studies tested the relationships across four samples and controlled for intelligence (Kaufman et al., 2014). In two out of four samples, the relationship between Intellect and scientific creativity was explained by its overlap with

intelligence. These findings may suggest that scientific creativity may be a function of intelligence and the shared variance between Intellect and intelligence, rather than Intellect alone.

Apart from ability and creativity, Openness and Intellect are differentially related to the propensity to experience powerful aesthetic emotions, life meaning-making, impulsivity, absorption, fantasy proneness, conscientiousness, and subclinical delusional ideation. Openness was related to a greater propensity to experience powerful aesthetic emotions, particularly, chills and absorption, while Intellect was negatively associated with experiencing chills (Silvia & Nusbaum, 2011). This finding is reflective of the differences between Openness to Experience and Intellect constructs discussed by Trapnell (1994), and dismissed by Goldberg (1994). Trapnell (1994) posited that "the hearts of open people are as open as their minds" (p. 288) suggesting an emotional component of Openness to Experience. Goldberg (1994) dismissed this as belonging to the domains of Extraversion and Agreeableness. Importantly, the relationship between Openness and powerful aesthetic states were observed after controlling for the other Big Five domains (Silvia & Nusbaum, 2011), suggesting an emotional component that is independent from Extraversion and Agreeableness.

One study found a positive relationship between Openness, but not Intellect, and positive schizotypy variables (Menon et al., 2013). This was supported by a simplex model where positive schizotypy was closer to Openness facets than to Intellect facets (Deyoung et al., 2012). These findings suggest that Openness, but not Intellect, reflect a tendency towards positive elements of schizotypy related to the detection of patterns where there are none. Interestingly, Openness has been linked to non-conscious detections of patterns. Perhaps, the extreme of Openness is where this ability becomes maladaptive.

Openness and Intellect have been shown to differentially relate to two meaning-of-life orientations (Lavigne, Hofman, Ring, Ryder, & Woodward, 2012). Openness was a much stronger predictor of the learning for the sake of learning life orientation, however Intellect was also significantly associated with the scale. Additionally, Intellect was related to learning out of responsibility, while Openness was not. This last differential relationship may be reflective of the differential relationships that Openness and Intellect have with Conscientiousness. Conscientiousness was the best predictor of learning out of responsibility, but does not predict learning orientations. Likewise, Openness is unrelated to Conscientiousness, while Intellect shares a significant amount of variance with the Industriousness aspect of Conscientiousness (e.g. DeYoung et al., 2007).

Openness and Intellect also diverge in association with political orientations. Openness was found to be associated with two different measures of liberalism, and republican voters were found to be lower on Openness than liberal voters, while intellect did not play a role in these relationships (J. B. Hirsh, DeYoung, Xiaowen Xu, & Peterson, 2010). Finally, in an analysis of self-narrative writing, Openness was associated with use of perceptual words dealing with visual and auditory perception, while intellect was not related to any words consistent with the domain (Jacob B. Hirsh & Peterson, 2009).

Taking these differential relationships together, a picture of a person high on only one of these aspects emerges. The open person would possess good verbal knowledge, be observant of complex patterns—without necessary conscious knowledge of them, be left-leaning politically, be involved in the creation of artistic and fantastical things, would get emotional about sunsets and sunrises, would cry during films, and would experience chills and goosebumps in response to music. They would be a little odd, enjoy learning for the sake of learning, and be slightly impulsive and disorganised.

The person high on Intellect, but lacking in Openness would be clever. They would be good at storing information in memory and solving complex puzzles, and they would also possess an impressive vocabulary. They would be a creator, but not of the arts; knowledge would be their domain. They would be quite organised and not let emotions get the better of them. Even though the Openness/Intellect aspects are usually correlated, the overlap in them is not so great as to suggest that such people could not exist.

Based on item content and some of these differential associations—primarily cognitive abilities and creativity—DeYoung proposed that Openness and Intellect are linked by cognitive exploration, but diverge based on the type of processes and abilities that facilitate such exploration (DeYoung, 2015). Openness is proposed to explain individual differences in engagement with perceptual and sensory information, while Intellect is reflective of engagement with abstract and semantic information. These definitions are reminiscent of Johnson's (1994) distinction of the aspects as interests in truth versus beauty, and his proposal that Openness and Intellect reflect engagement in different types of situations that involve information. For example, Intellect would be hypothesised to explain variation in engagement with abstract stimuli such as scientific discoveries, and Openness with the visual arts. While hypothesised, these differential engagement associations have not previously been tested. The following section will review literature on an engagement state associated with information seeking and engagement: the emotion of *interest.*

The emotion of Interest as engagement with information

Interest is an emotional and motivational state that facilitates exploration, engagement, and learning (Silvia, 2005b, 2008b). The placement of interest in the emotional sphere of psychology was contentious in the past when strict lines were drawn between

emotion and cognition. Interest was considered too 'cognitive' to be included in Ekman's list of basic emotions (Ellsworth, 2003). The illusionary lines between emotions and cognitions have since dissipated as cognitive and emotional brain systems seem to be so intertwined that any separation seems implausible: "cognitive-emotional behaviours have their basis in dynamic coalitions of networks of brain areas, none of which should be conceptualized as specifically affective or cognitive" (Pessoa, 2008, p. 148).

Interestingly, Phoebe Ellsworth—a research assistant at the time of Ekman's cross-cultural basic emotions research—expressed regret regarding the omission of interest from Ekman's list of basic emotions: "…even by the strictest standards of the strictest categorical emotion theorists, interest qualifies" (Ellsworth, 2003, p. 84). Therefore, interest in the question of whether interest is an emotion has largely dissipated as evidence for its membership in the emotion club has grown and developed. Interest has a known appraisal structure (Silvia, 2005b), adaptive functions (Izard & Ackerman, 2000; Izard, 2009), facial expressions (Reeve, 1993), and physiological underpinnings (Gruber, Gelman, & Ranganath, 2014; Kang et al., 2009).

The function of emotions is broadly considered as the primary motivational system for behaviour (Izard & Ackerman, 2000). Izard (2009) included interest as one of his basic emotions, and attributed a vital function to the emotion. He posited that interest is the most ubiquitous emotion: "interest is continually present in the normal mind under normal conditions, and it is the central motivation for engagement in creative and constructive endeavours and for the sense of well-being" (Izard, 2009, p. 4). Similarly, Fredrickson (1998) suggested that all learned information may one day have a benefit and therefore any gain in knowledge can protect against future encounters with unpredicted and novel situations.

Therefore, the function of interest is proposed to be that of engagement and to motivate acquisition of information that may one day prove useful.

From state to trait: Interest and Openness/Intellect

Generally, the link between traits and states is important and powerful. Fleeson suggested that states are crucial in explaining trait differences, proposing that traits reflect the propensity to experience trait-relevant states (Fleeson & Jayawickreme, 2015; Fleeson, 2004). For example, those higher in Extraversion will tend to experience extraverted states more frequently. Similarly, Izard and Ackerman (2000) discussed the role of emotional states in personality traits and stated that "individual differences in emotion activation thresholds and in the frequency and intensity with which particular emotions are experienced and expressed are major determinants of specific traits and broad dimensions of personality" (p. 262).

The overlap between states and traits has been empirically demonstrated. While there is major variation in hour-to-hour and day-to-day states, there is remarkable consistency in states averaged over a longer period of time (2-3 weeks) with correlations rarely—if ever—seen in psychological research (0.8-0.9; Baird et al., 2006; Epstein, 1979; Fleeson, 2001). Fleeson's seminal work into state-trait relationships highlighted the importance of studying states in trait psychology. However, in studying only the overlap between traits and states, such research does not provide much information on the processes associated with traits. In evaluating such relationships, Fleeson measured states using adjectives related to the various personality domains (Fleeson, Gallagher, Edu, & Gallagher, 2009; Fleeson, 2001). For example, Openness/Intellect states were measured by asking participants to report to what extent they are acting *intelligent, philosophical,*

inquisitive, creative, uninquisitive, bright, artistic, unreflective, and imaginative. Such explanations are somewhat unsatisfying as they are circular (Boag, 2011), in that they explain the influence of Openness/Intellect on behaviour as *open people are open because they are open more often*. Within this thesis I diverge from assessing states in a way that overlaps with the measurement of the trait itself by evaluating the influence of Openness/Intellect on a state relevant, but not overlapping with trait measures.

Empirically, both interest and Openness/Intellect are associated with learning and engagement with information—albeit at different levels of analysis: momentary states, and trait. Interest predicts attention, motivation, and better learning outcomes (see Hidi, 2006; Renninger, Hidi, & Krapp, 2014; Silvia, 2006 for reviews). Similarly, Openness/Intellect has been implicated in years spent on education (Goldberg, Sweeney, Merenda, & Hughes, 1998), better educational outcomes (Poropat, 2009, 2014), and greater general knowledge (e.g. Ackerman, Bowen, Beier, & Kanfer, 2001; Chamorro-Premuzic, Furnham, & Ackerman, 2006; von Stumm, Hell, & Chamorro-Premuzic, 2011). There is also direct evidence of the relationship between Openness/Intellect and the emotion of interest. This relationship has been observed in response to art, poetry, music, and celestial images (Silvia, Fayn, Nusbaum, & Beaty, 2015; Silvia, Henson, & Templin, 2009; Silvia, 2008a). The overlap between interest and Openness/Intellect therefore exists both by direct association, and in terms of the variables they covary with.

There is a rather remarkable concordance in the proposed functions of Openness/Intellect and interest. As previously discussed, interest is thought to facilitate the motivation for gathering of information that may be useful to future adaptive functioning (Fredrickson, 1998; Izard & Ackerman, 2000). The function of Openness/Intellect has recently been suggested to be that of cognitive exploration and engagement with

information (DeYoung, 2015). A biological mechanism for the function of Openness/Intellect as a tendency to approach information has also been proposed (DeYoung, 2013). Based on the finding that *salience coding neurons* are sensitive to the value of information (Bromberg-Martin & Hikosaka, 2009), DeYoung suggested that Openness/Intellect should be related to the salience coding dopaminergic system. The salience coding system "appears to potentiate exploration in response to the incentive value of the possibility of gaining information—that is, it drives curiosity or desire for information" (DeYoung, 2013, p. 4). While DeYoung stopped short of proposing a single state that is associated with the salience coding system, one of the states that he mentioned as a possibility is the state of curiosity—a state synonymous with interest (Silvia, 2006). In line with DeYoung's hypothesis, the state of interest is associated with activation of the dopaminergic system (Gruber et al., 2014; Kang et al., 2009) strengthening the argument for interest being the state of cognitive exploration and therefore one that should be associated with Openness/Intellect.

It may seem strange to equate the function of an emotional state and a personality domain, yet it is reasonable given the evidence of strong relationships between traits and states—since traits reflect the density distributions of states (Fleeson & Jayawickreme, 2015). Stated as a state-trait explanation: If the function of Openness/Intellect is cognitive exploration and engagement with information, we would expect open people to have a greater propensity to experience states that reflect cognitive exploration and engagement with information—the state of interest.

The proposal that interest is the Openness/Intellect state is not radical. Openness/Intellect shares conceptual, functional and empirical overlap with the emotion of interest. Indeed, vocational and leisure interests associated with information have strong relationships with Openness/Intellect (Barrick, Mount, & Gupta, 2003; Larson et al., 2002). It

is no wonder that when 10 judges, with a detailed understanding of the Big Five, rated a large number of participants (N=280) on the most prototypical descriptors of each Big Five domain, the term “wide interests” had the highest loading for the Openness/Intellect domain (John et al., 2008). Therefore the domain of Openness/Intellect describes the interested, particularly in information. The distinction between Openness and Intellect suggests that the aspects should be associated with interest in different types of informational stimuli (perceptual versus abstract). To date, no studies have researched the unique relationships between Openness and Intellect, and the emotion of interest. The next section reviews the literature on the antecedents of interest. With the goal of understanding *why* open people are more interested I will discuss, and eventually empirically evaluate, the processes that lead to experiencing interest.

From social-cognitive processes to states to traits

The research linking states to traits is convincing, as is the overlap between the state of interest and Openness/Intellect. The next step in bridging the gap between descriptive and explanatory models of traits calls for investigation of the social-cognitive mechanisms associated with trait relevant states as outlined by Whole Trait Theory (Fleeson & Jayawickreme, 2015). According to Whole Trait Theory, social-cognitive mechanisms can be defined as “information processing mechanisms that are connected to affect and motivation and that have to do with interpreting changing situations and events” (Fleeson & Jayawickreme, 2015, p 84). There is a theory with a large body of literature on such mechanisms—the appraisal theory of emotions.

Appraisal accounts of emotions posit that (1) the way that a situation is appraised (both consciously and unconsciously) cause emotional experiences; (2) individuals appraise

their situations based on their own concerns, goal and abilities; (3) combinations of particular appraisal outcomes are associated with particular emotions (Scherer, Schorr, & Johnstone, 2001; Ellsworth & Scherer, 2003). Thus, the appraisal approach to emotions suggests that, rather than being driven only by situational properties, emotions are felt based on how people *appraise* a situation. The overlap between the definition of social-cognitive mechanisms and appraisals is clear, and appraisals have been integrated into social-cognitive models of personality (Cervone, 2005; Kuppens & Tong, 2010). One of the central goals, and indeed virtues, of appraisal theories is that they are able to account for individual differences in emotional experiences in response to the same event (e. g. Siemer, Mauss, & Gross, 2007).

Kuppens and Tong (2010) suggested that since appraisals are by definition subjective—a function of the individuals' goals, beliefs, motivations, and abilities—they should relate to variables that are associated with individual differences in beliefs, motivations and abilities. Personality traits are good candidates for such variables as they describe such differences. Two sources of individual differences are proposed by the appraisal account of individual differences in emotional experiences (Kuppens & Tong, 2010). First, people differ in the way they appraise situations—*appraisal strength*; second, people differ in appraisal-emotion contingencies. This theoretical framework has the goal of explaining *why* individuals differ in emotional experiences, and therefore, why some individuals are prone to experience trait relevant affect in response to trait relevant situations (Kuppens, 2009). Recent empirical tests of this model highlight its utility for providing social-cognitive explanations of trait manifestations.

Differences in appraisal strength have been observed in accordance with differences in personality traits (e. g. Kuppens, Van Mechelen, Smits, De Boeck, & Ceulemans, 2007;

Silvia, 2008a; Tong et al., 2006). That is, personality traits are associated with consistencies in appraisals of situations. For example, in an experience sampling study, police officers higher in neuroticism appraised situations as less pleasant, less controllable, and less certain in outcome. Conversely, those higher on conscientiousness had the opposite relationships to the same appraisals (Tong et al., 2006). These findings suggested that neuroticism and conscientiousness are associated with opposing emotional processes, which may explain why the domains are negatively related to each other (Costa & McCrae, 1992).

Individual differences in appraisal-emotion contingencies—the extent to which appraisals produce emotions—have also been observed (e.g. Kuppens, Van Mechelen, & Rijmen, 2008; Kuppens et al., 2007; Nezlek, Vansteelandt, Van Mechelen, & Kuppens, 2008; Silvia et al., 2009; Tong, 2010). For example, the relationship between appraisals associated with anger (e.g. unfairness of a situation) and the emotion of anger, vary according to trait anger (i.e., the same appraisal strength may result in different intensity of emotion). As another example, Tong (2010) demonstrated that neuroticism moderated appraisal-emotion relationships to the extent that people low on neuroticism did not exhibit the predicted appraisal-emotion relationships, suggesting a mechanism for differences in emotionality associated with different standing on neuroticism. Thus, these appraisal based findings suggest that those higher in neuroticism are sensitive to particular appraisals.

The examples described above highlight the explanatory power of the appraisal approach to explaining individual difference in emotional experience. I propose this to be a valuable approach for progress towards providing explanations and mechanisms for descriptive personality traits. Given my goal of developing a process based understanding of the relationship between engagement with information and the aspects of Openness/Intellect, I next review the appraisal structure of the emotion of interest,

followed by a review of research that has tested the appraisal based individual differences in the experience of interest.

The appraisal structure of interest

The processes associated with interest historically stem from the work of Daniel Berlyne (1960). Berlyne was interested in the phenomenon of humans spending a substantial portion of their time engaging with situations and objects that are not inherently beneficial, but may lead to advantageous outcomes in the future (Berlyne, 1966). He suggested a set of *collative variables*—novelty, complexity, uncertainty, and conflict—play a major role in eliciting such curiosity and exploration (Berlyne, 1960). Berlyne labelled these variables *collative* because they depend on comparison or collation of stimulus elements. The work of Berlyne demonstrated that collative variables did indeed elicit interest and exploration, but the task of differentiating them from each other proved rather difficult as they generally formed a single factor (Evans & Day, 1971). This factor came to be one of the appraisal processes that predicts interest—*novelty/complexity*.

Paul Silvia built on Berlyne's work by developing an appraisal structure of the interest emotion (Silvia, 2005a, 2005b, 2008c). Silvia's research suggested that interest had a relatively simple appraisal structure with just two appraisals. The novelty appraisal is in concordance with Berlyne's collative variables, and facilitates attention to possibly important changes in the environment (Ellsworth & Scherer, 2003). An issue that was left largely unresolved in Berlyne's work was the inverted U-shaped relationship between interest and novelty—interest increases with increased novelty/complexity, but eventually declines at high levels of novelty/complexity. The resolution to this issue came in the form of the second appraisal associated with interest: *coping potential*, which estimates our capacity to cope with a given situation (Lazarus, 1993). In the case of interest, this appraisal

represents the self-perceived ability to understand an event. As events increase in novelty, eventually the novelty becomes incomprehensible, which leads to the state of confusion (Silvia & Berg, 2011; Silvia, 2009).

Cross-sectional and experimental evidence supports the appraisal structure of interest. Appraisals of novelty and understanding predicted interest in art, film, and poetry (Silvia & Berg, 2011; Silvia, 2005a, 2008a; Turner & Silvia, 2006). Further, experimentally manipulating the comprehensibility of a poem led to greater reported interest, and complex polygons were preferred to simple polygons (Silvia, 2005b). This suggests a causal relationship between the novelty and understanding appraisals, and interest. Thus, the appraisal structure of interest can be used as the social-cognitive variables that explain within-person and between situation variability in engagement with information. By evaluating the relationships between traits and appraisal strength and appraisal-emotion contingencies, insights into the mechanisms underlying personality traits may become apparent (Kuppens & Tong, 2010). I next review research on individual differences in the appraisals of interest.

Individual differences in interest appraisal processes

Traits related to Openness/Intellect have been found to relate to differences in both appraisal strength and appraisal-emotion contingencies for the emotion of interest. Silvia (2008) found that trait curiosity was associated a greater tendency to appraise poetry as more understandable—appraisal strength. This appraisal tendency mediated the relationship between curiosity and interest suggesting that curious people feel more interest because of a greater appraised ability to understand. Curiosity was measured as a latent variable in the study that included two assessments of curiosity and an assessment of the broad domain of Openness/Intellect, therefore conflating the possible unique influence

of Openness and Intellect in the appraisal processes. While an Openness/Intellect measure was part of the latent variable used to define curiosity, the relationship between Openness/Intellect and curiosity is not perfect. There are many measures of curiosity that appear to measure the same construct (Mussel, 2010). The Openness/Intellect facet that was shown to be synonymous with curiosity measures is *Openness to Ideas*—a facet conceptually and empirically related to Intellect (DeYoung et al., 2007; DeYoung, 2015; Kaufman et al., 2010). Therefore, Silvia's appraisal strength result may be a function of Intellect rather than Openness.

Another study found evidence for possible appraisal-emotion contingencies associated with Openness/Intellect (Silvia et al., 2009). The study cluster-analysed appraisal-interest relationships in response to visual art, and found two between-person clusters that differed in their within person appraisal-interest contingencies. For one cluster, Interest was primarily driven by understanding and to a smaller extent by novelty, while the other clusters' interest was mostly driven by novelty and to a small extent by understanding. Openness/Intellect was associated with membership in the cluster where interest was particularly driven by novelty and to a lesser extent by understanding. This finding suggests that Openness/Intellect may moderate the interest-appraisal relationship so that those scoring higher on the domain are going to be more sensitive to novelty and less reliant on understanding in their experience of interest. However, this study did not include separate measurements for Intellect and Openness leaving the unique role of these aspects unexplored. Additionally, the stimuli used in the study were images and therefore are more likely to illicit perceptual, rather than epistemic curiosity.

In summary, there is some evidence that the relationship between Openness/Intellect and interest could be explained by appraisal strength and appraisal-

interest processes. Rather than simply observing a relationship between Openness/Intellect and interest, this approach allows for process-based explanations for *why* this relationship might persist. So far, research has used stimuli that could be broadly categorised as aesthetic. Thus, while initial findings are promising, there are some questions that remain unanswered. Do Openness and Intellect play distinct roles in the appraisal-interest relationships? Does the influence of Openness and Intellect vary according to different kinds of information? DeYoung distinguished between two types of engagement with Openness reflecting perceptual engagement and Intellect reflecting abstract engagement. It follows that the influence of the aspects on explaining individual differences in appraisal-interest relationships should vary according to the type of information.

Social-Cognitive model of Openness/Intellect and engagement with information

Based on empirical and theoretical work, Openness/Intellect describes people that experience greater engagement with information. The broad goal of this thesis is to get an understanding of the social-cognitive processes that facilitate and maintain this relationship. Above, I discussed the separation of the broad domain into the aspects of Openness and Intellect. The aspects have been proposed to describe people that differ in the type of information that elicits engagement. Openness describes differences in engagement with perceptual and sensory information, and Intellect describes differences in engagement with abstract and semantic information. While such differences between the aspects are implied, they have never been directly assessed.

The engagement state that shares theoretical and empirical overlap with Openness/Intellect was proposed to be the emotion of interest, and the social-cognitive processes associated with interest are the appraisals of novelty and understanding. Initial

evidence for the influence of Openness/Intellect on interest through appraisal processes points to the utility of appraisals in explaining the Openness/Intellect-interest relationship, yet our current understanding is incomplete. The unique influence of Openness versus Intellect remains unexplored, and the informational stimuli remain largely aesthetic.

Figure 1.2 represents a model that will be tested throughout the empirical parts of this thesis. This model is based on the model presented in the appraisal account of individual differences in emotional experience (Kuppens & Tong, 2010). The [1] pathway represents the theoretical and empirical relationship between the Openness/Intellect and interest in informational stimuli. This is the pathway that the model aims to explain, and therefore moves towards an understanding of the mechanisms that explain this relationship. Pathway [2] represents the appraisal structure of interest. Pathways [3] and [4] represent social-cognitive parts of the model. 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 [2] and [3].

This model was used to foster tests of whether social-cognitive variables (appraisals) are able to explain the relationship between interest, and the Openness and Intellect aspects. The empirical studies within this thesis attempted to gain a dynamic understanding of the differences between Openness and Intellect in terms of engagement with informational stimuli. The first study evaluated these relationships in response to quotations. Quotations, while semantic, are also aesthetic and therefore Openness and Intellect may both play a role in interest in response to them. The second and third studies

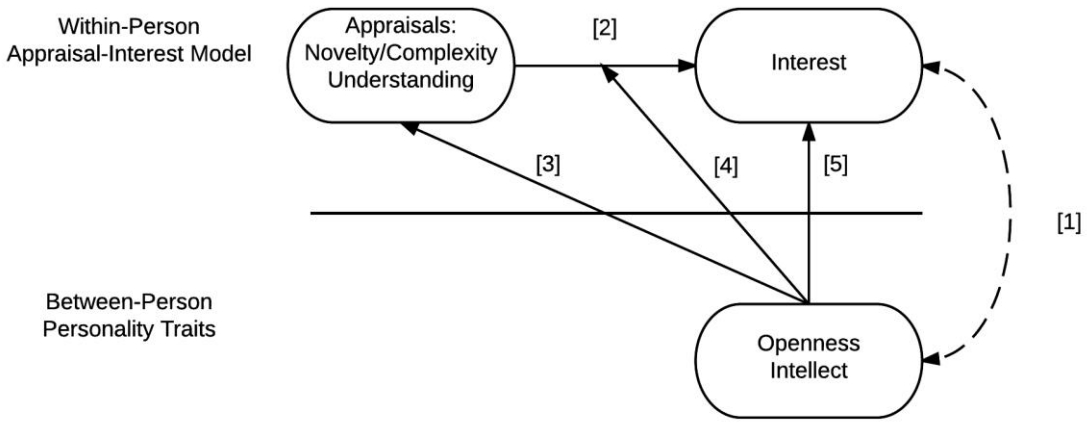

Figure 1.2. Social-Cognitive model of Openness/Intellect and engagement with Information.

evaluated these relationships in response to art, extended the emotions studied to interest, pleasure, and confusion, and evaluated the influence of a possible confound variable—art expertise. Finally, the last study evaluated the influence of Openness and Intellect in response to art, science and philosophy, directly testing the distinction between Openness and Intellect and the interests and processes that they are proposed to reflect.

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Chapter 2: Interest in truth versus beauty: Intellect and Openness reflect different pathways towards Interest

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Abstract

Openness and Intellect have been proposed as different pathways towards cognitive exploration, yet this distinction remains untested with respect to the exploratory emotion of interest. In this study we examined multi-level appraisal processes to determine whether Openness and Intellect differ in their effects on interest. University undergraduates (*N* = 99) rated their interest in seven literary quotations, and appraised the quotations for their novelty and understanding. Both Openness and Intellect predicted greater interest, but via different pathways. In between-person analyses, understanding mediated the Intellect/interest but not the Openness/interest relationship (i.e., high-Intellect people are more interested through greater understanding). In within-person analyses, Openness (but not Intellect) significantly moderated the understanding/interest relationship. High-Openness people experienced greater interest in difficult to understand quotations. Results highlight the need to examine within-person effects and to consider the lower-level elements of personality. These findings distinguish Openness and Intellect in terms of pathways towards interest and provide a dynamic understanding of the differences between them.

Introduction

There is a developing consensus that personality is best understood not just in terms of differences between people, but also as differences in within-person processes (Hampson, 2012). Studying within-person processes using multi-level analyses is an increasingly popular paradigm for personality research, as it integrates process and structural models of personality. Using this within-person paradigm, Silvia (2005) proposed a within-person appraisal structure for the emotional state of interest, involving appraisals of Novelty (judgments of complexity and unfamiliarity) and Understanding (judgments of coping potential). The personality domain of Openness/Intellect and one of its facets (trait curiosity) are involved in the appraisal processes leading to interest (Silvia, 2008; Silvia, Henson, & Templin, 2009). However, such effects have only been considered for the broad domain and a single facet, without considering that different elements of Openness/Intellect can show different and even opposite effects (e.g., Ziegler, Danay, Scholmerich, & Buhner, 2010). In the current study, we separately consider the effects of both Intellect and Openness aspects of Openness/Intellect (DeYoung, Quilty, & Peterson, 2007) on the within-person appraisal processes underlying interest. While openness and intellect have been distinguished in their associations with cognitive and creative abilities they are also theorised to reflect different pathways towards cognitive exploration (DeYoung, in press). Openness reflects individual differences in exploration through perceptual or sensory information. In contrast, Intellect reflects individual differences in exploration of abstract information. However, these two different exploratory pathways have never been directly tested. In the paragraphs below, we outline the theoretical models of within-person appraisals and personality assessed, as well as our reasons for examining the separate aspects of Openness/Intellect.

The appraisal processes underlying interest

Interest is an exploratory emotion that facilitates arousal, promotes attention, is associated with learning and exploring, and is felt in response to situations and stimuli that require thinking and understanding (Silvia, 2010). Interest has an empirically demonstrated appraisal structure, depending on two appraisals: *Novelty* and *Understanding* (Silvia, 2005). The novelty appraisal facilitates attention to possibly important changes in the environment, and the understanding appraisal estimates our capacity to cope with a given situation (Ellsworth & Scherer, 2003). This appraisal structure has been replicated for poetry, film, and visual art, indicating stability across different types of stimuli (Silvia, 2005; Silvia & Berg, 2011; Silvia, Henson, & Templin, 2009).

The appraisal approach to emotions contends that appraisal processes are subjective evaluations of situations that rely on a person's needs, preferences, goals, and abilities (Ellsworth & Scherer, 2003), and should therefore be associated with individual differences in personality. Kuppens and Tong (2010) proposed two types of individual differences within the appraisal-emotion system: (a) appraisal strength, and (b) appraisal-emotion relationships. Appraisal strength refers to a between-person tendency to, for example, appraise situations as more understandable and therefore experience greater overall interest. In this scenario understanding is a mediating variable that explains why some people experience interest in more situations. Differences in appraisal-emotion relationships refer to within-person contingencies. For example people may differ in the importance of understanding in their experience of interest. In this scenario personality acts as a moderator of understanding-interest relationships.

In a study of interest in visual art and poetry, Silvia (2008) found that personality predicted differences in *appraisal strength* but not differences in *appraisal/emotion*

relationships. Specifically, individual differences in trait curiosity (a facet of Openness/Intellect) predicted stronger appraisals of understanding (but not a stronger understanding/interest relationship). In fact, appraised understanding mediated the relationship between personality and interest. In the current study, we test this mediation for the domain of Openness/Intellect rather than its narrow facet of curiosity. We hypothesise that understanding will also mediate the relationship between Openness/Intellect and interest.

A further study found that differences in both trait curiosity and the Openness/Intellect domain predicted different *appraisal-emotion relationships* (Silvia, Henson, & Templin, 2009). Openness/Intellect predicted membership in a cluster where interest was best predicted by novelty and less so by understanding, as opposed to a cluster where interest was best predicted by understanding and less so by novelty. We therefore hypothesised that Openness/Intellect would predict differences in appraisal-emotion relationships.

The inconsistency between the two previous studies is whether personality predicts appraisal-emotion processes (one study found such a relationship, the other did not). These differing results may be due to the different levels of analysis of personality (i.e., the specific personality facet of curiosity and the broad domain of Openness/Intellect). We propose that separately examining the two major aspects of Openness/Intellect can clarify their effects on the appraisal processes underlying interest. We will thus examine the effects of Intellect and Openness aspects on both appraisal strength and appraisal-emotion relationships.

The nature of the Openness domain: differentiating Openness and Intellect aspects

The Openness/Intellect domain is associated with individual differences in quintessentially human outcomes such as creativity, engagement with the arts, higher

cognitive functioning, vocational interests, values and political affiliations. Yet Openness/Intellect remains arguably the most controversial domain in Big Five models. Openness/Intellect has been plagued by heterogeneity and disagreements regarding its nature and therefore label. Additionally, a dynamic understanding of the domain remains out of reach, as research has primarily focused on the structure and predictive validity of the domain, at the cost of a process based approach.

The current study addresses both these concerns by clarifying the suggested relationship between Openness/Intellect and cognitive exploration (DeYoung, in press). Studying situational processes alongside dispositional variables has long been advocated (Cronbach, 1957, Underwood, 1975), but rarely followed. Recent findings suggest that this is a powerful approach (see Kuppens and Tong [2010] for a review) that can address our central research questions: (1) *How* do Openness and Intellect relate to cognitive exploration? and (2) can Openness and Intellect be distinguished as different pathways to cognitive exploration?

Disagreements regarding the structure and nature of the Openness/Intellect domain led Goldberg (1993) to call it a "scientific embarrassment" (p.27). Different methods of measurement traditions underlying structural studies eventually converged on two conceptualisations of the domain. Questionnaire based research labelled the domain as Openness to Experience (McCrae & Costa, 1994), while adjective based research argued for Intellect (Peabody & Goldberg, 1989). Saucier suggested that both conceptualisations were important aspects of the domain (1994). Finally, Johnson (1994) poetically described the two conceptualisations as "interest in truth" (Intellect) versus "interest in beauty" (Openness).

Recent psychometric evidence suggests two distinct yet related aspects of the Openness/Intellect domain: Openness and Intellect (DeYoung et al., 2007). DeYoung et al. (2007) proposed that Openness and Intellect aspects constitute a new level of personality located between the broad domain Openness/Intellect and the narrow facets. *Intellect* is conceptually similar to the Openness to Ideas facet, reflecting perceived intelligence and intellectual engagement (DeYoung, in press). Mussell (2010) found strong empirical evidence that the facets of curiosity and openness to ideas were virtually identical, suggesting that the effects of curiosity on the appraisal structure of interest should also generalize to the Intellect aspect of personality. We therefore hypothesised that the mediating role of understanding in the Openness/Intellect-Interest relationship would be particularly a function of intellect due to its proximity to curiosity measures. *Openness* is represented by the Openness to Aesthetics, Feelings, and Fantasy, reflecting engagement with sensation and perception, fantasy and artistic creativity (DeYoung, et al., 2007).

Openness and Intellect have different associations with cognitive and creative abilities, and with scientific and artistic creativity. Openness relates to greater crystallised intelligence, implicit learning and artistic creativity whereas Intellect relates to both fluid and crystallised intelligence and to scientific creativity (Kaufman, 2009, 2010; Nusbaum & Silvia, 2011). Such differences support the idea that Openness and Intellect are distinct constructs, but do not speak to the proposed distinction in terms of cognitive exploration. DeYoung (in press) suggests that openness reflects individual differences in exploration through perceptual or sensory information, and that intellect reflects individual differences in exploration of abstract information. The main goal of the current research is to test these two different exploratory pathways.

The present research

The current research looked to explore: (1) the relationships between Openness/Intellect and the states and appraisal processes of Interest, and (2) the utility and validity of separating Openness and Intellect by studying their relationships with Interest and its associated appraisals in response to quotations. We chose quotations due to their general popularity as engaging short thoughts and ideas.

Based on the literature reviewed above, we have three hypotheses. First, we hypothesise that the three personality variables (Openness/Intellect, Openness and Intellect) will predict: (a) greater appraisals of understanding, and (b) greater interest in quotations. Second, we hypothesised the Intellect-interest relationship will be mediated by understanding appraisals, replicating previous results for the related construct of curiosity (Silvia, 2008). Third, we hypothesised that the within-person appraisal emotion relationships (novelty-interest and understanding-interest) will be moderated by the three personality variables (Openness/Intellect, Openness and Intellect).

Method

Participants

Participants were 101 first-year students, participating in the study for course credit (77% female; sample age range = 17 to 42 years; *M*=19.41 years, *SD*=3.48 years). All participants were pre-screened for English proficiency in order to ensure comprehension of instructions and stimuli. Two participants did not complete ratings of quotations due to computer difficulties and were excluded from further analyses making the final sample 99.

Measures

Big Five Aspect Scale (BFAS; DeYoung et al., 2007). This 100-item rating scale contains 10 items for each aspect of personality, including Openness ("I enjoy the beauty of nature") and Intellect ("I like to solve complex problems"). Each item was rated on a 7-point Likert scale from strongly agree to strongly disagree.

Quotations with Appraisal and Interest Ratings. Each participant provided ratings for the same 7 quotations selected quasi-randomly from the Oxford Dictionary of Quotations (Ratcliffe, 2010). Each item was rated on a 7-point semantic differential scale. Two items assessed interest (interesting-uninteresting, engaging-boring), two assessed novelty appraisals (simple-complex, common-unusual) and three assessed understanding potential (easy to understand-hard to understand, comprehensible-incomprehensible, coherent-incoherent). Items were drawn from previous research on the appraisal structure of Interest (e.g. Silvia, 2005; Silvia et al., 2009).

Procedure

The study was conducted on computers over two one-hour sessions. In the first session, participants completed the personality scales, as well as other personality and intelligence measures not relevant to the current study. In the second session (separated by at least one hour from the first session), participants viewed and rated quotations. Participants also rated images in this session, but these were not used in the current study (the images were displayed after all the quotations were viewed and rated and thus had no effect on the current study). The protocol for this study was approved by the human research ethics committee of the first author's institution.

Analysis

Path analysis was used to test whether the personality-interest relationship was mediated by understanding appraisals. The significance of the indirect effect was assessed using a bootstrapping procedure with unbiased estimators as is suggested by Hayes (2009).

The models generated 5000 thousand bootstrapped resamples and the bias corrected and adjusted confidence intervals. A confidence interval that does not include zero indicates a significant indirect effect (Hayes, 2009).

Two multi-level slope-and-intercept models were conducted to test whether personality moderates the within person appraisal-interest relationships (see regression equations for Model 3 and 4 below). At Level 1, both models tested whether a person's mean level of Understanding and Novelty predicted their mean level of Interest in response to seven quotations. At Level 2, differences between people on Openness/Intellect (Model 3) or Openness and Intellect (Model 4) predict between-person differences in: (a) people's mean level of interest; (b) the novelty/interest slope (i.e., the extent to which novelty predicts interest for each person); and (c) the understanding/interest slope (i.e., the extent to which understanding predicts interest for each person).The appraisals at the within-person level were person centred around each person's mean. Multilevel models were conducted in Mplus 7 using maximum-likelihood estimation.

Model 3

Within-Person

$$Interest_{ij} = \beta_{0j} + \beta_{1j}(Understanding) + \beta_{1j}\,(Novelty) + r_{ij}$$

Between-People

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\left(\text{Openness/Intellect}_{\text{j}}\right) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\left(\text{Openness/Intellect}_{\text{j}}\right) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}\left(\text{Openness/Intellect}_{\text{j}}\right) + u_{2j}$$

Model 4

Within-Person

$$Interest_{ij} = \beta_{0j} + \beta_{1j}(Understanding) + \beta_{1j}\,(Novelty) + r_{ij}$$

Between-People

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\left(\text{Openness}_{\text{j}}\right) + \gamma_{02}(\text{Intellect}_{\text{j}}) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\left(\text{Openness}_{\text{j}}\right) + \gamma_{12}(\text{Intellect}_{\text{j}}) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}\left(\text{Openness}_{\text{j}}\right) + \gamma_{22}(\text{Intellect}_{\text{j}}) + u_{2j}$$

Results

Descriptive statistics and bivariate relations

Table 2.1 provides descriptive statistics and correlations for all measures. A medium-sized positive correlation between the Openness and Intellect aspects was observed, suggesting that these are parts of the same personality domain. Openness/Intellect, Openness, and Intellect all predicted aggregated Interest and understanding appraisals, but

were not related to Novelty appraisals. Greater Interest was associated with greater understanding, consistent with previous research (Silvia, 2005). Contrary to previous findings, Interest did not significantly predict Novelty appraisals at the between-person level. The average within-person correlations of the interest, understanding, and novelty items are also displayed in the table. While the interest and understanding correlations were high, the novelty correlation was a little low, but acceptable as a two item measure.

Table 2.1.

Pearson's correlations of personality variables with aggregated interest and appraisals.

Variable	M	SD	1	2	3	4	5	6
1.Openness/Intellect	69.59	11.41	(.84)	.83**	.81**	.37**	.10	.37**
2.Intellect	34.58	6.04		(.82)	.34**	.29**	.05	.39**
3.Openness	38.87	5.74			(.79)	.32**	.12	.21*
4. Interest+	5.58	0.73				[.87]	.04	.37**
5. Novelty+	4.00	0.83					[.61]	-.42**
6. Understanding+	5.35	0.64						[.79]

Note: * $p<.05$;** $p<.01$; $N=99$; + indicates a between-person aggregate variable across all seven quotations; Cronbach's reliabilities for personality variables are presented on main diagonal in round brackets and average within-person correlations for interest and appraisal variables are presented on main diagonal in square brackets;

Between-person analysis: Do appraisals mediate the personality/interest relationship?

Novelty appraisals were not included in the model as they did not meet the pre-conditions for mediation, being unrelated to both interest and to all three personality

variables (Frazier, Tix, & Barron, 2004). Two path models were conducted: (a) Model 1 included Openness/Intellect; (b) Model 2 included both Openness and Intellect as independent variables.

Model 1. Openness/Intellect significantly predicted both understanding and interest. Understanding significantly predicted interest (Figure 2.1). The indirect effect of Openness/Intellect on Interest was significant (point estimate =.072; 95% C.I.: .014 to .164).

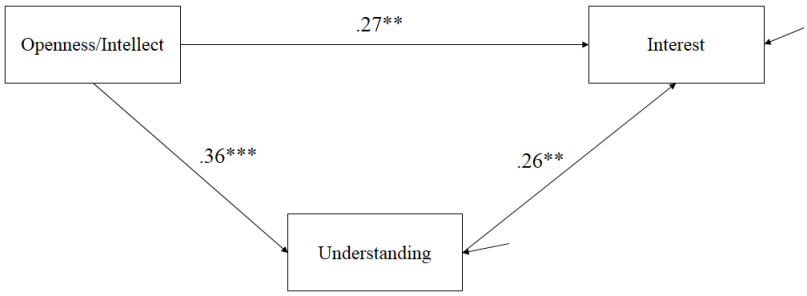

Figure 2.1. A mediation model of understanding on the relation between Openness/Intellect and Interest. $^{**}p<.01$;$^{***}p<.001$

Model 2. Openness significantly predicted interest, but did not significantly predict understanding (Figure 2.2). Intellect significantly predicted understanding, which in turn predicted interest. The indirect effect of Intellect on interest was significant (point estimate =.076; 95% C.I.: .019 to .177) but the indirect effect of Openness on interest was not (point estimate =.018; 95% C.I.: -.023 to .085). That is, Openness directly predicted interest whereas Intellect predicted interest indirectly though appraised understanding. Results support hypothesis 2 (the effect for Intellect replicates a previous finding for trait curiosity; Silvia, 2008).

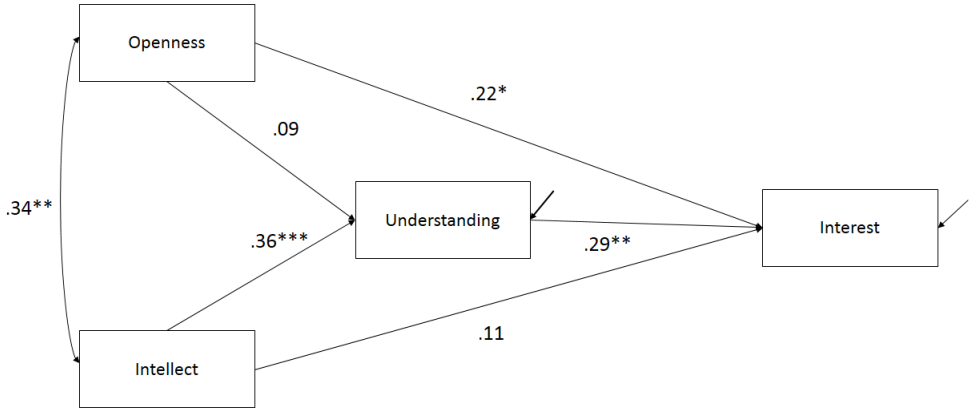

Figure 2.2. A mediation model of understanding on the relation between Openness and Intellect, and Interest.$^{*}p<.05;^{**}p<.01;^{***}p<.001$

Within-person analysis: Does Personality Moderate Appraisal/Interest Relationships?

Multilevel modelling allows for testing of within-person contingencies in appraisal/interest relationships. That is, are the appraisals of novelty and understanding equally meaningful for all people or do they vary according to personality? An unconditional model showed that a substantial amount of variance in interest was at the between-person level (ICC = .24).

Level 1: Understanding and Novelty appraisals predict interest. Within-person appraisals of Understanding and Novelty predicted interest in both Model 3 and Model 4, replicating previous research (Silvia, 2008). Higher interest ratings were predicted by greater understanding, (Model 3: γ_{10}=.354, SE=.049, p<.001; Model 4: γ_{10}=.359, SE=.049, p<.001), and Novelty (Model 3: γ_{20}=.295, SE=.051, p<.001; Model 4: γ_{20}=.299, SE=.051, p<.001).

The proportional variance statistic (PRV) was calculated to estimate the local effect size of the variables included in the analyses (Raudenbush and Bryk, 2002). The two appraisals explained 29% of the within-person variance in interest.

Level 2, Model 3: Openness/Intellect predicts slopes and intercepts. Openness/Intellect significantly predicted within-person intercepts for interest (γ_{01}=.273, SE=.066, *p*<.001), and also moderated the within-person understanding/interest relationship (γ_{11}=-.146, SE=.045, *p*=.001). That is, higher Openness/Intellect predicted a smaller relationship between understanding and interest. Openness/Intellect did not moderate the Novelty/Interest relationship. Openness/Intellect explained 18% of the between-person variance in the intercepts and 33% of the variance in the slopes.

Level 2, Model 4: Openness and Intellect predicts slopes and intercepts. Both aspects of personality predicted the intercept for Interest (Openness: γ_{01}=.177, SE=.076, *p*<.05; Intellect: γ_{02}=.154, SE=.067, *p*<.05). That is, both Openness and Intellect predict greater levels of interest. Openness also moderated the within-person relationship between understanding and interest (γ_{11}=-.133, SE=.044, *p*=.002), but Intellect did not. That is, higher Openness predicted a smaller relationship between understanding and interest. Neither Openness nor Intellect moderated the Novelty/Interest relationship. Openness and Intellect explained 19% of the between-person variance in the intercepts and 39% of the variance in the slopes.

Taken together, these results suggest that those higher on Openness/Intellect rely less on understanding in their experience of interest and that this effect is driven by Openness as opposed to Intellect. Importantly, these within-person findings illuminate the Openness-interest relationship and provide a dynamic understanding of *why* open people are more interested.

Discussion

In general, results support the major goal of our research, which was to clarify the different effects of Openness and Intellect personality aspects on the appraisal processes underlying interest. All three personality variables (Openness, Intellect, and Openness/Intellect) predicted greater appraised understanding and greater interest in quotations, but showed no relationship with Novelty appraisals, supporting our first hypothesis. Although Openness and Intellect showed similar magnitude of correlations to both appraisals and to interest, a mediation analysis demonstrated that Openness directly predicted greater interest in quotations whereas Intellect showed only an indirect relationship, supporting our second hypothesis. This result is evidence of the distinction between Openness and Intellect as they affect the process of Interest in qualitatively different ways. Within-person analyses provided further evidence that Openness and Intellect are distinct: The combination of larger intercepts and smaller understanding-interest relationships suggests that those higher on Openness/Intellect were more interested in difficult to understand quotations compared to those lower on Openness/Intellect. The separation of the domain into its aspects demonstrated that this finding was particularly associated with Openness rather than Intellect. These results provided support for our third hypothesis.

Our results demonstrate the necessity of examining personality in a nuanced fashion, going beyond (a) the broad domain level of personality; (b) zero-order correlations of personality with criteria; and (c) between-person analyses. Although relationships of Openness and Intellect with appraisals and interest were indistinguishable at the level of zero-order correlations, mediation analyses suggested an indirect path for Intellect but not Openness, and multi-level analyses suggested within-person contingencies operate for

Openness but not Intellect. The majority of personality research considers personality in terms of between-person differences at the broad domain level, despite evidence that within-person effects can be markedly different to between-person effects and that personality can have markedly different effects across different facets or aspects (e.g., Beckmann, Wood, & Minbashian, 2010; Ziegler et al., 2010). It is rare for personality research to decompose the broad domains into their elements or to consider within-person effects (see Kuppens & Tong, 2010; Hampson, 2012 for reviews of exceptions). It is exceedingly rare to do both. The current study illustrates that effects can be hidden unless all levels are considered.

Openness, Intellect and interest-appraisal relationships

While some appraisal theories contend that appraisals determine the emotions people feel, others adopt a probabilistic approach where people may vary in appraisal strength and in appraisal/emotion relationships (Scherer, 2001). Research supports the latter, and personality facets predict differences in appraisals and in emotion-appraisal relationships (Kuppens & Tong, 2012). Such process based findings have provided a dynamic understanding of *how* personality manifests in behaviour. The current research has provided such an understanding of the Intellect and Openness aspects.

Intellect

The role of Intellect can be described simply as those higher in intellect are likely to appraise situations as more understandable and therefore more interesting than someone with a lower aspect standing. This replicates previous findings with trait curiosity (Silvia, 2008), providing further evidence for the similarity of the two constructs (Mussel, 2010).

Furthermore, if appraised understanding and objective understanding are closely related, ability variables may explain the Intellect-Interest relationship. Silvia (2005) has

demonstrated that manipulating actual understanding affects appraised understanding, suggesting a direct and strong asymmetric relationship between the two constructs. Indeed, this has been previously suggested as an explanation for the observed fluid Intelligence-Interest relationship (Silvia & Sanders, 2010). Since Intellect is related to general, fluid, and crystallised intelligence (DeYoung, Quilty, Peterson, & Gray, 2014), we propose that ability constructs are capable of partially explaining the variance in Interest that is currently attributed to Intellect. The issue of incremental validity is of relevance here therefore future research should evaluate whether Intellect contributes uniquely to Interest over and above cognitive abilities.

Openness

The unique influence of openness on the interest-understanding relationship is similar to a previous finding where Openness/Intellect predicted a greater reactivity to novelty and a lesser reliance on understanding (Silvia, et al., 2009). These findings were interpreted as greater reactivity to novelty—an explanation consistent with theories regarding the Openness/Intellect domain—rather than a lesser reliance on understanding.

In our study, Openness was associated with a lesser reliance on understanding, but not a greater reactivity to novelty. One challenge in finding consistent results within the emotion of interest may be the relationship between novelty and understanding appraisals. As stimuli are appraised as more novel, they are also appraised as less understandable. That is reflected by a consistent relationship between the two appraisals in our and other studies (e. g. Silvia, 2008). Logically, it would follow that if Openness moderates the interest-understanding relationship, it should also be moderating the interest-novelty relationship because more novel stimuli would illicit interest due to the lesser negative reaction to *not* understanding. This novelty-understanding relationship may vary between different types of

stimuli, thus possibly explaining the differences in our results and is, therefore, an important question for future research.

This special relationship with understanding qualifies a particularly strong association between Openness/Intellect and appreciation of abstract art, which, by definition, is more difficult to understand (e.g. Feist & Brady, 2004; Furnham & Walker, 2001). Our study suggests that Openness as opposed to Intellect may be particularly responsible for such preferences. Due of a lower reliance on understanding, those high in Openness have a particular disposition to enjoy the abstract. Further, McManus and Furnham (2006) found that Openness/Intellect was negatively related to aesthetic attitudes such as: “one has to understand the emotions of the artist in order to appreciate the work, that the meaning behind art has to be obvious for it to have value, and that one needs to understand the background information of a piece of art to appreciate it properly” (p. 566). This attitude towards art might be extended to literary art that has its own element of aesthetics. Our study supports this finding through within-person processes and suggests that it is Openness and not Intellect that is driving these differences in attitudes.

Implications for the Openness/Intellect domain

While the previous section focused of what the current findings say about processes associated with Openness and Intellect, the current section discusses what these findings mean for the Openness/Intellect model of the domain. Support is provided for the utility in evaluating Openness and Intellect as separate, yet related aspects of the personality domain. DeYoung (in press) suggested that what binds Openness and Intellect is cognitive exploration, and that they reflect different processes by which cognitive exploration takes place. Intellect reflects exploration through reasoning, while Openness reveals exploration

through sensation and perception. In our study, Openness and Intellect were indeed bound by states of exploration, in their similar associations with overall Interest. Further, Intellect reflected exploration through reasoning—a greater appraised ability to understand—which lead to greater Interest.

The roles of perceptual and sensational processes were not evaluated, but Openness explained variance unaccounted for by appraisal processes at the between-person level, and a lesser reliance on understanding through within-person findings. These results suggest an emotional reactivity associated with Openness, supported by previously found associations with greater tendencies to experience powerful emotions of chills and absorption, for which Intellect was a negative and non-significant predictor respectively (Silvia & Nusbaum, 2011).

Conclusion

Goldberg (1993) boldly labelled Openness/Intellect a scientific embarrassment. Twenty years on, we are seeing a far greater understanding of the differences and similarities between the constructs of Openness and Intellect, and strong evidence suggesting that they are separate yet related aspects of a broader domain. We acknowledge the correlational, cross-sectional, nature of our study, and our student sample as limitations for our findings. However, we firmly believe we have taken a step towards disembarrassing this domain by demonstrating in this study a further differentiation between these two aspects through their dissimilar pathways to cognitive exploration concerning the emotion of interest. It is fitting that Johnson's (1994) elegant analysis and poetic distinction 20 years ago still rings true today: *Interest in truth versus interest in beauty*.

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Chapter 3: Aesthetic Emotions and Aesthetic People: Openness Predicts Sensitivity to Novelty in the Experiences of Interest and Pleasure

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Abstract

There is a stable relationship between the Openness/Intellect domain of personality and aesthetic engagement. However, neither of these are simple constructs and while the relationship exists, process based evidence explaining the relationship is still lacking. This research sought to clarify the relationship by evaluating the influence of the Openness and Intellect aspects on several different aesthetic emotions. Two studies looked at the between- and within-person differences in arousal and the emotions of interest, pleasure and confusion in response to visual art. The results suggest that Openness, as opposed to Intellect, was predictive of greater arousal, interest and pleasure, while both aspects explained less confusion. Differences in Openness were associated with within-person emotion appraisal contingencies, particularly greater novelty-interest and novelty-pleasure relationships. Those higher in Openness were particularly influenced by novelty in artworks. For pleasure this relationship suggested a different qualitative structure of appraisals. The appraisal of novelty is part of the experience of pleasure for those high in Openness, but not those low in Openness. This research supports the utility of studying Openness and Intellect as separate aspects of the broad domain and clarifies the relationship between Openness and aesthetic states in terms of within-person appraisal processes.

Introduction

"It is art that makes life, makes interest, makes importance... and I know of no substitute whatever for the force and beauty of its process."

-Henry James

Making and appreciating art is a quintessentially human behaviour, but not everyone would agree with the sentiment expressed by Henry James above. Divergent opinions about the importance of art and experiences with art make the study of individual differences a crucial part of aesthetic science—after all, it is said that beauty is in the eye of the beholder. However, in psychological aesthetics there are still gaps in what is known about both the beauty and the beholder. Psychological aesthetics has primarily focused on one aspect of the aesthetic experience in the form of liking, pleasure and preference. Aesthetics associations with personality—primarily Openness/Intellect—have focused almost exclusively on individual differences in liking different types of art. Further, little work has gone into understanding the processes underlying the relationship between aesthetics and Openness/Intellect. This is problematic because the nature of the personality/art appreciation relationship could seem circular, given that personality items directly mention aesthetic engagement when measuring Openness/Intellect.

In the current study, we extend previous research investigating the relationship between Openness/Intellect and aesthetic appreciation in three ways. First, we model the appraisal processes underlying the emotions of interest, pleasure, and confusion. This extends previous research by considering three distinct emotions rather than pleasure only.

Second, we test whether the aspects of Openness and Intellect differentially predict these three emotional states. This extends previous research by considering the two different aspects of Openness/Intellect, rather than the broad domain only. Third, we test whether the aspects of Openness and Intellect differentially predict within-person appraisal processes underlying these three emotional states. This extends previous research by considering within-person processes, rather than between-person associations only. By integrating these various elements we intended to answer the question: Why are those higher in Openness/Intellect more aesthetically engaged?

Aesthetic People

Openness/Intellect is the personality domain of the aesthetically sensitive, according to many areas of research. It is the best predictor of positive aesthetic attitudes and participation in aesthetic activities such as visiting museums, reading literature, and creating art (McManus and Furnham, 2006). Previous findings have demonstrated Openness/Intellect to be the best personality predictor of artistic creativity (Feist, 1998; Silvia et al., 2009b) and vocational interests related to the arts (Barrick et al., 2003). Most importantly, Openness/Intellect is a consistent predictor of aesthetic appreciation, which has been shown to be highly variable (Vessel and Rubin, 2010). Several studies indicate that Openness/Intellect is associated with liking a broad range of artistic types including abstract, representational, pop, renaissance, cubism, Japanese, and unpleasant art (Furnham and Walker, 2001; Rawlings, 2003; Chamorro-Premuzic et al., 2009, 2010). Openness/Intellect therefore is a domain of personality that explains individual differences in creating, seeking, and appreciating art.

Openness/Intellect is an unusually heterogeneous personality domain, and recent work suggests that it can be represented with two major aspects: Openness and Intellect (DeYoung et al., 2007, 2012; Woo et al., 2014). Johnson (1994) poetically described Openness as interest in beauty and Intellect as interest in truth, suggesting that they are both information-seeking traits diverging in the types of situations that elicit interest.

Intellect is associated with fluid and crystallized intelligence and with scientific creativity, while Openness is associated with artistic creativity, implicit learning ability, and crystallized intelligence (Kaufman et al., 2010; Nusbaum and Silvia, 2011; Kaufman, 2013). DeYoung (2014) distinguishes the aspects on the basis of different styles of cognitive exploration, with Openness reflecting individual differences in exploration through perceptual or sensory information, and Intellect reflecting individual differences in learning and exploration of abstract information. Johnson's (1994) and DeYoung's (2014) distinctions suggest that Openness, as opposed to Intellect, is the aspect primarily associated with appreciation of visual art. Further distinctions based on emotional experiences have also emerged. Silvia and Nusbaum (2011) showed that Openness, and not Intellect, is associated with unusual aesthetic experiences such as chills, feeling touched, and absorption, suggesting differences between the aspects in the propensity to experience states that have been linked to broad definitions of aesthetic experiences. Given the distinction between Openness and Intellect we aimed to test their differential roles in aesthetic experiences.

Aesthetic Emotions

Nearly all research on the link between personality and aesthetic appreciation, like aesthetics research more generally, has focused on how much participants liked or disliked an artwork (e.g., Furnham and Walker, 2001; Rawlings, 2003; Chamorro-Premuzic et al., 2009). Since the pioneering work of Berlyne (1971), most models of aesthetics concern

themselves with states of pleasure, liking, or preference. Silvia (2009) argued that, while important, such evaluations do not take into account the breadth of emotions felt in response to art. A similar trend exists within the research in the emerging field of neuroaesthetics, which has almost exclusively focused on the evaluation of something as pleasing or beautiful (Fayn & Silvia, 2015). Such a reductionist approach runs the risk of missing meaningful individual differences in aesthetic experiences and in understanding the ways in which personality traits manifest in such experiences. Emotions felt in response to aesthetic objects—categorized within this paper as aesthetic emotions—are varied and include interest, confusion, pleasure, anger, and even disgust (Silvia, 2012). The term aesthetic emotions is not used to suggest a separate group of emotions only felt in response to aesthetic objects. Rather, it is used to group the states that have been observed to occur in response to aesthetic objects.

The distinction between liking versus disliking something may be a valid indicator of pleasure, but it does not represent the depth and complexity of aesthetic emotions. A group of emotions frequently felt in response to art, yet distinct from pleasure, are the knowledge emotions. The knowledge emotions—interest, awe, beauty, confusion, and surprise—associated with beliefs about thoughts and knowledge, they stem from epistemic goals, and arise from metacognitive processes (Silvia, 2010, 2012). Several emotional states may fit this categorization, and all are distinct from pleasure. The emotion of interest has been distinguished from pleasure on the basis of cognitive appraisal processes—interest is positively associated with complex stimuli, but pleasure is negatively related to complexity (Turner and Silvia, 2006). Two other states that are distinct from pleasure and involve epistemic goals are awe and beauty. The emotion of awe is felt as one tries to accommodate vast novelty, the success of which leads to a powerful emotional state (Shiota

et al., 2007). Awe can be and is frequently experienced as a negative and fear-like state when accommodation is unsuccessful. Beauty is defined as “the exhilarating feeling that something complex, perhaps to the point of being profound, might yield an understanding” (Armstrong and Detweiler-Bedell, 2008, p. 312). Beauty is distinguished from the pleasant on the basis of effort: pleasure is associated with fluent processing (Reber, 2012), but beauty relies on effortful processing that drives arousal and results in an exhilarating experience. Therefore, several aesthetic states are distinguished from simple pleasure. All are elicited by complex and novel situations where understanding is required but is effortful. Pleasure, on the other hand, is facilitated by ease of understanding.

From the individual differences perspective, two studies have distinguished pleasure and other aesthetic experiences through factor analysis techniques. Eysenck (1941) attempted to explain the presence of two factors in aesthetic preference. The first factor was easily attributable to valance, while the second was generally associated with preferences for the abstract. A core feature of abstract art is novelty and complexity, suggesting interest driven rather than pleasure driven preferences. More recently, Marković (2010) found that two factors describe aesthetic appreciation. These factors were labeled affective tone and aesthetic experiences. Descriptors “lovely” and “charming” loaded highest on affective tone, while aesthetic experience was associated with adjectives such as “exceptional” and “profound.” Thus, converging evidence and theory suggest that some aesthetic experiences are distinct from mild positive states of pleasure and that at the core of these states is the resolution of novelty and complexity, rather than fluent processing associated with pleasure.

Aesthetic states, like other emotions, are generated by appraisal process patterns (Ellsworth and Scherer, 2003). Interest occurs when a stimulus is appraised as novel yet understandable (Silvia, 2005). Novelty orientates and highjacks our attention, while the resolution of the novelty toward understanding leads to the positive experience of interest. This appraisal structure has been supported in response to art, poetry, and film (Silvia, 2005, 2008; Silvia et al., 2009a; Silvia and Berg, 2011). Pleasure and confusion are also predicted by the same appraisals but in different ways. Confusion is associated with appraisals of novelty and lack of understanding (Silvia, 2010). Pleasure is elicited by appraised understanding and negatively related to novelty (Turner and Silvia, 2006). The appraisal approach is therefore particularly useful in distinguishing differing aesthetic emotions and studying the underlying processes that facilitate them.

Between aesthetic emotions and aesthetic people

Appraisal theories of emotions have been used to further understanding of processes that underlie personality traits associated with emotional experiences. There are two ways in which personality is involved in the appraisal-emotion system: (1) appraisal strength—the tendency to appraise situations in a particular way—varies as a function of personality; and (2) appraisal-emotion relationships vary as a function of personality (Kuppens, 2009; Kuppens and Tong, 2010).

Openness/Intellect has been implicated in both of the aforementioned ways. Curiosity—a trait associated with Openness/Intellect (Mussel, 2010)—is associated with greater appraised understanding, which fully mediates the curiosity-interest relationship (Silvia, 2008). That is, curious people feel greater interest because they are better able to understand epistemic situations, which in turn predicts greater interest. This finding is consistent with the theoretical framework proposed by Mussel (2013) for Intellect traits.

Within this framework, Intellect traits are associated with processes of seeking and conquering intellectually stimulating events, which map onto interest and understanding.

Further, within the experience of interest, novelty and understanding have been found to form two clusters with Openness/Intellect predicting membership in only one (Silvia et al., 2009a). Openness/Intellect was associated with the cluster in which novelty was a much stronger predictor of interest while understanding was less important, compared to the other cluster. This suggests that Openness/Intellect may moderate the interest-appraisal relationships predisposing those higher on Openness/Intellect to be more sensitive to novelty and less sensitive to understanding appraisals. One study has looked at the unique influence of the Openness and Intellect aspects on the processes and appraisal structure of interest in response to quotations. Openness was related to greater interest overall and a lessened reliance on understanding, while Intellect related to greater understanding (Fayn et al., 2015). This suggests that Openness and Intellect may relate to interest in different ways and that appraisal processes are useful for explaining these differences.

The influence of Openness/Intellect on the appraisal structure of pleasure and confusion, and the distinct influence of Openness and Intellect on the appraisal structure of interest, have not previously been tested. Taken together, previous findings indicate that appraisals can explain the mechanisms that underlie Openness/Intellect and its relationship with interest. Therefore, we aimed to evaluate the underlying processes associated with the Openness and Intellect aspects in order to understand whether those higher in either aspect are more aesthetically engaged and how the aspects manifest differently in aesthetic experiences.

The present research

In summary, positive aesthetic experience is broader than liking and may be divided into two families of experiences: pleasure and the knowledge emotions. Openness/Intellect may influence both these states and the processes that underlie these traits. Therefore, we moved away from the predominant practice of evaluating liking artworks, in lieu of measuring distinct emotional states that have previously been implicated in the aesthetic experience. Additionally, by studying variability in appraisal-emotion relationships across multiple stimuli we were able to evaluate the way personality manifests in aesthetic experiences. Thus, the aims of the current research are to explore the relationship between Openness/Intellect and aesthetic appreciation by: (1) extending the states studied within personality-aesthetics relationships to pleasure, interest, and confusion; (2) evaluating the unique influences of the Openness and Intellect aspects; and (3) testing whether the Openness and Intellect aspects moderate the within-person appraisal processes that underlie these aesthetic emotional states.

Study 1 evaluated the differential influence of Openness and Intellect on different aesthetic states in response to visual art. In Study 2 we tested whether the appraisal processes associated with interest, pleasure and confusion can explain the relationships between Openness/Intellect and aesthetic appreciation, and whether the Openness and Intellect influence appraisal processes.

Study 1

The purpose of this study was to test whether Openness and Intellect differentially predict states of interest, pleasure, and arousal. Based on past work on Openness and

Intellect, we predicted that Openness would be a stronger predictor of aesthetic experience than Intellect.

Method

Ethics Statement

This study was approved by the Human Ethics Committee of the University of Sydney. Written consent was obtained from all the participants before the experiment according to the established guidelines of the committee.

Participants

A total of 53 psychology students (74% female) participated in the study for course credit. Participants were aged between 17 and 42 years (M = 19.15 years, SD = 3.01 years). All participants were proficient in English ensuring comprehension of instructions.

Procedure

The study was conducted on computers over two 1-h sessions to minimize the influence of a long session of psychometric assessments on aesthetic appreciation. In the first session participants completed the Openness and Intellect scales, as well as other individual difference measures not relevant to the current study. In the second session—at least 1 h apart from the first—participants reported their thoughts and feelings in response to seven color images taken from published art books. The images were all in color and could broadly be described as modern art, comprising of both abstract and representational examples. The artists were: Dorosheva, Kadel, Kiefer, Magritte, Moki, Pollock, and Ryden.

Measures

Openness and Intellect

Openness and Intellect were assessed using the Big Five Aspect Scales (DeYoung et al., 2007). Each scale included 10 Likert style items on a five-point Likert scale (1 = strongly

disagree, 5 = strongly agree) such as “I enjoy the beauty of nature” (Openness) and “I like to solve complex problems” (Intellect). The Openness scale is made up of items that reflect the Openness to Aesthetics, Feelings and Fantasy scales, while Intellect items include self-reported ability and Openness to Ideas items. The scale yields a full-scale Openness/Intellect score along with scores for the Openness and Intellect aspects. The internal consistencies for Openness ($\alpha = 0.86$) and Intellect ($\alpha = 0.79$) were good within the current sample.

Ratings of interest, pleasure, and arousal

After viewing each picture, people rated it on a series of seven-point semantic differential scales. The scales assessed feelings of interest (interesting-uninteresting, engaging-boring), pleasure (pleasing-displeasing, enjoyable-unenjoyable), and arousal (calm-aroused, sluggish-excited). Most of the items have been used in past research in research on emotions (e.g., Day, 1967, 1968; Silvia, 2005; Turner and Silvia, 2006). The items were reverse-scored and averaged; high scores indicate high levels of interest, pleasure, and arousal.

Results and discussion

The analyses were conducted with Mplus 7.2 (Muthén and Muthén, Muthén and Muthén) using maximum likelihood with robust standard errors. For interpreting effect sizes, we use the common guidelines (Cumming, 2012) of r = 0.10/0.30/0.50 as small/medium/large. Table 3.1 reports descriptive statistics and correlations for the measures of personality and aesthetic experience.

Table 3.1.

Descriptive statistics and Pearson correlations of personality variables with between-person aggregated ratings.

	M	*SD*	1	2	3	4	5
1.Intellect	35.08	6.43	1	.27	.13	.18	.10
2.Openness	40.23	5.39		1	.28	.34	.39
3.Interest	5.83	0.67			1	.84	.50
4.Pleasure	5.52	0.74				1	.47
5.Arousal	4.67	0.72					1

Note: n = 53; All relationships above .18 are significant at .05 level, all those above .38 are significant at the .01 level, and all those above .49 are significant at the .001 level.

The zero-order correlations suggest, as expected, that Openness was associated with stronger aesthetic engagement than Intellect: Openness had stronger relationships, medium in size, with all three outcomes. To examine their differences more formally, we conducted a multivariate regression model in which Openness and Intellect were the two predictors and interest, pleasure, and arousal were the outcomes. Figure 3.1 displays the model and results. The effects of Openness on interest, pleasure, and arousal were medium in size, and most were statistically significant; the effects of Intellect on interest, pleasure, and arousal, in contrast, were all near-zero or small in size. The Openness/Intellect aspects explained 8%,

12%, and 15% of the variance in interest, pleasure, and arousal respectively. The results lend support to the utility of separating Openness and Intellect when evaluating individual differences in aesthetic states. Openness had notable relationships with the three types of aesthetic experience, whereas Intellect did not. Limitations of this study are the small sample size which we addressed in study 2, and a limited range on the Openness scale. Both of these limitations have a bearing on the strength of the results found in this study. Small sample sizes are an indication of underpowered studies, while range restrictions usually underestimate effect sizes.

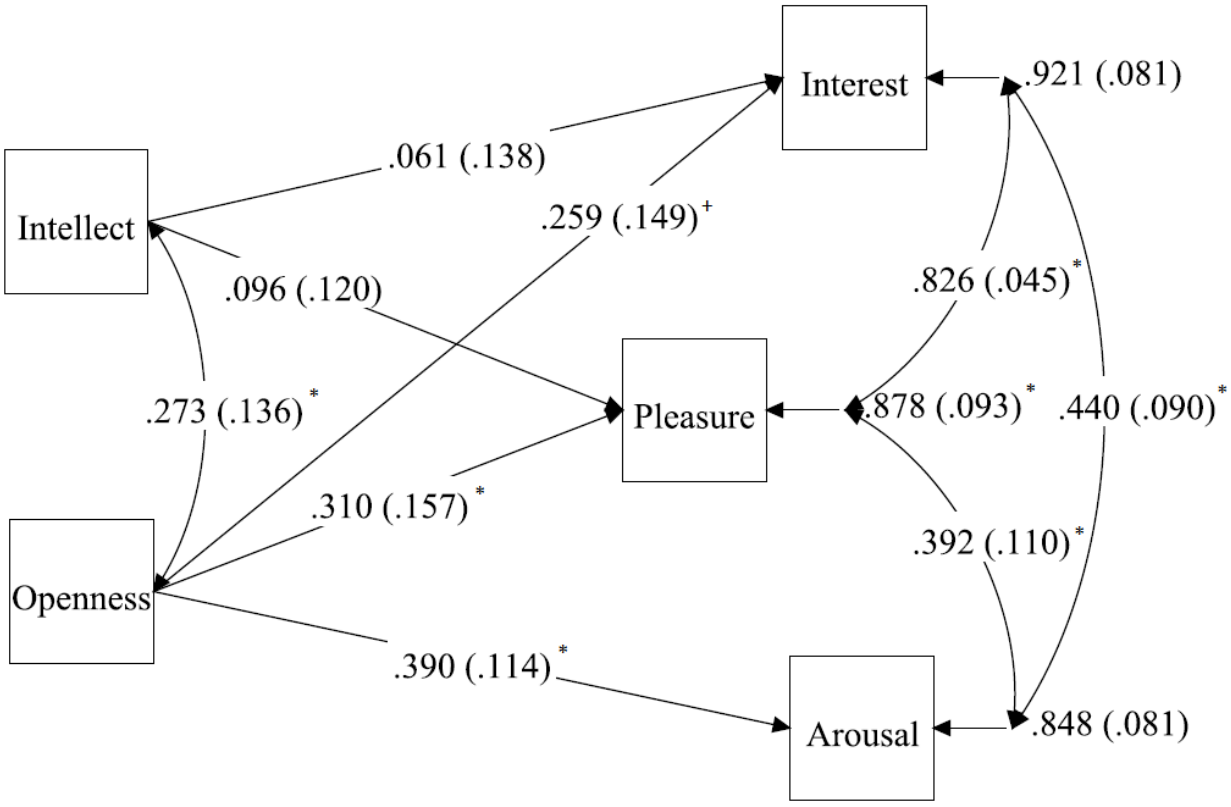

Figure 3.1. Effects of Openness and Intellect on ratings of interest, pleasure, and arousal: Study 1. n = 53. R squared for Note that the effect of Intellect on Arousal is $\beta < 0.01$ and hence not drawn. Standard errors are reported in brackets. $*p < 0.05$.

Study 2

Study 2 sought to extend these findings in several important ways. First, we shifted the range of emotional states that we assessed by focusing on interest, pleasure, and confusion. Whereas interest and pleasure have a long history in aesthetics research, confusion has only recently attracted attention among emotion researchers as a response to events that are unfamiliar and hard to understand (Silvia, 2010).

Second, to understand the processes underlying the Openness/Intellect-emotion relationships, appraisal processes were evaluated. The inclusion of appraisal processes can help determine why those higher in Openness/Intellect are more aesthetically sensitive—whether they are more or less emotionally responsive to appraisals. That is, we seek to determine whether Openness/Intellect can explain individual differences in appraisal-emotion relationships. As previously mentioned, Openness/Intellect moderates the appraisal structure of interest and relates to greater appraisals of understanding (Silvia, 2008; Silvia et al., 2009a). The current study extends this finding in several ways. First, we examine the two aspects of Openness/Intellect for their unique influence on aesthetic experience. Second, we test whether Openness and Intellect similarly moderate the appraisal structure of pleasure and confusion. We expect, as in Study 1, that Openness but not Intellect will be the aesthetically relevant aspect. Third, we included an additional individual difference measure to help clarify the roles of Openness and Intellect. A possible explanation for the relationship between Openness/Intellect and aesthetic appreciation is that those higher in Openness/Intellect have greater knowledge of the arts (Silvia, 2007a), which in turn predicts interest in art (Silvia, 2006). Art expertise has been shown to

moderate the interest-appraisal relationships—experts are less reliant on understanding and more sensitive to novelty (Silvia, 2013)—a finding also associated with Openness/Intellect (Silvia et al., 2009a). This may indicate that the effects of Openness/Intellect on aesthetic appreciation are a function of expertise in the arts rather than a differences in personality. These variables have not been studied together in the context of aesthetic appreciation, therefore, we controlled for art expertise in the current study.

Method

Ethics Statement

This study was approved by the Human Ethics Committees of the University of Sydney and the University of North Carolina at Greensboro. Written consent was obtained from all the participants before the experiment according to the established guidelines of the committees.

Participants

A total of 225 students from various degrees and majors (69% female) participated in the study for either course credit or $10 USD compensation. The students majors were 25.3% Physical Sciences, 21.8% Arts, 14.7% Psychology, 12% Health Sciences, 10% Business/Economics, 6.7% Social Sciences, 4.4% were undecided, and 4.9% had majors that did not fit into the categories presented as they were mixtures of more than one category. Participants' age was between 18 and 56 years (M = 20.56 years, SD = 4.91 years). All participants were proficient in English ensuring comprehension of instructions.

Procedure

The data were collected during a 1-h session in groups ranging from 1 to 8 participants at a time. The study involved completion of self-report personality scales and

ratings of 18 visual art images. We sought to include a broad scope of pieces ranging from traditional to contemporary art. The images were all in color and included both abstract and representational works. The artists were: Bacon, Blake, Goya, Hayuk, Kato, Kiefer, Magritte, Marc, Monroe, Pollock, Repin, Ryden, Schiele, Siqueiros, and Turner. The self-report scales came before and after the visual art ratings to avoid fatigue. All data was collected using Medialab (Jarvis, 2004) on computers. Images were presented in a random order, as were questions relating to the images; both controlled by the randomization algorithm within Medialab.

Measures

Openness and Intellect

As in Study 1, Openness and Intellect were assessed using the Big Five Aspect Scales (DeYoung et al., 2007). Each scale has 10 items on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Art expertise

Art expertise was measured using the aesthetic fluency scale (Smith and Smith, 2006), which assesses expertise by asking people how familiar they are with different figures and ideas from art history. The scale got participants to report their familiarity in response to 10 people and concepts (Mary Cassatt, Isamu Noguchi, John Singer Sargent, Alessandro Boticelli, Gian Lorenzo Bernini, Fauvism, Egyptian Funerary Stelae, Impressionism, Chinese Scrolls, Abstract Expressionism). The scale ranged from 0 (I have never heard of this artist or term) to 4 (I can talk intelligently about this artist or idea in art). It should be noted that the fluency scale assesses self-reported expertise in the arts and may be subject to overclaiming. However, the aesthetic fluency scale has been used widely used to assess

expertise and has displayed good internal and external validity (e.g., Silvia, 2007a; Silvia and Barona, 2009; DeWall et al., 2011; Silvia and Nusbaum, 2011; Smith, 2014).

Emotions and cognitions in response to visual art

Participants viewed 18 images of various valance and style taken from various art books, previous studies, and the google images database. Participants could observe the image for as long as they wanted, but for a minimum of 5 s. A smaller version of the image was also visible while reporting on their thoughts and feelings.

For each image participants completed items assessing various emotions and cognitions. For emotional evaluations participants were asked: “Did you find this picture…” followed by items for interesting, pleasing, and confusing. Appraisal processes of novelty (complex-simple, unusual-common) and understanding (hard to understand-easy to understand, comprehensible-incomprehensible) were assessed using seven-point semantic differential scales. All scales had been previously used in assessments of aesthetic states (Silvia, 2005, 2010, 2013). In addition to the emotion items, we asked some behavior-like preference items, which are common in aesthetics research (e.g., Cooper and Silvia, 2009). For each image, participants were asked I would like more information on this image, On Facebook I would “like” this image, On Facebook I would share this image on my wall, and I would like to own a copy of this. Each item was answered with a binary NO/YES scale. The time taken to view each image was also recorded to evaluate whether Openness or Intellect were associated with longer viewing times.

Results and discussion

Data reduction and analysis

The items for the personality and aesthetic fluency scales were averaged to form overall scores. Internal consistencies for the BFAS Openness and Intellect scales, and the aesthetic fluency scale were good (see Table 3.2).

Table 3.2.

Descriptive statistics and correlations between personality traits, aesthetic fluency and emotions.

	N	M	SD	1	2	3	4	5	6
1.Openness	225	39.16	5.59	(.76)	.39	.53	.39	.56	-.28
2.Intellect	225	36.23	5.51		(.80)	.39	.11	.27	-.28
3.Aesthetic Fluency	224	22.21	7.41			(.83)	.36	.52	-.26
4.Interest	224	5.21	.84				1	.67	.06
5.Pleasure	224	3.51	.83				.52	1	-.13
6.Confusion	224	3.98	.80				.02	-.20	1

Note: All relationships above .13 are significant at .001 level, and all those below .13 are not significant; Correlations below the diagonal are within-person relationships; Cronbach's alphas in parentheses.

The large number of images viewed by each person allowed us to use multilevel models, which can estimate between-person effects, within-person effects, and their interactions (Silvia, 2007b; Nezlek, 2011). For the multilevel models, between-person predictors (Openness, Intellect, and Aesthetic Fluency) were centered at the sample's grand mean and were rescaled by dividing the full scale score by the number of items in the scale.

Within-person predictors (appraisals of novelty-complexity and understanding) were centered at each person's own mean (Enders and Tofighi, 2007). The null model was used to evaluate intraclass correlation coefficients (ICCs). The ICCs indicated a significant amount of variance for interest (19%), pleasure (11%), and confusion (13%) at the between-person level.

The random slope and intercept models were tested separately for each emotion and are graphically depicted in Figure 3.2. The analyses were conducted with Mplus 7.2, using maximum likelihood with robust standard errors. All coefficients are unstandardized regression weights; some, where noted, are logistic effects. Estimation of power is a contentious topic within multilevel modeling due to the complexity of the parameters being estimated (Nezlek, 2011); by most standards the number of level 1 and level 2 units of measurement in our sample is sufficient to assume accurate estimations of the parameters of interest (Maas and Hox, 2005).

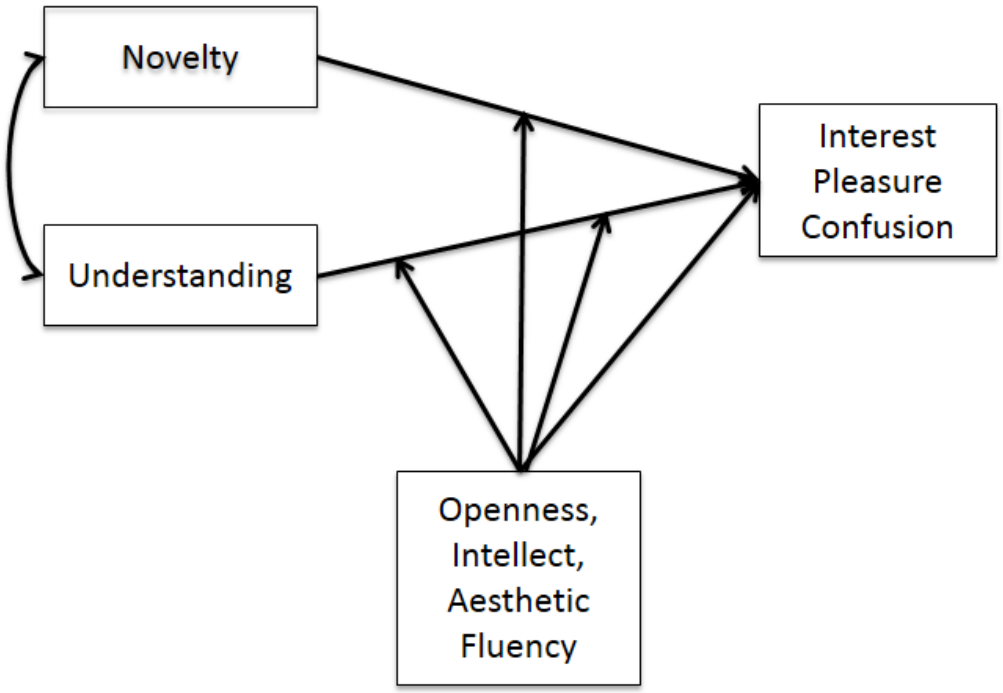

Figure 3.2. A depiction of the multilevel models.

Descriptive statistics and bivariate relationships

Openness and Intellect were both related to greater Aesthetic Fluency, pleasure, and lower confusion. Openness, but not Intellect, was related to greater interest (Table 2). The states of interest and pleasure had a strong overlap at the between and within person levels, and were unrelated to confusion at the between person level. Pleasure and interest differed from each other in their within-person relationship with confusion, interest was independent of confusion, but pleasure had a small negative relationship with confusion.

Overall between-person effects of Openness and Intellect on emotions and preference ratings

Our first models examined the overall effects of Openness and Intellect on emotion ratings (interest, pleasure, and confusion) and on preference ratings (e.g., whether people indicated wanting to own a copy of the image). As expected, Openness and Intellect showed diverging relationships with these outcomes. Openness predicted finding the images significantly more interesting ($b = 0.61$, $SE = 0.11$, $p < 0.001$), more pleasing ($b = 0.77$, $SE = 0.09$, $p < 0.001$), and less confusing ($b = -0.31$, $SE = 0.10$, $p = 0.003$). Intellect, in contrast, predicted finding the images less confusing ($b = -0.29$, $SE = 0.11$, $p = 0.008$), but it didn't significantly predict either interest ($b = -0.06$, $SE = 0.10$, $p = 0.573$) or pleasure ($b = 0.09$, $SE = 0.09$, $p = 0.287$).

For the preference ratings, a logistic model found that Openness significantly predicted the likelihood of wanting more information about the image ($b = 1.65$, $SE = 0.32$, $p < 0.001$), the likelihood of liking ($b = 0.93$, $SE = 0.16$, $p < 0.001$) and sharing ($b = 1.09$, $SE = 0.25$, $p < 0.001$) the image on Facebook, and the likelihood of wanting to own it ($b = 1.14$, $SE = 0.18$, $p < 0.001$). Intellect, in contrast, did not significantly predict wanting to learn more (b

= -0.49, SE = 0.30, p = 0.101), liking (b = -0.08, SE = 0.16, p = 0.619) or sharing (b = 0.14, SE = 0.18, p = 0.402) the image on Facebook, or wanting to own it (b = 0.02, SE = 0.22, p = 0.942).

For view times—averaged across all stimuli—a regression model found that Openness significantly predicted greater viewing times (b = 206.29, SE = 62.85, p = 0.001). Intellect did not predict variance in view times (b = -0.39.06, SE = 63.89, p = 0.542).

In short, Openness and Intellect diverged in their relationships with aesthetic experience, preference ratings, and viewing times. Openness significantly predicted all of them, but Intellect predicted only feeling less confused.

Overall within-person effects of appraisals on emotions

The results for all multilevel models are presented in Table 3.3. These models evaluated the within-person main effects of appraisals on emotions. As in past work, interest was significantly predicted by appraisals of high novelty and high comprehensibility, and confusion was predicted by high novelty and low comprehensibility. Pleasure, in contrast, was more weakly predicted by novelty but predicted by comprehensibility, consistent with models that emphasize ease of understanding (Reber, 2012) and achieving insight and knowledge (Leder et al., 2012) as a source of liking.

Personality as predictors of emotion intercepts and moderators of appraisal-emotion relationships

Openness and Intellect had different main effects on aesthetic experience, but do they moderate how appraisals influence aesthetic experience? These models included Openness and Intellect as between-person predictors of emotions and appraisal-emotion slopes. If a between-person trait significantly predicts a slope, then the relationship between an appraisal and an emotion shifts across levels of the trait. Prediction of

Table 3.3.

Multilevel models of within and between person predictors of aesthetic experiences.

	Interest (DV)			Pleasure (DV)			Confusion (DV)		
Within-Person Predictors									
Novelty	.39*** (.03)			.08** (.03)			.20*** (.02)		
Understanding	.28*** (.02)			.28*** (.03)			-.56*** (.03)		
Between-Person		Slopes			Slopes			Slopes	
Predictors	Intercept	N	U	Intercept	N	U	Intercept	N	U
Model 1, 2, 3									
Openness	.61*** (.11)	.12** (.04)	-.06 (.05)	.77*** (.10)	.16** (.05)	.02 (.05)	-.31** (.10)	-.01 (.04)	-.03 (.04)
Intellect	-.06 (.10)	.12* (.05)	.05 (.04)	.09 (.09)	.07 (.06)	-.04 (.05)	-.29** (.11)	-.06 (.04)	.01 (.05)
Model 4, 5, 6									
Openness	.45*** (.12)	.11* (.05)	-.04 (.05)	.57*** (.09)	.13* (.06)	.03 (.05)	-.23* (.15)	.03 (.04)	<.01 (.05)
Intellect	-.09 (.10)	.11* (.05)	.07 (.04)	-.01 (.09)	.05 (.06)	-.03 (.04)	-.27* (.11)	-.04 (.04)	.03 (.05)
Aesthetic Fluency	.28** (.08)	.02 (.04)	-.05 (.03)	.34*** (.07)	.04 (.04)	-.03 (.04)	-.13 (.09)	-.06* (.03)	-.06 (.04)

Note: *p<.05; **p<.01; ***p<.001; N=Novelty-Interest slope; U=Understanding-Interest slope; Standard errors are reported in brackets.

intercepts implies that the overall mean of the emotion shifts according to trait regardless of appraisals. Both intercepts and slopes were modeled as random in these models.

Openness predicted larger intercepts for interest, pleasure, and smaller intercepts for confusion. Intellect predicted lower intercepts for confusion, but was not significantly related to interest and pleasure intercepts.

For interest (Model 1), the effect of novelty was moderated by both Openness and Intellect. For people high in Openness and Intellect, novelty was more strongly coupled to interest. No significant moderation effects appeared for understanding. For pleasure (Model 2), the effect of novelty was moderated by Openness but not Intellect. For people high in Openness, novelty was more strongly linked to pleasure. Follow up analysis on the difference between the novelty-pleasure slopes for Openness and Intellect indicated that they were not significantly different from each other (Wald test = 1.00, df = 1, p = 0.32). No significant moderation effects appeared for understanding. And for confusion (Model 3), in contrast, neither Openness nor Intellect moderated either appraisal. Neither the effect of novelty nor the effect of understanding on confusion varied across levels of Openness and Intellect.

Considered together, these results suggest that both Openness and Intellect are associated with greater sensitivity to novelty in the experience of interest, but only the Openness aspect is associated with greater sensitivity to novelty in the experience of pleasure. While the slope moderations by Openness and Intellect were not found to differ from each other, the moderating influence of Openness was significant, while the influence of Intellect was not. Finally, Openness, but not Intellect, was associated with greater pleasure and interest overall.

Exploring art expertise

Our final models explored the roles of art expertise (measured with the aesthetic fluency scale). To examine art expertise, we included it alongside Openness and Intellect to see if it reduced their effects. As we discussed earlier, such a result would suggest that the effects of personality are largely carried by acquired expertise about the arts.

The inclusion of art expertise didn't change any of the Openness and Intellect findings with respect to interest, confusion and pleasure. This suggests that the effects of Openness and Intellect are not driven by greater expertise in the arts. For interest (Model 4), neither the effect of novelty nor the effect of understanding was moderated by art expertise, but expertise was related to greater intercepts in the model. For pleasure (Model 5), neither the effect of novelty nor the effect of understanding was moderated by art expertise, but expertise was related to greater intercepts in the model. And for confusion (Model 6), art expertise moderated the effect of novelty, but not understanding; in contrast, neither Openness nor Intellect moderated either appraisal. This suggests that novelty is less related to confusion for those with greater art expertise. These results suggest that the novelty-interest and novelty-pleasure moderation are not influenced by art expertise but are rather driven by Openness.

General discussion

Openness/Intellect is the personality domain that best explains individual differences in aesthetic appreciation. However, the research linking actual art appreciation to the domain has several issues. First, as discussed in the introduction the focus on liking artworks is limited, as aesthetic experience is much broader and richer than mild feelings of pleasure

(Silvia, 2009). Second, there's a risk of circularity in the relationship, given that items about aesthetic engagement appear on all major Openness to Experience scales. Without examining why this relationship exists, not much is added to our understanding of Openness/Intellect and aesthetics. In this research, we broadened the range of aesthetic emotions and examined appraisal mechanisms that could explain differences in aesthetic experience as a function of Openness/Intellect. Art expertise was evaluated alongside personality to test whether the influence of Openness and Intellect on aesthetic appreciation can be explained by greater art knowledge.

As predicted, Openness/Intellect reflected individual differences in aesthetic experiences—both pleasure and the knowledge emotions. The strength of the relationship was particularly driven by Openness as opposed to Intellect, supporting the distinction in the aspects based on perceptual versus abstract engagement (DeYoung, 2015). Mechanisms for these relationships were also discovered through differences in appraisal-emotion relationships. The Openness/Intellect aspects predicted reactivity to novelty appraisals in experiences of interest. While the novelty seeking core of Openness/Intellect has previously been suggested (Woo et al., 2014), our study provides within-person process evidence for this special relationship with novelty and demonstrates that those higher in Openness/Intellect are reactive to novelty in their experiences with interest. Openness diverged from Intellect in the experience of pleasure. Intellect did not predict individual differences in the processes associated with pleasure, but novelty was a stronger predictor of pleasure for people high in Openness. Further, Openness predicted greater interest and pleasure regardless of how artworks were appraised, further distinguishing it from Intellect. Openness and Intellect were related to lower levels of confusion, but variance in appraisal-emotion relationships was not associated with either aspect.

Finally, the possible confound of art expertise was evaluated as an explanation for the Openness-aesthetic emotions relationship. The inclusion of art expertise did not influence any of the Openness-aesthetic emotion relationships, suggesting that the effects were particular to the personality variables rather than greater expertise. Expertise did predict greater interest and less confusion overall, and it was related to a smaller relationship between novelty and confusion.

Together these findings provide an important update for our understanding of the relationship between the Openness/Intellect and aesthetic emotions. Particularly, our findings show that Openness, as opposed to Intellect, is the aspect of the aesthetically engaged, and provide a process based understanding for why those higher in Openness are more aesthetically engaged. Finally, methodological differences between this and previous research on personality and aesthetics highlight the advantages of the current approach.

Within this paper we assume rather that test a causal flow from personality to emotion states. That is, we assume that personality reflects biologically driven consistencies in emotions, cognitions, and behavior. Therefore, personality is treated as an antecedent of states. Similarly, appraisals are considered to be antecedents of emotions. For interest, both appraisals, when experimentally manipulated, have been shown to influence interest (Silvia, 2005). Thus, within this paper, we treat appraisals as causing emotions.

Advantages of the current method

There are two methodological differences between the current method and most of the research on personality and aesthetics. First, we moved away from the predominant practice of evaluating liking artworks and shifted toward measuring distinct emotional states that have previously been implicated in the aesthetic experience. Liking is a common

and important aesthetic response—mild feelings of pleasure might be the most common everyday aesthetic experience—but it is only one of many important experiences people have in response to the arts (Silvia, 2009). Second, we explored both within- and between-person effects. The integration of dispositional and situational variables has long been advocated (Cronbach, 1957; Underwood, 1975), but it is uncommon for aesthetics research to examine effects at the within-person level of analysis, which is the natural level for examining how appraisals influence emotional responses (see Silvia, 2007b; Nezlek, 2011).

The how and why of Openness/Intellect and aesthetics

Previous research has demonstrated that Openness/Intellect is related to differences in appraisal processes for the emotion of interest (Silvia, 2008; Silvia et al., 2009a). The current research builds on these findings in two important ways by: (a) evaluating the independent roles of Openness and Intellect in interest-appraisal processes; and (b) evaluating differences in pleasure-appraisal and confusion-appraisal processes.

Openness and Intellect were both associated with reactivity to novelty in the experience of interest suggesting that novelty sensitivity is at the core of the domain. However, Intellect, as opposed to Openness, did not reflect greater interest overall. This suggests that being higher on Intellect is reflective of lower than average levels of interest when novelty is not found in an artwork, yet higher than average interest for novel artworks. Conversely, Openness was related to greater interest regardless of appraised novelty suggesting that while novelty is preferred, greater interest is experienced even in the absence of it. The sensitivity to novelty in the experience of interest for both Openness and Intellect provides a possible process explanation for part of the Openness-Fluid-Crystallized-Intelligence (OFCI) model which proposes a developmental link between Openness/Intellect and fluid intelligence (Ziegler et al., 2012). Ziegler et al. (2012) propose

that being open increases learning opportunities, thereby increasing fluid intelligence. Our findings suggest that Openness/Intellect is associated with a sensitivity, through interest, to stimuli and situations that are appraised as novel and complex. This preferential engagement with challenging information could support the pathway from Openness/Intellect to gains in fluid and crystallized intelligence.

While the Openness and Intellect aspects reflect quantitative differences in the appraisal structure of interest, qualitative differences are present in the experience of pleasure. Openness, but not Intellect, was associated with the presence or absence of a pleasure-novelty relationship. Studies have shown quantitative differences in appraisal structures—the appraisal structure remains constant yet the predictive strength of an appraisal varies as a function of a trait (Kuppens and Tong, 2010). However, few studies have found qualitative differences in appraisal structures. Our findings indicate that those higher in Openness experience pleasure as a function of novelty and understanding, while those lower on the aspect are only influenced by understanding. The idea that understandable things are pleasant is congruent with fluency based aesthetic theories where things that are easily understood are pleasant to the beholder (Reber, 2012). Our findings suggest that this may primarily be the case for people lower on Openness. For those higher on Openness, pleasure is also influenced by the novelty of an artwork.

This finding has important implications for aesthetic theories. Fluency based accounts are at odds with interest based accounts. Interest requires novelty, whereas fluency-based aesthetic experiences are a function of easy processing. This distinction maps nicely onto interest and pleasure. Interest is experienced in the face of novelty and pleasure is experienced when processing requires little effort. Our research suggests that individual differences both complicate and clarify this distinction. It seems that the influence of fluent

processing in the experience of aesthetic pleasure is dependent on trait standing. Those higher in Openness are sensitive to novelty and complexity in their experience of pleasure. Conversely, pleasurable experiences for those lower on Openness are not predicted by stimulus novelty.

Openness/Intellect model

These findings add to the growing empirical consensus for the utility of studying Openness and Intellect as separate aspects of the broader domain. The distinction previously proposed—Openness as exploration through perception, and Intellect through learning and abstract information (DeYoung, 2015)—is supported with Openness reflecting greater pleasure and interest and less confusion in response to visual art. While Intellect was also found to play a role in the processes that facilitate interest, this role does not predict greater aesthetic reactions but rather reflects a preference for the novel, and a lesser tendency to feel confusion in response to visual art. The relationship between Intellect and interest in art, when controlling for Openness, is not evident at the between-person level, but is apparent when within-person processes are considered. Future studies are encouraged to explore the differential influence of Openness and Intellect on interest in non-perceptual stimuli such as science and philosophy to gain further insights into this useful separation of the Openness/Intellect domain.

Conclusion

Henry James saw art as central to life and beauty, and this attitude, like that of many other creative people, was likely a function of his Openness. We aimed to extend our understanding of the role personality plays in common aesthetic experiences: pleasure, interest, and confusion. Our findings suggest that Openness, as opposed to Intellect, is the

personality core of aesthetic experiences, and that the relationship persists because those higher in Openness are more sensitive to novelty in artworks and experience greater engagement overall, predisposing them to feel more interest and pleasure in response to the arts.

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Chapter 4: Engaged in different things or in different ways? The engagement basis of the distinction between Openness and Intellect.

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Abstract

Openness and Intellect are proposed to differentially predict engagement depending on stimulus content. Engagement with sensory experiences is explained by Openness, while engagement with abstract information is explained by Intellect. We propose an alternative distinction, where Openness drives engagement in all types of content. These two positions are contrasted through associations of both Openness and Intellect with interest in a broad range of stimuli (art, science and philosophy). When modelled concurrently, only Openness predicts interest in all stimuli types. The influence of Openness on interest is qualified by appraisal processes. The Openness-interest link shows lower reliance on understanding for art and greater reactivity to novelty for science and philosophy. Our findings suggest that Openness is the engagement aspect of Openness/Intellect.

Introduction

The debate whether to call Factor V in Big Five models Openness to Experience or Intellect has seemingly been resolved. The fifth broad domain of personality, has been parsimoniously divided into two aspects—*Openness* and *Intellect* (DeYoung, Quilty, & Peterson, 2007)—appeasing both sides of the label and nature debate. The aspects have been shown to have differing relationships with cognitive abilities, and creativity (DeYoung, Quilty, Peterson, & Gray, 2014; Kaufman, 2013; Kaufman et al., 2010; Nusbaum & Silvia, 2011) suggesting that they are distinct. Based on such differential associations, DeYoung (2014) suggested that Openness and Intellect differ in terms of the processes that facilitate engagement and exploration—Openness facilitates engagement with sensory and visual information processing, and Intellect with semantic and abstract information.

This suggested engagement distinction in terms of content has particular implications for explaining important psychological phenomena associated with the Openness/Intellect domain. Particularly, engagement with different types of informational situations implies that the aspects should differentially predict the choice and enjoyment of different subjects in educational settings, vocational and leisure pursuits, and knowledge acquisition. However, the distinction proposed is primarily based on differing associations with cognitive and creative ability constructs, and not completely settled when considering Openness and Intellect associations with engagement states, and the measurement of Intellect.

When considering associations with states of engagement, Openness, compared to Intellect, was the stronger predictor of engagement with visual stimuli (Fayn, MacCann, Tiliopoulos, & Silvia, 2015), and with self-reported experiences of the powerful emotion states of chills and absorption (Silvia & Nusbaum, 2011). Further, inspection of the item

content that makes up the Intellect measure (DeYoung et al., 2007) implies primarily the assessment of self-reported ability, rather than engagement. However, Openness and Intellect were found to both independently predict engagement with quotations (Fayn, Tiliopoulos, & MacCann, 2015). Such findings and observations indicate that the division of Openness and Intellect based on engagement with different types of information is not yet settled, and a direct test of the distinction is warranted.

Therefore, the current study aimed to directly test the engagement differences between Openness and Intellect in response to a broad range of visual and abstract stimuli (specifically, visual art, science, and philosophy). The broad range of stimuli allowed us to test whether the engagement differences between Openness and Intellect are primarily based on the type of information that elicits engagement (a *content distinction*), or primarily a function of Openness rather than Intellect (an *engagement distinction*).

Content distinction of Openness and Intellect

The facet structure of the most popular measurement of Openness/Intellect—the NEO and its various versions—is organised by the situations or stimuli that people are open to (e.g., Openness to ideas, aesthetics, feelings, and values are separate facets). The distinction proposed for the aspects of Openness and Intellect is also in the type of information that is being processed. This distinction is primarily based on item content, and differential psychometric associations of the Openness and Intellect aspects with ability and creativity constructs. Intellect is associated with fluid and crystallised intelligence, working memory, and scientific creativity, whereas Openness is associated with implicit learning ability, and artistic creativity (DeYoung et al., 2014; Kaufman et al., 2010; Nusbaum & Silvia, 2011). This pattern of associations, as well as the content of the items in the scales, has been interpreted as Openness reflecting engagement with sensory and perceptual

information, and Intellect reflecting engagement with abstract and semantic information primarily though reasoning.

One problem with assuming such a distinction is its basis on associations with ability based constructs that are distinguished from personality constructs in terms of maximal versus typical behaviour (Cronbach, 1949). Ability constructs have traditionally been thought of as 'can do' constructs, versus the 'will do' constructs of personality. Therefore, associations between Openness and Intellect and ability based constructs suggest 'can do' capacities, rather than 'will do' engagement-based tendencies. For example, the association between Intellect and working memory tells us that those higher on Intellect will, on average, have greater ability to understand complex abstract information, but tells us little regarding their engagement with such information.

Engagement distinction of Openness and Intellect

An alternative position to the content distinction is that Openness primarily reflects engagement, whereas Intellect primarily reflects self-reported ability. When modelled together, Openness, was the stronger predictor of engagement in response to visual art and quotations (Fayn, Tiliopoulos, & MacCann, 2015; Fayn et al., in press). However, Intellect did independently predict interest in quotations.

Further evidence for the engagement distinction comes from associations between engagement constructs and NEO based measures of Openness/Intellect. Within such measures, Intellect only reflects one sixth of the measure (Openness to Ideas), making discovered relationships more attributable to Openness, rather than Intellect. A NEO measure of Openness/Intellect has been the best predictor of powerful engagement states, both in terms of tendency to experience such states (Shiota, Keltner, & John, 2006) and in response to music and celestial objects (Silvia, Fayn, Nusbaum, & Beaty, 2015).

Direct evidence for the engagement distinction looked at the tendency to experience powerful emotional states, which was predicted by Openness, but not by 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. Such findings are supportive of the dual-process distinction between Openness and Intellect where Openness is reflective of automatic processes associated with affect, and Intellect of more deliberate cognitive processes (Kaufman, 2013; Kaufman et al., 2015). In conclusion, while some evidence supports the content distinction between Openness and Intellect, other findings suggest that Openness is the engagement core of the domain.

Engagement and its processes

Interest is an emotion associated with learning, intrinsic motivation and engagement with epistemic situations (Silvia, 2006). Interest is part of a category of emotions—the knowledge emotions—that are felt in response to meta-cognitive beliefs regarding informational stimuli (Keltner, & Shiota, 2003; Silvia, 2008). An added advantage to studying interest is its well-researched appraisal process structure which has been replicated across several types of situations including art, poetry, and film (Silvia, 2005; Silvia, & Berg, 2011; Silvia et al., 2009).

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 case of interest, is akin to the coping appraisal through which understanding facilitates the experience of interest. Knowledge of the process structure of interest allows for tests of

differences between the aspects, not only in the propensity to experience interest, but also the processes associated with interest.

Appraisal approach to individual differences

The appraisal approach to studying individual differences in emotional experiences has allowed for greater understanding of trait-emotion relationships. Kuppens and Tong (2010) identified two sources of individual differences in the appraisal-emotion system: (1) appraisal strength (e.g., how likely someone is to make a particular appraisal); and (2) variability in appraisal-emotion relationships (e.g. how strongly an appraisal is coupled with a resulting emotion for a person). The appraisal model for interest and the influences of traits on the model are presented in Figure 4.1. Therefore the influence of Openness/Intellect on interest may be (1) novelty and/or understanding strength (1a and 1b in Fig. 1); and (2) novelty-interest, and understanding-interest contingencies (2a and 2b in Fig 1).

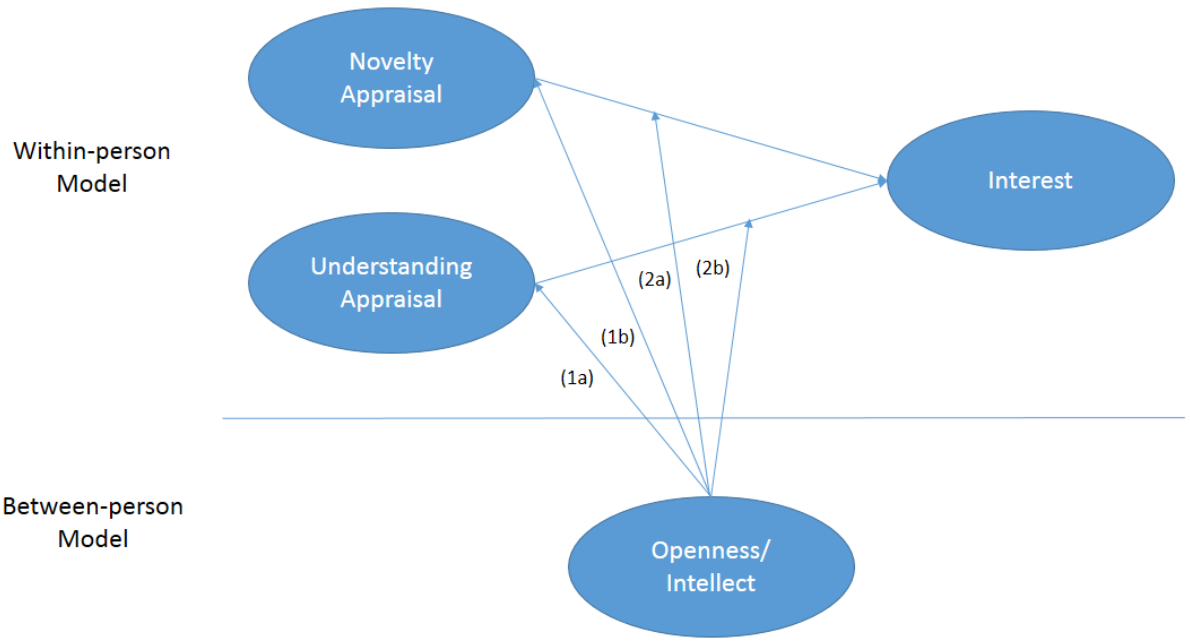

Figure 4.1. Conceptual model of the effects of Openness/Intellect on appraisals, interest and appraisal-interest relationships.

Two studies have looked at the unique influence of Openness and Intellect on the processes and appraisal structure of interest. For visual art, Openness was related to greater interest, greater understanding of visual art (Fig.1, 1a), and a greater reactivity to novelty (Fayn, et al., in press). For quotations, both Openness and Intellect were associated with greater interest overall, but the relationship for Intellect was mediated through greater understanding (Fig. 1, 1a), while Openness was related to a lessened reliance on understanding (Fig. 1, 2b; Fayn et al., 2015). Therefore, relationships between interest and the Openness/Intellect aspects suggest that Openness and Intellect may be distinguished through their influence on the processes associated with interest.

The current research

The current research tested 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 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:

H1: Openness will be best predictor of interest in visual art, while intellect will be the best predictor of interest in philosophy and science.

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:

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.

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 hypothesis 4 and hypothesis 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).

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*).

Art, Science, and Philosophy.

For each participant all the stimuli were presented in a different random order. Each stimulus could be viewed for as long as desired, but for a minimum of five seconds for the art and philosophy stimuli and ten seconds for the science stimuli (due to their length). The stimuli consisted of ten contemporary visual art images by various artists (e.g., Kandinsky, Ryden, Magritte), ten 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 ten scientific stimuli that were short explanations of recent scientific findings in different areas of research (e.g., artificial intelligence, evolution, virtual reality, linguistics). All the stimuli are available in the supplementary materials.

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*, 7 = *very much*) scale. One possible issue with relying only on self-report interest is that those higher on Openness/Intellect may self-present as more interested due to their self-concept as open-minded. For this reason we also asked participants if they would like more information for each stimulus, which was answered with a binary NO/YES scale. Appraisals

were assessed using 7-point bi-polar scales (*Simple-Complex*, *Common-Unusual*, *Hard to Understand-Easy to Understand*, *Comprehensible-Incomprehensible*).

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 modelled concurrently to evaluate their unique influence on interest. The large number of stimuli viewed within each category by each person allowed us to use multilevel models, which can estimate between-person effects, within-person effects, and their interactions (Nezlek, 2008; Silvia, 2007). Within-person predictors (appraisals of novelty and comprehension) were centred at each person's own mean and entered into the models simultaneously. Person centring reduces idiosyncratic response bias by using deviations from each person's mean to predict interest (Enders & Tofighi, 2007). Separate multilevel models were analysed 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

Given that the primary goal of this project is to test the unique influences of Openness and Intellect, we only report relationships with these aspects. A full table of BFAS correlations is available upon request from the first author. Importantly, the BFAS aspects, apart from Openness and Intellect, did not predict a significant amount of additional variance in interest in science ($\Delta R = .06$, $F = 1.48$, $p = .169$), arts ($\Delta R = .07$, $F = 1.76$, $p = .089$)), or philosophy ($\Delta R = .03$. $F = .88$, $p = .536$) and were therefore left out from

subsequent modelling. The only significant predictor of interest (apart from Openness and Intellect) when all aspects were modelled concurrently was the Enthusiasm aspect of Extraversion in its prediction of interest in art. This supports previously found associations between Extraversion and aesthetic appreciation but also demonstrates that the effects of Openness and Intellect are independent of the overlap with Extraversion.

Bivariate relationships are reported in Table 4.1. 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.

Table 4.1.

Pearson's correlations of Openness, Intellect, and aggregated interest and appraisals.

		Art			Science			Philosophy		
	Int	Interest	U	N	Interest	U	N	Interest	U	N
Open	.48**	.37**	.34**	-.19***	.39**	.16*	0.01	.43**	.35**	-0.12
Int		.15*	.21***	-.18*	.30**	.25**	-0.1	.29**	.33**	-0.09

Note. *p < .05, **p < .01, ***p < .001; N = 182; Int: Intellect; U: Aggregated Understanding Appraisals; N: Aggregated Novelty Appraisals;

Between-person relationships between Openness/Intellect aspects and interest

To test the unique influence of Openness and Intellect on interest in science,

philosophy, and art, the aspects were modelled concurrently along with aggregated interests across the three stimulus types (Figure 4.2). Openness, but not Intellect, was associated with greater interest in response to art, science, and philosophy, supporting the engagement, as opposed to the content, distinction between the aspects.

This unique engagement role of Openness was also replicated for the information request questions. A logistic model found that Openness significantly predicted the likelihood of wanting more information about images ($b = .52$, $SE = .17$, $p = .002$), philosophical quotations ($b = .43$, $SE = .15$, $p = .003$) and scientific findings ($b = .40$, $SE = .13$, $p = .004$). Intellect, in contrast, did not significantly predict wanting more information about images ($b = -.07$, $SE = .16$, $p > .05$), philosophical quotations ($b = .05$, $SE = .15$, $p > .05$) and scientific findings ($b = .06$, $SE = .15$, $p > .05$).

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

Between-person appraisal strength and the Openness/Intellect aspects

Path models were used to test whether appraisal strength could explain the personality-interest between-person relationships (Figure 4.3). These models tested whether the influence of Openness or Intellect on interest were mediated by appraisal tendencies (See Figure 4.1, 1a and 1b). The significance of the indirect effects was assessed using bootstrapping procedure with unbiased estimators (Hayes, 2009). The models generated 5000 bootstrapped resamples with bias-corrected and adjusted confidence intervals. A confidence interval that does not include zero indicates a significant indirect

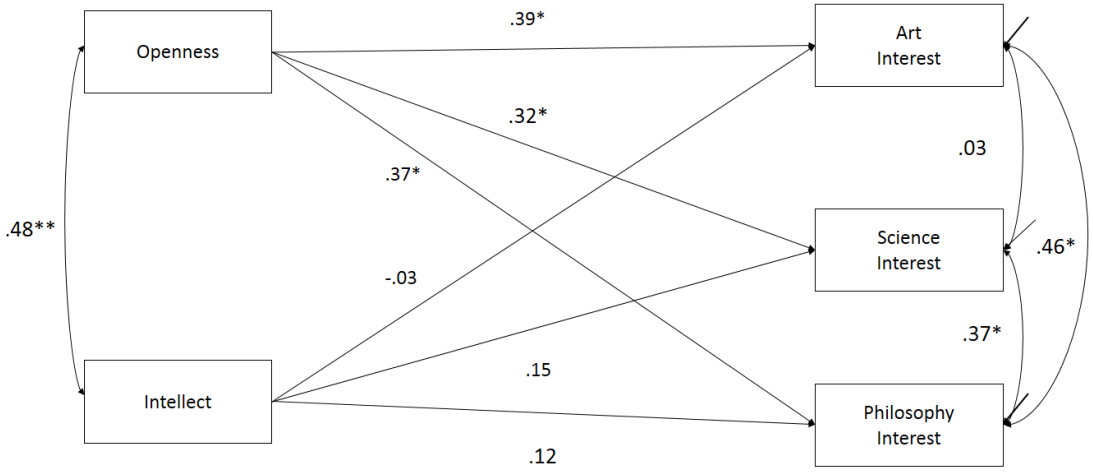

Figure 4.2. Path model representing between-person relationships between Openness, Intellect and interest in art, science and philosophy. *$p < .001$.

For art, the relationship between Openness and interest was mediated by greater understanding (point estimate =.124; 95% C.I.: .051 to .197). Intellect did not predict significant variance in art interest through direct or indirect pathways. These findings support both content and affective positions as the association between Openness and interest in art is predicted by both.

For science, the relationship between Openness and interest was not explained by an indirect effect through greater understanding, but Openness maintained a direct relationship with interest. A significant indirect pathway was found for the Intellect-interest relationship through greater understanding (point estimate =.136; 95% C.I.: .035 to .237). Given that Intellect shared no variance with interest independent of Openness, this relationship should be interpreted cautiously. The indirect relationship through understanding suggested that those higher in Intellect should be more interested in science as they are better able to understand it. However, this relationship was not significant when

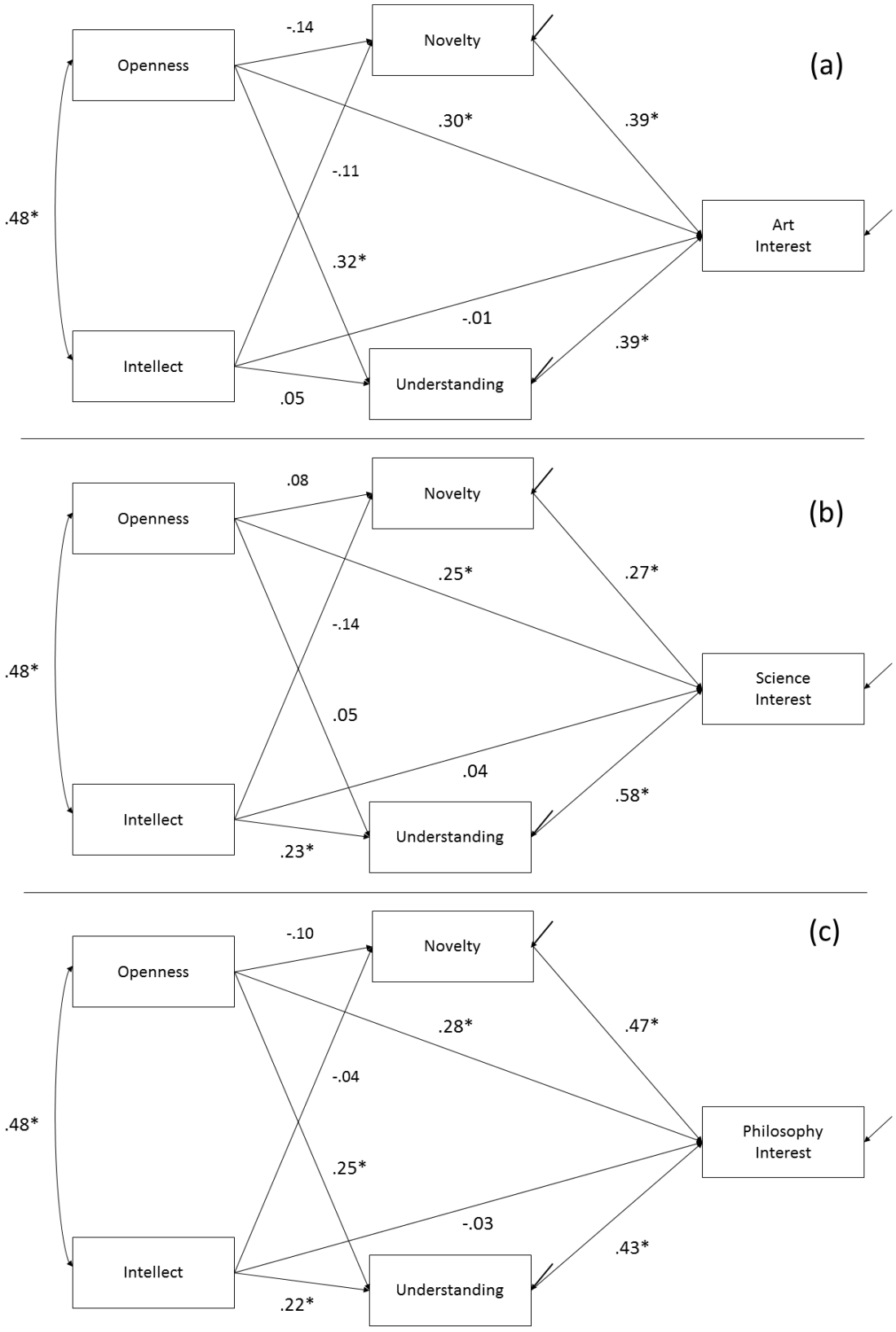

Figure 4.3. Appraisal strength mediation models of understanding on the relationships between Openness, Intellect and interest. $^{*}p < .001$.

controlling for Openness. This path suggests a 'can do' influence of Intellect. Overall these results supported the engagement distinction between Openness and Intellect, as Openness was the only direct predictor of interest in science.

For philosophy, both Openness (point estimate =.106; 95% C.I.: .029 to .183) and Intellect (point estimate =.092; 95% C.I.: .016 to .168) predicted an indirect path to interest through greater appraised understanding. Once again, Intellect predicted the indirect pathway whilst not having a significant relationship with interest when controlling for Openness.

Overall, the findings for science and philosophy supported the engagement distinction between Openness and Intellect because, when modelled concurrently, only Openness explains variance in engagement. However, for both the verbal stimuli, Intellect predicted an indirect pathway through greater understanding, which also replicated a previous finding in response to quotations (Fayn, et al., 2015). This finding points to the 'can do' influence of Intellect—greater appraised understanding of abstract information.

Within-person appraisal-emotion 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 (see Nezlek, 2008; Silvia, 2007, for descriptions of this approach). These models tested whether idiosyncratic within-person variance in appraisal-interest contingencies 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 4.2. At the within-person level, interest was positively predicted by novelty and understanding

appraisals for all three stimulus types, which replicates the previously proposed appraisal structure for various stimuli (e. g. Silvia, 2005), and extends them to philosophical and scientific stimuli. For art, the appraisals were medium sized predictors of interest. For science and philosophy, understanding appraisals were strong predictors of interest, while novelty appraisals were small-medium predictors of interest. This suggests that while novelty and understanding are both associated with greater interest for abstract stimuli, understanding is particularly important for such stimuli.

Table 4.2.

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

	Art			Science			Philosophy		
Within-Person Predictors									
Understanding		.37***			.56***			.48***	
Novelty		.42***			.23***			.26***	
Between-Person Predictors	Intercept	N	U	Intercept	N	U	Intercept	N	U
Openness	.34***	-.01	-.08*	.27***	.07*	-.06	.35***	.09*	>-.01
Intellect	-.04	.04	>-.01	.12	.03	<.01	.09	.03	-.03

Note. *p < .05, **p < .01, ***p < .001; n = 182; U: Understanding Appraisals; N: Novelty Appraisals;

Openness was further distinguished from Intellect in that it was associated with different appraisal-interest contingencies for all three stimuli. Openness, but not Intellect, predicted larger slopes and within-person variance in appraisal-interest relationships for all three stimuli providing further support for the engagement distinction. Openness was related to a lessened reliance on the understanding appraisal in the experience of interest in art. Coupled with its prediction of the intercept, these findings indicated that those higher in Openness felt greater interest overall, and were especially more engaged 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 greater 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. Intellect did not predict any of the intercepts of appraisal-interest relationships. The results for science and philosophy stimuli support the engagement distinction between Openness and Intellect, rather than the content distinction, and suggest processes that facilitate Openness-interest relationships[1].

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—perceptual versus abstract—predicted that Openness and Intellect would predict engagement with visual versus semantic stimuli. The engagement distinction predicted that Openness would be the primary predictor of engagement with all stimuli, while Intellect would be unrelated to engagement.

Our results primarily supported the engagement distinction. When modelled together, Openness was the consistent predictor of engagement with all three types of stimuli, while Intellect did not predict any additional variance. The relationship between Openness and engagement for all stimuli types was qualified by the influence of Openness on processes associated with engagement. Openness was associated with greater reactivity

[1] The possibility of suppression effects was also investigated by running each of the models (both path and multilevel) with only Openness or Intellect. No evidence of suppression effects was found.

to novelty for philosophy and science stimuli, and a lessened reliance of understanding in the experience of engagement with artistic stimuli. Intellect, while not directly related to engagement, was associated with greater appraised understanding of the semantic stimuli (science and philosophy). These findings have implications for our understanding of how the aspects manifest in engagement, and suggest an engagement distinction between Openness and Intellect.

Openness/Intellect and processes of engagement

Openness, as opposed to Intellect, moderated within-person appraisal processes, suggesting mechanisms that explain why open people experience greater engagement across a variety of stimuli and situations. For visual art, Openness was associated with a lessened reliance on understanding artworks in the experience of interest, replicating a findings attributed to the Openness/Intellect domain (Siliva et al., 2009). This finding provides process evidence for the previously discovered association between Openness/Intellect and appreciation of abstract visual art (Feist & Brady, 2004), and the attitudes held by those higher in Openness/Intellect, who believe that art does not need to be understood to be appreciated (McManus & Furnham, 2006). Our findings suggest that understanding does not play as large a role in the experience of engagement for the open. Finally, our findings suggest an explanation for why taste in abstract art is a lot more individualised 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 produce a greater distribution of aesthetic appreciation.

For verbal stimuli, Openness was associated with greater reactivity to novelty in the experience of interest. These findings are congruent with DeYoung's (2013) theory on the

role of dopamine in exploratory behaviour. He suggested that Openness/Intellect reflect exploratory tendencies towards information based stimuli as a function of dopaminergic responses to novelty. Findings on biological associations between Openness/Intellect and the dopaminergic systems are somewhat inconsistent, but indirect evidence presented in detail in DeYoung's (2013) review suggests that this may be due to current limitations in biological measurement. Another possible reason is arguably due to a lack of investigations into activation in response to stimuli, rather than structural or 'at rest' designs. Our study suggests that variability in Openness should predict activation of the dopaminergic system in response to epistemic stimuli.

Our findings may also provide a dynamic understanding for the relationship between Openness/Intellect and fluid and crystallised intelligence. The Openness/Intellect domain is the best personality predictor of both forms of intelligence and it has been suggested that through exposure to enriched environments, those higher on the domain may develop greater fluid and crystallised intelligence (Ziegler, Danay, Heene, Asendorpf, & Bühner, 2012). The sensitivity to novelty—associated with Openness—may predispose those higher on Openness to be particularly engaged with stimuli and situations that are appraised as novel and complex. This novelty sensitivity provides a process based explanation for the consistent relationship between the Openness/Intellect domain and cognitive abilities—both fluid and crystalized.

Engagement distinction between Openness and Intellect

Our results clearly implicate Openness as the aspect that best explains individual differences in engagement in response to both visual and abstract stimuli. This is contrary to the current thinking about the distinction between the aspects—thought to reflect engagement with different types of stimuli—and suggests that Openness is the engagement

core of Openness/Intellect. DeYoung's (2014) theory of Openness/Intellect describes behaviour beyond just engagement, labelled broadly as exploration—which includes understanding. If we extend our findings to exploration, then there is some support for its relationship with Intellect. In the current study, understanding of philosophy and science was facilitated by higher Intellect, even though it was in the absence of predicting engagement when Openness was controlled for.

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 et al., 2015). While Extraversion and Neuroticism are the best personality predictors of positive and negative affect, Openness/Intellect appears to reflect emotional engagement with epistemic situations and therefore the experience of the knowledge emotions. As suggested by McCrae and Costa (1997), "open people are not only *able* to grasp new ideas, they *enjoy* doing so" (p. 832).

While, DeYoung proposed that Openness/Intellect is primarily a cognitive personality domain (DeYoung et al., 2005; DeYoung, 2015), the evidence used for this assertion (Pytlik Zillig, Hemenover, & Dienstbier, 2002) can be interpreted differently. Pytlik Zillig and colleagues (2002) evaluated whether NEO facet items measured cognitive, emotional, or behavioural tendencies. Although, they found that *some* of the NEO facets measured primarily cognition, rather than emotion or behaviour, when they considered the facets that underlie Openness, it was evident that aesthetics and feelings primarily assessed emotions. Another study that assessed the affective, cognitive, behavioural, and desire content of personality questionnaires found that the NEO based measure of the domain included a substantial amount of affective content, especially compared to the abridged Big-Five

circumplex measure of the domain (Wilt & Revelle, 2015). Within the context of our findings, the cognitive versus emotional aspect distinction makes sense since the facets associated with the Openness aspect are primarily NEO facets, while the Intellect aspect is best represented by facets from the Abridged Big-Five Circumplex (DeYoung et al., 2007).

The lack of association between Intellect and engagement with science and philosophy warranted further exploration. The current study was part of a broader project that included other individual difference measures that included the short version of the curiosity facet from a recently developed measure of Openness/Intellect (Woo, Chernyshenko, Longley, Zhang, Chiu, & Stark, 2014). Therefore, we tested whether another measure of intellectual engagement would predict additional variance in interest. It should be noted that the internal consistency of the short measure was rather low (.60), therefore interpretations of the results are to be treated cautiously. Simple slope and intercept models that included Openness, Intellect, and curiosity were analysed to see if curiosity predicted interest in science and philosophy. Curiosity was associated with greater intercepts for science (b = .28, SE = .07, p < .001), and philosophy (b = .14, SE = .07, p = .04), but not art (b = .10, SE = .06, p = .10), while controlling for the Openness and Intellect aspects. None of the appraisal-interests moderation findings associated with Openness changed as a result of including Curiosity in the models. These additional post hoc findings suggest that another intellectual engagement variable explains variance in interest in abstract information, while Intellect does not. Coupled with the rest of the findings within this paper, we wonder, has Intellect lost its curiosity?

While theoretically tied with other measures of intellectual engagement (DeYoung, 2015), the measurement of Intellect is radically 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 seems to have gone away from assessing an intellectual engagement construct, and towards a self-assessed measure of intelligence. While not problematic in itself, our findings suggests that the current conceptualisation of Intellect as explaining individual differences in engagement with abstract information may need revision.

Conclusion

We sought to test the engagement basis of Openness and Intellect in response to a broad range of visual and abstract stimuli. While the distinction between Openness and Intellect has been proposed as engagement in different situations, we found that only Openness was related to engagement. 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 not be that of content, but rather of engagement—those higher in Openness were more emotionally engaged with a broad range of epistemic situations, while those higher in Intellect were better able to understand abstract and semantic situations without reflecting greater engagement. Therefore, we propose Openness to be the emotional aspect of the Openness/Intellect domain, reflecting a propensity to experience the knowledge emotions such as interest, fascination, and awe. The Intellect aspect appears to mainly reflect an ability to understand

abstract stimuli, and, through the inclusion of primarily ability items, may have drifted away from properly assessing intellectual engagement.

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Chapter 5: General discussion

"…to boldly go where no man[uscript] has gone before."

Star Trek

The four studies described within this thesis demonstrated that the Openness and Intellect aspects differentially relate to interest in varied types of informational stimuli, both in terms of interest in different types of stimuli, and their impact on the processes associated with engagement. In the paragraphs below, I briefly summarise the empirical chapters within the thesis, and discuss the implications of the results in terms of the appraisal account of individual differences in interest, the emotional nature of the Openness aspect, the lack of Intellect-Interest associations, and the future directions for research into Openness and Intellect.

The new theoretical and measurement model of Openness/Intellect promised to resolve an old debate regarding the nature and structure of the domain by separating it into the two aspects of Openness and Intellect (DeYoung et al., 2007). The separation of the domain has proved fruitful, as the aspects have been shown to play different roles in emotions, cognitions and behaviours (Chapter 1). The BFAS model of the Openness/Intellect domain proposed that Openness and Intellect both reflect individual differences in cognitive exploration, but are distinguished in the processes that facilitate exploration. Openness was proposed to describe engagement with perceptual and sensory processes, while Intellect was theorised to reflect engagement with semantic and abstract situations (DeYoung, 2015b).

Given that the engagement distinction between the aspects had never been tested, I sought to explore the differences between the aspects, both in terms of their associations with engagement in different types of stimuli, and in their influence on the antecedent

processes associated with engagement. Across the three papers within this thesis, Openness was found to be a consistent unique predictor of interest in art, quotations, philosophical quotations, and scientific findings. Intellect was not consistent in its relationship with interest when Openness was controlled for. The social-cognitive model proposed at the end of chapter 1 (Figure 5.1) proved useful; both in differentiating Openness from Intellect, and in providing explanatory evidence for Openness/Intellect-interest relationships.

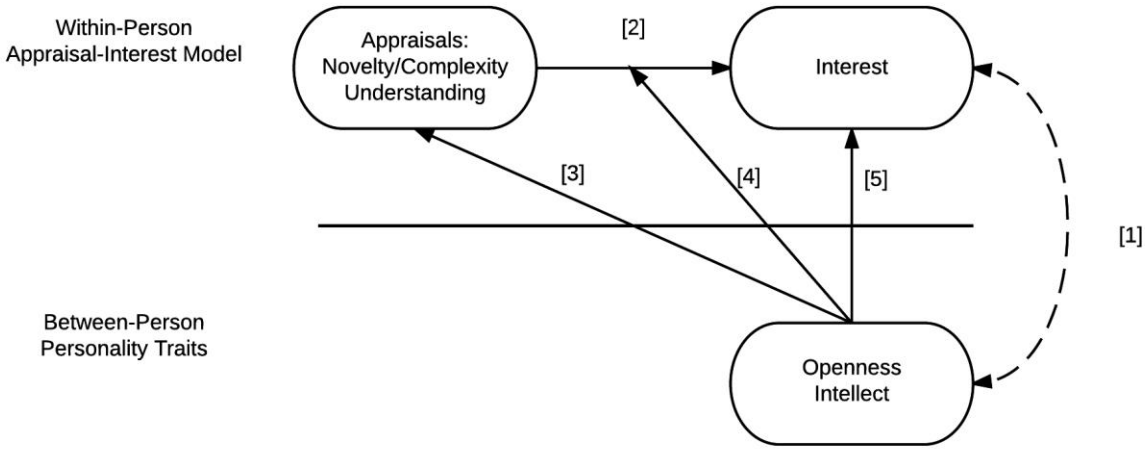

Figure 5.1. Social-Cognitive model of Openness/Intellect and engagement with Information.

Openness was unique in that it consistently predicted differences in appraisal processes associated with engagement. That is, the Openness-engagement relationship was qualified by either reactivity to novelty (pathway 4), or a lessened reliance on understanding (pathway 4). One study, found a similar role for Intellect (Chapter 3), but this finding did not replicate (Chapter 4). Both Openness and Intellect were associated with differences in appraisal strength (pathway 3). Intellect was associated with greater understanding of semantic (quotations, philosophy and science), but not artistic stimuli. Openness was associated with greater understanding of artistic and philosophical stimuli. Overall, the influences of the Openness and Intellect aspects on engagement were relatively consistent

across all the studies within this thesis. The consistency on the findings within this thesis warrants mention, particularly at a time when replication in psychological sciences has proved challenging ((Open Science Collaboration, 2015).

Overview of Empirical Results

The following sections provide a brief summary of the findings and discussion points presented in the empirical chapters of this thesis.

Chapter 2: Do Openness and Intellect differ in terms of Interest?

Chapter 2 (Fayn, Tiliopoulos, & MacCann, 2015) was the first study that tested the differences between Openness and Intellect in terms of interest and its appraisal processes. Both Openness and Intellect predicted unique variance in interest, but via different appraisal processes: (a) the relationship between interest and Intellect was mediated by greater appraised understanding, but (b) the relationship between interest and Openness showed was facilitated by a lessened reliance on understanding. These findings established that Openness and Intellect, while both related to engagement, were distinct in the processes that facilitated engagement.

The mediation associated with Intellect replicated a previous finding associated with curiosity where understanding was found to mediate the relationship between curiosity and interest (Silvia, 2008a). Likewise, the understanding-interest moderation related to Openness replicated a previous study (Silvia et al., 2009), and was discussed in terms of the previously found relationship between Openness/Intellect and an attitude that art does not have to be necessarily understood to be appreciated (McManus & Furnham, 2006)McManus & Furnham, 2006). Thus, those higher in Openness were less reliant on understanding in their experience of interest.

A possible limitation of this study was a somewhat underpowered design. Estimation of power is a contentious topic within multilevel modelling due to the complexity of the parameters being estimated (Nezlek, 2011); by most standards the number of level 1 and level 2 units of measurement in our sample is sufficient to assume accurate estimations of the parameters of interest (Maas and Hox, 2005). However, the sample size at level 1 was small by these standards. The next two studies therefore included larger level 1 sample sizes. Overall, the idea that Openness and Intellect reflect different ways of engagement with information was supported providing evidence for the distinction between Openness and Intellect in terms of engagement facilitated by different processes. The appraisal account of individual differences in emotional experiences (Kuppens & Tong, 2010) was useful in explaining the differences between the aspects. Differences that at the bivariate level would appear non-existent were illuminated via appraisal processes. However, the prediction that Openness and Intellect are associated with engagement with different kinds of stimuli was not supported as both of the aspects were related to interest in quotations. For a more detailed discussion please refer to the discussion section of chapter 2.

Chapter 3: Aesthetic states and aesthetic people

Chapter 3 (Fayn, MacCann, Tiliopoulos, & Silvia, 2015) explored the influence of Openness and Intellect on three emotional states (and associated processes) in response to visual art. This was the first study investigating the personality-aesthetics relationship that distinguished between multiple states, rather than just looking at preference or liking. Across two studies, it was found that only Openness was related to greater interest, pleasure and arousal in response to art, and that both Openness and Intellect predicted less confusion. Openness and Intellect were both related to greater reactivity to appraised novelty for interest, but only Openness was related to greater novelty-pleasure

relationships, and greater levels of interest and pleasure overall. Additionally, the possible confound of expertise in the arts was explored which was previously found to moderate appraisal-interest relationships (Silvia, 2013). We found that expertise did not change any of the findings related to Openness and Intellect suggesting that the personality aspects are driving differences in appraisal-emotion variability. Finally, we explored the influence of Openness and Intellect on viewing time, information requests, desire to own, and the likelihood of liking and sharing the artworks on Facebook. Openness, but not Intellect, was positively related to all these variables.

The sensitivity to novelty associated with Openness and Intellect was discussed with reference to a theory on the relationships between Openness/Intellect and cognitive abilities. A sensitivity to novelty suggested greater engagement with complex stimuli and situations. This process based finding fits with the Openness–Fluid–Crystallized-Intelligence (OFCI) model which aims to explain the longitudinal influence of Openness on fluid and crystallised intelligence (Ziegler et al., 2012). The sensitivity to novelty may explain why open people are more likely to be interested in complex and challenging situations which could facilitate longitudinal increases in cognitive ability.

A unique finding that arose from this chapter was variance in novelty-pleasure relationships associated with Openness. The finding is unique because pleasure has previously been found to be predicted by ease of processing, with novelty being a negative predictor of the state. I found that novelty was a weak positive predictor of pleasure, but that this relationship got stronger with higher Openness standing. Generally, the novelty-pleasure relationship—which is contrary to previous research—could have resulted from our particular sample which, on average, scored high in Openness. It would appear that the novelty-pleasure relationship is contingent on level of Openness, in that for those lower in

Openness, novelty does not predict pleasure, but is a part of the pleasure experience for those higher on the trait. The finding is rare, because qualitative differences in appraisal structures for emotions are not common. For a more detailed discussion please refer to the discussion section of Chapter 3.

Chapter 4: Engaged in different things or in different ways?

Chapter 3 (Fayn, Silvia, MacCann, and Tiliopoulos, under review) tested two perspectives on the engagement differences between Openness and Intellect. This study was the strongest test of the Openness versus Intellect distinction because it included stimuli that could not be broadly categorised as aesthetic: science and philosophy. The current conceptualisation of the aspects suggests that Openness should be related to perceptual and sensory engagement, while Intellect should be related to engagement with abstract and semantic stimuli and situations. An alternative position is that Openness is the engagement aspect of the domain and Intellect is the self-assessed ability aspect.

We found substantial evidence for the engagement, rather than situational distinction. Openness was related to greater interest in all three sets of stimuli, while Intellect was not uniquely related to engagement. Openness also predicted requesting further information regarding all three types of stimuli. Appraisal processes, like in previous studies, qualified the influence of Openness on interest. Openness was associated with greater reactivity to novelty in response to science and philosophy, and smaller understanding-interest relationships in response to art. Openness was also related to greater appraised understanding of art and philosophy, while Intellect was related to greater appraised understanding of science and philosophy stimuli. These paths—through understanding to interest—were all significant mediations, however, Intellect did not predict variance in interest directly, when Openness was controlled for.

Overall, this study casts doubt on Intellect as an engagement construct in the presence of Openness as a covariate. Openness, but not Intellect, appears to be the aspect that predicts emotional reactions in response to various epistemic situations. While Openness is not generally considered an emotion trait, recent evidence, and the findings of this thesis indicate that Openness may be the knowledge emotion core of the Big Five. The discussion in chapter 3 unpacks the particular connections to current thinking and theory on the Openness and Intellect aspects.

Connections, implications and future directions

The findings of each of the empirical chapters have previously been discussed within the manuscripts, and briefly summarised above. The goal of research, generally, is to answer questions and I will attempt to do so in what is to come. As is often the case, questions answered have the propensity to lead to more questions that remain unanswered; these too will be discussed.

This is a good time to revisit the broad aim of this thesis. I sought to explore the distinction between Openness and Intellect in terms of engagement with various informational stimuli in order to test the validity of their conceptualisation. Further, by combining social-cognitive and trait approaches to personality, I sought a dynamic understanding of how these aspects manifest in engagement situations. The research within this thesis has provided some answers that coincide with those aims. Broadly, the findings update our understanding of the Openness and Intellect constructs in two ways: (1) process evidence provides a dynamic understanding of the aspects as they pertain to engagement; (2) the current theory on the engagement distinction between Openness and Intellect is not supported by the data and a slightly different distinction will be proposed below.

Social-Cognitive model of Openness/Intellect and engagement with information

"We all boil at different degrees."

—Ralph Waldo Emerson

The social-cognitive model for the engagement basis of Openness and Intellect was facilitated by the appraisal account of individual differences in emotional experiences (Kuppens & Tong, 2010; Kuppens et al., 2008). This model was previously described in Chapter 1 and is reproduced above (Figure 5.1). The model suggests that individual differences in emotional experiences may be explained by appraisal strength and appraisal-emotion contingencies. Every study within this thesis found evidence for the validity and utility of the model. While there was considerable consistency in the findings, some results varied between studies. We will begin by resolving some of the inconsistencies and then move onto the Openness/Intellect engagement model.

All three studies found that Openness moderated appraisal-emotion relationships, but not consistently the same appraisal. Openness moderated the novelty-interest relationships in Study 2 (art), and Study 3 (science and philosophy), and the understanding-interest relationships in Study 1 (quotations) and Study 3 (art). This inconsistency may be, in part, due to overlap between the appraisals of novelty and understanding—stimuli appraised as more novel tend to be appraised as less understandable as the appraisals are consistently correlated (e.g. Fayn et al., 2015; Silvia, 2005b). Therefore, when Openness is found to moderate understanding-interest relationships, this may also indicate a moderation of the novelty-interest relationships. Given that the appraisals were modelled together, it is possible that Openness moderates both appraisals, but not in the presence of the other as the shared variance between the appraisals is partialed out. This was previously observed when interest and appraisal data was cluster analysed to indicate two types of

interest—one that was driven by high novelty and low understanding, and the other by low novelty and high understanding (Silvia et al., 2009).

Follow up analyses partially confirmed this hypothesis, when the understanding appraisal was not modelled, Openness moderated the novelty-interest relationships in response to quotations (Study 1; b = .117, SE = .06, p = .035), but not for art (Study 3; b = .06, SE = .04, p = .13). However, the broad domain of Openness/Intellect, as opposed to either aspect, did moderate the novelty-interest relationship for art (b = .10, SE = .03, p<.001). Therefore, reactivity to novelty was mostly supported across all studies suggesting that those higher in Openness were more reactive to novelty—in terms of interest—in response to all stimuli. Having partially resolved the inconsistencies, I next describe the appraisals based role of Openness and Intellect in engagement with informational stimuli.

In terms of appraisal strength, those higher on the domain of Openness/Intellect tended to appraise events as more understandable. This association was previously observed for those higher in curiosity (a trait with strong links to Openness/Intellect; Silvia, 2008a). Differences between Openness and Intellect in terms of appraisal strength were observed according to differences in stimuli. Openness was associated with greater understanding of artistic and philosophical stimuli, and Intellect was related to greater understanding of science and quotations. Generally, these findings could be explained by the overlap between Openness/Intellect and cognitive abilities. For artistic stimuli, part of the measurement of the Openness aspect assesses aesthetic engagement which in turn is associated with knowledge about the arts. This was found in Chapter 3, where Openness had a strong relationship with Aesthetic fluency. For semantic stimuli, Openness and Intellect have been shown to independently predict greater verbal ability (Deyoung et al., 2014) which would facilitate greater understanding of semantic stimuli. Intellect is

independently related to fluid intelligence which could facilitate greater ability to understand complex abstract information. An intelligence-interest relationship has been observed, in response to images and poems, and greater understanding was suggested as a possible explanation of the effect (Silvia & Sanders, 2010). Thus, Openness/Intellect, possibly through associations with knowledge and abilities, facilitates greater interest for those higher on the domain as a result of greater understanding.

Critically, the appraisal strength findings should be interpreted with caution because the constructs under investigation share method, and for Intellect, item content variance. Since the Intellect scale includes items that primarily assess ability (e.g. "I am quick to understand things), circularity is inherent in the Intellect-understanding relationships. Participants that say they are good and quick at thinking and understanding, report greater understanding of complex stimuli. Therefore, the Intellect-understanding relationships are somewhat dubious. While the findings associated with Openness are difficult to explain away in this manner (as they do not include items that assess ability to understand), those with Intellect are of a circular nature.

Perhaps the more novel and interesting finding of this thesis is the moderating role that Openness plays on novelty-interest relationships. This consistent finding suggests that those higher in Openness are more *reactive* to novelty. Because appraisal ratings were person centred in all the models, the novelty-interest relationships indicate variation in idiosyncratic deviations from a person's mean. The appraisal model of interest indicates that every person (regardless of Openness standing) is likely to experience greater interest for stimuli that are appraised as more novel, as opposed to less novel. The moderating influence of Openness on this relationship indicates that those higher in Openness are likely

to be more sensitive or reactive in terms of interest according to differences in how novel they appraise a stimulus in their experience of interest.

For example, imagine we have two individuals with different levels of Openness. One is a highly open person and the other scores quite low on the aspect. They both have the same average novelty and comprehension appraisal tendencies—that is their person-centred mean is the same. When exposed to the same informational stimulus they appraise it—in exactly the same way—as above their own average on novelty and about average on comprehensibility. According to our findings, the person higher on Openness is likely to experience the stimulus as more interesting than the person lower on Openness because they are more reactive to novelty. Therefore, two people see exactly the same stimulus, appraise it in exactly the same way, but one feels more interest than the other.

The appraisal account of individual differences in emotional experiences aims to explain individual differences in emotions based on appraisal processes (Kuppens & Tong, 2010). The findings within this thesis contribute to just such an understanding for the relationship between the Openness/Intellect aspects and the emotion of interest. Those higher in Openness/Intellect tend to exhibit greater understanding of epistemic situations and stimuli, thereby allowing them to experience interest in more complex situations. Additionally, the relationship between Openness and interest is qualified by a special relationship with novelty. Those higher on the Openness aspect are particularly reactive to novelty and complexity and are therefore more likely to experience interest in response to novel and complex epistemic stimuli and situations.

The Openness novelty-reactivity mechanism: Connections and implications

Novelty-seeking is not something that is exclusively open. There is a rich and varied literature that examines the tendency of animals (including humans) to seek novelty—at

times at the cost of more tangible rewards (Kidd & Hayden, 2015). Such preferences suggest that information-seeking is inherently shared by many living organisms and has the function of gathering information to reduce uncertainty and increase future choices. Recent biological evidence suggests that information-seeking activates dopaminergic networks suggesting that it is rewarding (Gruber et al., 2014; Kang et al., 2009). Therefore, acquiring information is adaptive, rewarding, and something that is observed across many different species.

From an interest perspective, novelty appraisals are a consistent predictor of interest for most, if not all, people (Silvia, 2008a). The novelty-interest relationship is indicative of the general tendency for information seeking that facilitates exploration of the novel and complex. Variation in this relationship according to level of Openness suggests a mechanism for relationships between Openness and learning, knowledge development, and ability development. The following section will discuss the implications of novelty-reactivity for models that evaluate the overlap between Openness/Intellect and the development of knowledge and ability constructs.

Novelty-Reactivity and Biological Reactivity

In their thorough theoretical and empirical review of appraisal-emotion contingencies, Kuppens and Tong (2010) connect appraisal-emotion variation with several theoretical positions that suggest individual differences in reactivity. One such example is the Reinforcement Sensitivity Theory (RST; Gray, 1991; Smillie, Pickering, & Jackson, 2006) which proposed biological systems that influence individual differences in reactions to rewards and punishments. Current conceptualisations of Extraversion—the domain mostly synonymous with the Behavioural Activation System proposed by Gray—suggest that extraverts experience greater positive affect because they are more reactive in response to

positive stimuli or situations (Gross, Sutton, & Ketelaar, 1998). This affective-reactivity hypothesis was further clarified by contrasting activated reward seeking versus pleasant low activation manipulations (Smillie, Cooper, Wilt, & Revelle, 2012). Smillie and colleagues demonstrated Extraverts, relative to introverts, experienced more activated positive affect (also called reward-related affect or approach-motivated affect), in response to rewarding or appetitive stimuli or situations.

The finding that Openness moderates the within-person novelty-interest association suggests a similar reactivity for Openness, which can be linked to recent biological and functional perspectives on the Openness/Intellect domain. Based on a more nuanced understanding of the dopaminergic system, DeYoung (2013) suggested a link between Openness/Intellect and the dopaminergic function in exploratory behaviour. The broad function of the dopaminergic system has been identified as 'exploration', which is defined as "any behaviour or cognition motivated by the incentive reward value of uncertainty" (DeYoung, 2013. p. 1). While the dopaminergic system has traditionally been shown to code for the probability of reward, recent developments suggest that part of its function also responds to information (Bromberg-Martin, Matsumoto, & Hikosaka, 2010). These two functions reflect different networks within the dopaminergic system, known as the *value* and *salience* coding systems. The value coding system is associated with the traditional function of dopamine—coding for the probability of reward. DeYoung (2013) proposed that "the salience system is designed to potentiate cognitive exploration for information" (p. 5) and should therefore be related to Openness/Intellect. I propose the novelty-reactivity associated with Openness provides appraisal based process support for this hypothesis.

A key feature of DeYoung's (2013) dopaminergic theory of exploration is that the salience coding system is responsive to increases in informational entropy. A basic definition

of entropy is the amount of uncertainty and unpredictability in a given system. Psychological entropy refers to the uncertainty that arises as a function of goals, current states, and strategies that are active, present, and available for an individual at any given time (DeYoung, 2013, 2015a). I propose that the appraisals of novelty and complexity are associated with the psychological entropy discussed by DeYoung. This overlap is not perfect, as DeYoung refers to entropy within the context of goal pursuit; however, the novelty appraisal is reflective of informational entropy encountered in epistemic situations.

Thus, the novelty-reactivity findings are congruent with DeYoung's theory as those higher on Openness are more *reactive*—in terms of interest—in response to novelty and complexity. My findings suggest that Openness, rather than Intellect, may be particularly associated with the reactivity of the salience coding system. This is contrary to DeYoung's hypothesis that Intellect is the aspect more likely to be associated with the salience coding system. Direct research connecting the Openness and Intellect aspects to dopaminergic function is in its infancy and no strong conclusions are ready to be drawn. In trying to ascertain biological reactivity—that I have linked to the novelty-reactivity findings—investigations should look for associations with functional activation in response to informational stimuli. Given the findings within this thesis, it appears that Openness is the aspect that is sensitive to the novelty in information.

Novelty-Reactivity and the development of knowledge and ability

The novelty-reactivity findings also have implications for models and theories that describe the relationships among personality, ability, knowledge, and educational outcomes. The most prominent model that combines these variables is Ackerman's PPIK model (Ackerman, 1996). Within this model Openness/Intellect is considered as an investment trait that facilitates the investment of resources towards the development of

interests and knowledge (von Stumm & Ackerman, 2013). In particular, investment traits are considered to influence the transition from intelligence as process (fluid intelligence) to intelligence as knowledge (crystallised intelligence). Within this framework, investment traits are defined as "stable individual differences in the tendency to seek out, engage in, enjoy, and continuously pursue opportunities for effortful cognitive activity" (von Stumm, Chamorro-Premuzic, & Ackerman, 2011, p. 225). Therefore these models propose that Openness/Intellect plays a role in knowledge acquisition due to greater engagement with information. There is a plethora of support for this model based on the associations between investment traits and measures of general knowledge and educational outcomes (e.g. Ackerman, Bowen, Beier, & Kanfer, 2001; Chamorro-Premuzic, Furnham, & Ackerman, 2006; Poropat, 2009, 2014; von Stumm, Hell, & Chamorro-Premuzic, 2011). Process based explanations for these relationships are still lacking.

Another model that extends the PPIK model—the Openness–Fluid–Crystallized-Intelligence (OFCI) model—posits that Openness/Intellect affects the development of fluid intelligence due to greater exposure to new and challenging environments—the environment enrichment hypothesis (Ziegler et al., 2012). This hypothesis was supported via a longitudinal study in which parent-rated Openness/Intellect at 17 years of age predicted an increase in fluid intelligence from the ages of 17 to 23 (Ziegler et al., 2012). This finding updates the PPIK model by suggesting that Openness/Intellect not only influences knowledge development, but may also contribute to increases in fluid intelligence.

Both the PPIK and the OFCI models propose that Openness/Intellect play a role in developing cognitive capacities, both crystallised and fluid. The findings within this thesis provide evidence for a process based understanding of *how* Openness/Intellect may influence increases in cognitive abilities (both fluid and crystallised). The link between

Openness and felt interest in response to our broad range of stimuli suggests that those higher in the domain are more engaged with information which in turn facilitates knowledge acquisition—this is proposed by both the PPIK and OFCI models. Critically, the greater interest reported by those higher in Openness, could be a reflection of the self-concept possibly held by the open-minded. This is less likely to be true for the association between Openness and requests for further information and greater time spend engaging with stimuli (Chapters 3 and 4). Even more relevant to the PPIK and OFCI models are the novelty-reactivity findings associated with Openness.

The particular bias—of being more reactive to novelty in terms of interest—should lead to greater interest in particularly complex situations. Such interest should lead to greater exploration and intrinsic motivation to resolve the complexity. This should then lead to greater knowledge, and practice at resolving and understanding complex situations. Such intrinsically motivated engagement with complexity and the resolution of complexity may be one of the mechanisms that contribute to fluid intelligence change. This assertion is supported by cognitive training literature which suggests intrinsic motivation to be a possible explanation for differences in fluid intelligence gains as a result of training (Au et al., 2015). In a sense, having greater reactivity to novel and complex situations through life is a type of lifelong cognitive training. By experiencing greater rewards from complex informational situations, in the form of interest, those higher in Openness are likely to spend more time learning, solving, engaging, and dwelling and reflecting on complex stimuli and situations.

Updating the distinction between Openness and Intellect

Openness and Intellect are thought to facilitate different processes that predispose individuals towards cognitive exploration and engagement (DeYoung, 2015b). Openness is suggested to reflect individual differences in sensory and perceptual exploration, while Intellect reflects individual differences in abstract and semantic exploration. Importantly, the theory regarding the distinction is not strictly one of engagement, but rather exploration—though engagement is part of definitions within most papers that discuss the distinction (Deyoung et al., 2012; DeYoung, 2013, 2015a, 2015b; Kaufman et al., 2010, 2014). So, are our findings consistent with the theory distinguishing Openness and Intellect in terms of cognitive exploration? My research has primarily evaluated engagement and not exploration per se, however the distinction between exploration and engagement as discussed by DeYoung is rather hazy. In order to properly consider how my findings extend our understanding of Openness and Intellect, it is important to unpack the distinction between exploration and engagement.

DeYoung's (2015) definition of the Openness/Intellect domain is as the personality domain that describes "individual differences in cognitive exploration, the tendency to *seek, detect, appreciate, understand, and utilize* both sensory and abstract information" (p. 44). Therefore exploration is seen as the combination of seeking, detecting, appreciating, understanding and utilising informational stimuli and situations. Where Openness and Intellect diverge, according to DeYoung's perspective, is in exploration of sensory versus abstract information. The emotion of interest was the main dependent variable across all my studies and on face value it may seem to only relate to the appreciating aspect of the exploration definition above. However, when considered together with the antecedents of interest, as well as other variables measured, several features of exploration were assessed:

(1) appreciating was measured as interest is the state that best describes engagement with information, (2) seeking was reflected in interest—considered a motivational state that facilitates approach—as well as further information requests and time spent engaging with stimuli, and (3) understanding was measured as appraised understanding. Thus, our findings provide information on some aspects of cognitive exploration, but not others—detecting and utilising.

Another aspect of cognitive exploration that is not part of the definition of cognitive exploration, but is implied in conceptualisations of Openness/Intellect, is sensitivity to novel and complex information. This is synonymous with novelty-interest contingencies (as was discussed above). The findings of all the studies as they pertain to the definition unpacked above are summarised in Figure 5.2. Seeking for quotations was not measured in the first study, but a hypothesised relationship with Openness is represented by a dotted line.

The influence of Openness on most measured aspects of exploration was clearly evident as the aspect predicted seeking, appreciating, reactivity to novelty and, for some stimuli, understanding. Contrary to the proposed distinction, the influence of Openness on cognitive exploration was evident for both perceptual and abstract stimuli. Intellect was associated with greater appraised understanding of all abstract stimuli, but had almost no influence on the other aspects of exploration (apart from independently predicting interest in quotations).

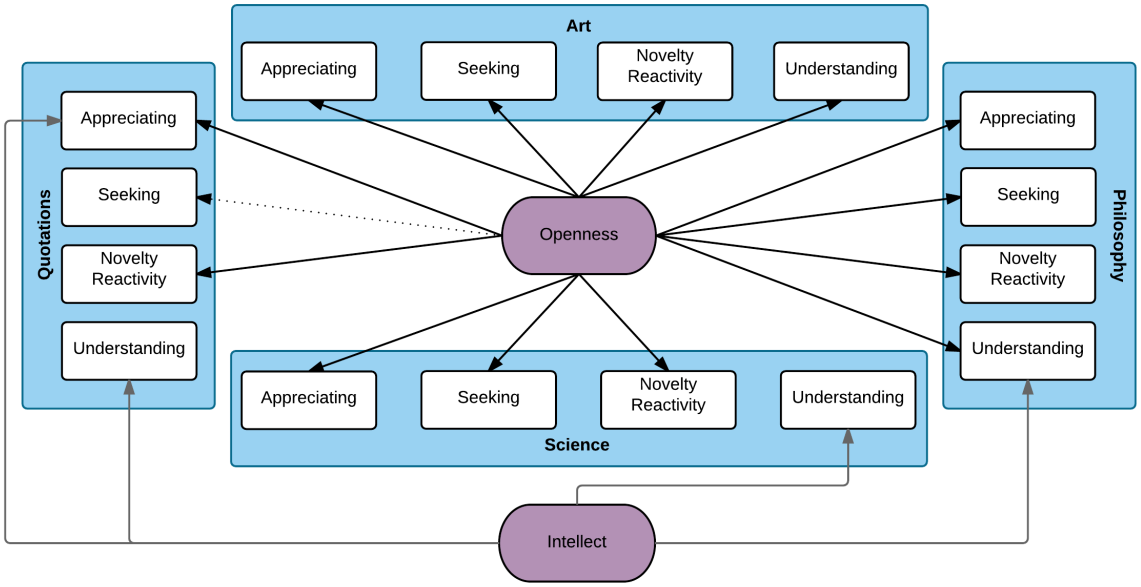

Figure 5.2. Summary of found associations between Openness, Intellect and cognitive explorations. Note: seeking was not measured for quotations.

These findings indicate that the distinction suggested by DeYoung may not be the best way of considering the differences between Openness and Intellect. Rather, it appears that Openness is the engagement core of Openness/Intellect and that Intellect is associated with a greater appraised ability to understand semantic stimuli. The ability to understand abstract stimuli could facilitate utilising information, which is an aspect of exploration not measured within this thesis. It is possible for example that understanding leads to greater memory retention and as such this stored information can be utilised at a later date. Critically, associations with understanding could arguably be better explained by ability constructs.

This summary of our findings suggests that at least in these studies the distinction based on type of information is not supported. Instead, the aspects appear to reflect different ways of processing and engaging with information, regardless of whether it is sensory or abstract. The following sections will discuss (1) Openness as the knowledge

emotion aspect of Openness/Intellect, and (2) whether the conceptualisation of Intellect has bitten off more than it can chew by attempting to assess an engagement with information construct with what appear to be self-reported ability items.

Openness: The knowledge emotion aspect

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and all science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead: his eyes are closed."

Albert Einstein

In the discussion of chapter 4, I went so far as to say that Openness could be considered as another emotion trait. Was this too bold an assertion? Or was emotion always a big part of the Openness/Intellect domain? The answers to these questions are not straight forward, but if forced to answer them, parsimoniously, I would say: "No" and "Sort of". Thankfully, parsimony is not the main goal of this discussion and I have the chance to unpack these ideas.

Starting broadly, the fields of personality and emotions are inextricably linked. Extraversion reflects the tendency to experience positive affect and neuroticism is associated with negative affectivity (Steel, Schmidt, & Shultz, 2008). This is not the place or time to unpack the plethora of findings that relate these domains, and positive and negative affect, rather, the reference above is a meta-analysis that indicates stable and large relationships between the constructs. There is a growing body of literature that connects Openness/intellect to another group of emotions that are referred to as epistemic or knowledge emotions (Keltner & Shiota, 2003; Silvia, 2008b).

The knowledge emotions are states experienced as a result of "what is happening in the inner world of thought" (Silvia, 2012, p. 265). They include the emotions of interest,

awe, beauty[2], confusion, and surprise—states associated with beliefs about thoughts and knowledge. They stem from epistemic goals, and arise from metacognitive processes associated with integration of new knowledge into existing schemas. They are distinct from pleasure—though they may co-occur. Historically, sparse attention was paid to such states as they were considered "too cognitive" to be emotions (Ellsworth, 2003). Since the strict lines between emotions and cognitions have proven non-existent (Pessoa, 2008), research into knowledge emotions has been influential in aesthetic and education disciplines (Pekrun & Linnenbrink-Garcia, 2014; Silvia, 2010). See Chapter 1 for a more detailed discussion.

I argue that the domain of Openness/Intellect (particularly the Openness aspect within the BFAS) is the personality construct that explains individual differences in knowledge emotions and should be considered the knowledge emotion domain of the Big Five. While this section is about the Openness aspect, there aren't enough studies that have looked at the aspects separately to restrict my argument to such. Therefore, evidence presented below will stray into evaluating associations with Openness to Experience measures (NEO) and, where possible, its facets. Generally, NEO measures of the domain are skewed towards Openness (DeYoung et al., 2007) and I will therefore, cautiously, report findings with the domain to be more reflective of Openness, rather than Intellect. Where possible, these will be supported by findings that highlight the unique importance of Openness.

McCrae and Costa proposed Openness to Experience as, in part, a motivational construct. They stated that "Open people are not only able to grasp new ideas, they enjoy doing so" (McCrae & Costa, 2007, p. 832). In line with the quote above, I propose that the

[2] Here "Beauty" is used to reflect the construct of beauty put forth by Armstrong and Detweiler-Bedell (2008) which is defined as "the exhilarating prospect of mastering a challenging world" (p. 305), rather than the colloquial meaning of the word.

emotional world of the open manifests in the knowledge emotions. DeYoung (2015) spoke to emotional associations with the Openness/Intellect domain but suggested that "the mechanisms of interpretation associated with Openness/Intellect are primarily those that are descriptive of the world, rather than evaluative" and that "the evaluations of emotional significance that form a core part of our interpretations of the world are likely to be determined primarily by basic affective processes associated with Extraversion, Neuroticism, and Agreeableness and by relevance to individuals' idiosyncratic goals (i.e., characteristic adaptations), as they interact with the mechanisms of interpretation underlying Openness/Intellect" (p.13). I will argue that evidence is accumulating for the *unique* role of the Openness/intellect domain in explaining individual differences in a class of affective states associated with engagement with information.

The best pancultural marker of the NEO Openness to Experience measure is the item that states: "Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement" (McCrae, 2007). Indeed the experience of chills and other powerful emotional states such as fascination and awe have empirical links to Openness to Experience. Individual differences in powerful emotional reactions to celestial and musical stimuli were found to be strongly related to Openness to Experience, but small and mostly non-significant relationships with Extraversion and other Big Five domains (Silvia et al., 2015). Openness to Experience was also the strongest personality predictor of the propensity to experience awe (Shiota, Keltner, & John, 2006). There is also direct evidence that Openness, rather than Intellect is reflective of knowledge emotion states. Silvia and Nusbaum (2011) found that Openness, but not Intellect, predicted powerful aesthetic states of chills and absorption, while Intellect was negatively related to experiencing chills. Further, Openness, but not Intellect, was independently related to powerful aesthetic emotions, and

found to moderate the relationship between interest and such states in response to visual art (Fayn, Tiliopoulos, & Silvia, 2014). For those higher in Openness, self-reported interest converges with describing something as profound, exceptional and awe inspiring, compared to those lower on the aspect. Combined, the findings reviewed above suggest that Openness, and not Extraversion (or any other personality domain), is the best predictor of the knowledge emotions.

As discussed in Chapter 4, another line of research that suggests that Openness reflects emotional experiences is found in studies that have analysed item content with respect to whether they measure affect, cognition, behaviour, and desire. One study found that facets of the NEO associated with Openness—aesthetics and feelings—were primarily assessing emotional phenomena, as opposed to cognitive or behavioural (Pytlik Zillig, Hemenover, & Dienstbier, 2002). Another study found that a NEO Openness measure had a substantial proportion of affective content in its items, but the AB5C measure did not (Wilt & Revelle, 2015[3]). This difference between the two measurement models could be an indication of the differences between BFAS Openness and Intellect as most of the items for the Openness scale came from NEO based assessments, and most of the Intellect items were from the AB5C (DeYoung et al., 2007).

The study from Chapter 2 included a measure of *need for affect* which is defined as a general motivational tendency to approach or avoid situations that may illicit emotional reactions (Maio & Esses, 2001). Openness and Intellect predicted variance in need for affect in opposite directions. Openness was positively, and Intellect negatively, associated with motivation to approach emotional situations. These relationships remained consistent when

[3] At the time of submission the Wilt and Revelle (2015) reports the difference mentioned above for Agreeableness. However, the figures indicate the difference is for Openness/Intellect. This was clarified through personal communication with the first author on the 12th of August 2015.

Extraversion aspects were controlled for (Figure 5.3). Finally, as previously discussed, findings within this thesis clearly suggest that Openness, as opposed to Intellect, is the interested aspect of the domain. This relationship is consistent across various stimuli, and is qualified by novelty sensitivity of the open. This is further supported by associations with information requests and time spent engaging with stimuli.

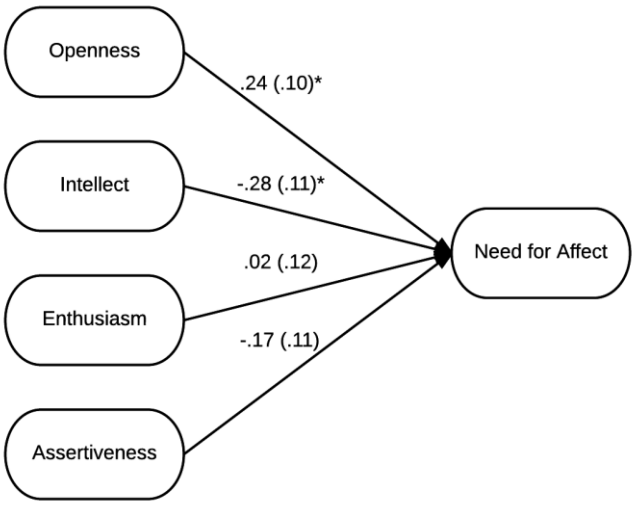

Figure 5.3. Path model testing the influence of Openness/Intellect and Extraversion aspect on Need for Affect. Note: N=99; $^{*}p<.05$.

Considering all these findings together, the case for Openness being the personality trait that reflects individual differences in the knowledge emotions becomes convincing. To me, the idea that Openness is associated with emotions that are felt in response to information is implicit, but I imagine this view will be met with some doubt. Perhaps it is the reluctance of many researchers to view the knowledge emotions as belonging in the exclusive club of emotions, but I think that time has passed.

Intellect: Has the curiosity gone?

The observation that intellect failed to consistently predict interest in abstract stimuli was initially surprising given that it is proposed to be a construct purportedly reflects

cognitive engagement with abstract and semantic information (Deyoung et al., 2012; DeYoung, 2013, 2015a, 2015b; Kaufman et al., 2010, 2014). Within this thesis, Intellect was not consistently associated with engagement in semantic and abstract information which can, arguably, be explained by how the measurement of the construct was developed and therefore the content of the items in the scale.

The lack of association between Intellect and engagement becomes less surprising when the items that assess it are closely examined. The items don't stray far from assessing self-reported ability. Three items can be thought to reflect intellectual engagement, but all three may also reflect ability (Table 5.1). In the first, 'like' implies an engagement or enjoyment, but 'solving complex problems' requires the ability to do so. The other two items could be considered to assess engagement as the opposite of 'avoid' is to approach. However, avoiding philosophical discussions and difficult reading material could just as easily result from a lack the intellectual capacity as from a lack of engagement with such pursuits. Therefore, judging on face validity, the Intellect meas ure falls short of assessing intellectual engagement.

The item content of the Intellect scale was chosen for empirical reasons. The goal of creating the Big Five Aspect Scales was to enable measurement of two distinct aspects for each of the Big Five domains (DeYoung et al., 2007). One piece of evidence that initially implied a two aspects per factor solution was that two genetic factors were found to best represent covariance of facets within the NEO-PI-R (Jang et al., 2002). DeYoung et al. (2007) criticised the narrow nature of the NEO-PI-R facets used in Jang et al's study, and his factor analytic approach included the AB5C model to broaden the construct. Items for the final BFAS scales were then selected to best represent two *distinct* aspects of each domain. Therefore, items that cross loaded on both aspects (within each domain) were not included

Table 5.1.

Face validity of Intellect items reflecting ability and engagement.

Intellect Items	Ability	Engagement
I am quick to understand things.	✓	
I have difficulty understanding abstract ideas.	✓	
I can handle a lot of information.	✓	
I like to solve complex problems.	✓	✓
I avoid philosophical discussions.	✓	✓
I avoid difficult reading material.	✓	✓
I have a rich vocabulary.	✓	
I think quickly.	✓	
I learn things slowly.	✓	
I formulate ideas clearly.	✓	

in the final measure. As a result, the item content of the Intellect scale was primarily made up of items that assess self-perceived ability. Importantly, such items were not present in the assessments that implied a two aspect per factor solution (Jang et al., 2002).

Evidence for self-assessed intelligence overlap with actual abilities is limited, and where present, the overlap is quite low (Paulhus, Lysy, & Yik, 1998). It is about the same as the overlap between Intellect and abilities. DeYoung's (2015) stance on the merger of ability and personality constructs is that every domain of personality already implies some abilities (for example agreeableness encompasses the ability to empathise), therefore there is no issue with inclusion of ability items in the Intellect scale. The idea that abilities are part of what differs between individuals and are therefore part of what makes up personality—if

viewed broadly as individual differences—is not radical. However, assessing abilities by asking people to self-report them is problematic. Self-report measures of abilities tend to suffer from the 'better than average' phenomenon (Krueger & Mueller, 2002). That is, people tend to overestimate their abilities and rate themselves as higher than their actual standing in the distribution of measured intelligence. An example of an attempt to measure abilities with self-report measures that has been deemed problematic is trait-assessments of Emotional Intelligence (Joseph & Newman, 2010). Within Emotional Intelligence literature trait-like measures are thought to assess self-efficacy rather than ability.

A problem with assessing a construct that purports to measure engagement almost exclusively with ability items is the assumptions one has to make: a) a perfect correlation between engagement and abilities, and b) that abilities and engagement constructs are associated with the same processes that influence behavioural outcomes. The first assumption seems premature as although intelligent people tend to be curious (von Stumm & Ackerman, 2013), the correlation is not sufficient to conclude that these constructs are synonymous. Thus, the Intellect scale as it stands today will underestimate the curiosity of people who don't see themselves as, or are not particularly gifted. There is a rich history and continuing work on assessing intellectual engagement which is conceptualised as explicitly distinct from ability, and playing a distinct role in educational outcomes and the development of knowledge.

Intellectual engagement has been proposed to be the third pillar of educational success (after intelligence and conscientiousness; von Stumm et al., 2011), with promising new theoretical and measurement conceptualisations receiving attention and empirical support (Mussel, 2013). Many constructs fall under the broad umbrella of intellectual engagement and include Typical Intellectual Engagement (TIE), Need for Cognition (NFC),

and a plethora of curiosity assessments (see von Stumm et al., 2011 for a review). Mussel (2010) demonstrated that most of these constructs (NFC, TIE, Openness to Ideas, and several curiosity measurements) lack discriminant validity and therefore largely assess similar constructs. Intellect, too, is proposed to measure intellectual engagement and is suggested to be similar to the constructs of TIE and NFC (DeYoung, 2015b), but does so, through what appear to be radically different items.

Other constructs developed to assess intellectual engagement have almost exclusively avoided items that measure self-assesses ability. Indeed, they are conceptualised as distinct from abilities. For example NFC is defined as an intrinsic motivation for effortful cognitive endeavours (Cacioppo, Petty, Feinstein, & Jarvis, 1996), TIE has facets that reflect interest and pleasure in thinking for its own sake (Ackerman & Goff, 1994), and the Curiosity and Exploration Inventory measures seeking and embracing information (Kashdan et al., 2009). Mussel's (2013) theoretical model integrates many of the different conceptualisations of intellectual engagement into one model which has been shown to detect subtle differences between these various constructs. This model divides intellectual engagement into the processes of *seeking* and *conquering*, and operations of *thinking, creating and learning*. Mussel (2013) didn't include the BFAS measure of Intellect in his model because of its inclusion of ability items, compared to other conceptualisations (TIE, NFC, and curiosity measures). Thus, the main goal of most intellectual engagement assessments is to measure 'will do'—as opposed to 'can do'—constructs that reflects engagement with information. The distinction between Intellect and other constructs that assess intellectual engagement is obvious in their measurement—Intellect is empirically constructed and is *assumed* to measure engagement, while the rest of the constructs are operationalised to do so.

An empirical rather than conceptual test of whether Intellect assesses the intellectual engagement aspect of Openness/Intellect would be to test the relationships the aspects have with intellectual engagement assessments. The expectation would be that Intellect should have stronger associations with such measures than Openness. An example of such a finding is that Openness to Ideas shares substantially more variance with intellectual engagement measures than the rest of the Openness to Experience scale (Mussel, 2010). However, Openness to Ideas is an intellectual engagement scale that does not include ability based items, as is the case for Intellect. As all of the studies within this thesis were part of broader projects that included some measures of curiosity, this test was possible.

Across all studies within this thesis, Openness and Intellect had very similar relationships with curiosity measures, which is contrary to what has been suggested as distinguishing the aspects (Table 5.2). Across all studies, Openness and Intellect shared roughly equivalent variance with curiosity measures indicating that both aspects assess intellectual engagement equally. Therefore, engagement, seeking, and embracing information seem to be in equal part Openness and Intellect. In one sense, this data suggests that Intellect certainly assesses curiosity in part, however the correlations are not indicative of Intellect being the intellectual engagement aspect of the Openness/Intellect model. It seems that intellectual engagement is equally represented by both aspects, which does not align with how Intellect is conceptualized, or how the aspects are distinguished from each other.

Table 5.2.

Bivariate and partial correlations between Openness/Intellect aspects and curiosity measures.

	Study 1 (N = 101)		Study 2 (N = 214)		Study 3 (N = 182)	
	ECS-Interest	ECS-Depravation	CEI-Stretching	CEI-Embracing	Curiosity	Depth
Intellect	.56*** (.47***)	.25* (.22*)	.44*** (.33***)	.21** (.11)	.50*** (.35***)	.31*** (.02)
Openness	.48*** (.35***)	.13 (.04)	.42*** (.29***)	.27*** (.21**)	.48*** (.32***)	.62*** (.57***)

Partial correlations in brackets;

An important issue with conflating intellectual engagement with ability comes from evidence suggesting these distinct constructs interact with each other in predicting educational outcomes (Zhang & Ziegler, 2015; Ziegler et al., 2012). Two studies have found that Openness/Intellect buffers the effect of lower cognitive abilities on educational outcomes. That is, the effect of Openness/Intellect on educational outcomes is marginal for high cognitive ability individuals, but is substantial for those lower on cognitive ability. Thus, ability and engagement have a complex relationship which would not be found using measurement that lumps them together. One way that this interactional relationship could be interpreted is that ability facilitates learning because less effort has to be invested in understanding educational materials. Thus, for those high in ability, extra engagement associated with Openness/Intellect does not contribute to greater educational outcomes. However for those lower on ability, greater engagement facilitates greater investment, which in turn facilitates learning. Therefore Openness/Intellect plays an important role for such individuals. These findings point to the validity and importance of separating cognitive abilities from intellectual engagement—something the Intellect scale is unlikely to achieve given its item content (Table 5.1).

Another issue with items assessing self-reported intelligence is that they tend to be endorsed by those higher in Conscientiousness, as pointed out by McCrae (1994) and Trapnell (1994). Both researchers observed that items that assess ability tend to have high loadings on the Conscientiousness domain. This seems to be the case with the Intellect scale as it shares equivalent, and sometimes greater, variance with the Industriousness aspect of Conscientiousness as with the Openness aspect (e. g. Ashton, Lee, Goldberg, & de Vries, 2009; DeYoung et al., 2007). Factor purity is not the be all and end all of personality assessments, but loadings on other domains should be secondary, not equivalent or greater than the domain under assessment.

Returning to how these issues relate to my findings, it seems that the Intellect scale does not uniquely assess engagement with abstract information, and what is missing, is the curiosity content from its items. Some evidence from chapter 4 suggests that this is indeed the case. A construct assessing curiosity was shown to predict variance in interest in both science and philosophy over and above the influence of Openness and in the presence of Intellect. Such a finding is exactly what would be expected of Intellect if the construct measured engagement with abstract information. This finding suggests that an intellectual engagement construct predicts unique variance in engagement with abstract information, while Intellect does not.

It should be noted that some studies have found larger correlations between Intellect and intellectual engagement constructs than observed in the samples within this thesis. For example, Kaufman et al. (2010) found a high correlation of .71 between Intellect and Openness to Ideas. Another study (Deyoung et al., 2012) found a large relationship between Intellect and TIE (r=.65), as opposed to a medium relationship to Openness (r = .30). These associations indicate that the Intellect measure is certainly capturing a healthy

amount of intellectual engagement, however according to the data within this thesis, Intellect does not consistently predict engagement with abstract and semantic information, while another measure of intellectual engagement and the Openness aspects do.

In summary, (1) the intellect scale (due to the way it was constructed) may primarily assesses self-rated intelligence, (2) self-rated intelligence is not a strong indicator of actual intelligence, (3) while self-rated intelligence is associated with intellectual engagement constructs, it seems to be a broader construct which also assesses Conscientiousness, (4) the measurement of Intellect is different construct to measures of intellectual engagement , (5) Intellect shares equivalent variance with intellectual engagement constructs compared to Openness, (6) there is a complex relationship between ability and intellectual engagement variables making their conflation problematic, and (7) Intellect does not predict engagement with information like curiosity does. For these reasons I argue that Intellect as measured by the BFAS has some validity issues. It attempts to measure engagement and ability, fails to properly measure either, and in so doing has lost some of its curiosity.

Limitations and future directions

The research within this thesis—just like research generally—is not without limitations. All of the studies were made up of student samples who are considered WEIRD (people from Western, Educated, Industrialized, Rich, and Democratic cultures; Jones, 2010). This likely results in restrictions of range for both Openness and Intellect as university students are on average more intelligent and more open than the average person. There is also a restriction in age and therefore maturity, as has been observed by anyone who has worked with first year student participants. A very important future direction would involve replicating the results in older and more representative populations. Having said that, even

if the findings don't replicate in older populations, they are still of importance for the field. University students are at university to learn and develop. Therefore, greater understanding about engagement with epistemic situations is of interest even within this narrow population.

Another issue with my research is that it is cross sectional. This may seem especially problematic as, at times, my language in describing the findings is causal. The causal language is present due to theoretical and empirical reasons, rather as an indication of an experimental design. I operated under the theoretical assumption that personality reflects biologically driven consistencies in emotions, cognitions and behaviour. Therefore I assume that personality is an antecedent of states and processes. For interest, both of the appraisals, when experimentally manipulated, have been shown to influence interest (Silvia, 2005b). The individual difference approach to psychology is at its most powerful when cross sectional findings are combined with experimental manipulations (Eysenck, 1997; Revelle, 2007). This is an important next step for solidifying our understanding of the Openness/Intellect-engagement relationship. The most consistent and, in my opinion, interesting finding within this thesis is the novelty-interest moderation and this should be tested via experimental methods by future research.

Another important extension of the work within this thesis is integrating extra variables to further clarify the current findings. Both the measurement and influence of interest could be more rigorously investigated. For example, eye tracking and information retention could be used to test whether those higher on Openness/Intellect are *utilising* their greater interest, and whether self-reported interest is not just part of the self-concept of the open-minded. Evidence for differential eye-gaze behaviour associated with curiosity measures has already started to emerge (Baranes, Oudeyer, & Gottlieb, 2015). Our findings

regarding further information requests (Chapters 2 and 3) and time spent viewing art (Chapter 2) indicate that what is assessed via self-reported interest is not just self-concept. Further, activation of the dopaminergic system associated with interest was observed in conjunction with self-reported interest which suggests validity in such assessments (Gruber et al., 2014; Kang et al., 2009). While being interested in a broad range of stimuli seems to be a feature of the open, it is important to see if open people are utilising this interest, for example in the retention of information. There is some evidence that supports such a relationship. Greater retention of information (both relevant and irrelevant to the task) was related to activation of the dopaminergic system associated with ratings of interest (Kang et al., 2009). This suggests that self-reported interest has validity as a variable that predicts learning.

One interesting avenue for future studies involves placing Openness and Intellect within Mussel's theoretical framework of constructs related to intellectual achievements (2013). In one sense the Openness/Intellect domain is a broader construct than the Intellect construct proposed by Mussel—only the facet of Openness to Ideas was suggested as part of the framework—thus, perhaps it is Mussel's Intellect that needs to be placed within the Openness/Intellect domain. No measures were found to occupy the create operation of the model, all of a sudden making the omission of Openness seemingly stark. Afterall, Openness is a strong predictor of creative achievement in the arts (Kaufman et al., 2014). Given the results of this thesis Openness broadly fits within the seek process as it was related to information requests, more time spent engaging with artistic stimuli, and interest in information. Intellect, based on its associations with understanding, would fit within the learning operation. Intellect may also be associated with the conquering process as it was related to curiosity as a sense of deprivation.

Finally, I argue that it is crucial to further investigate the unique influence of other investment traits on interest in abstract informational stimuli. Intellect does not seem to be capturing greater intellectual engagement. Perhaps variables that do not conflate ability with engagement constructs may play an important and unique role in explaining engagement with abstract information. For example, the complex relationships between Openness/Intellect and abilities—both in affecting each other longitudinally and interacting with each other in predicting educational outcomes (Zhang & Ziegler, 2015; Ziegler et al., 2012)—are encouraging, and future studies should continue the work of disentangling these constructs.

Conclusions

"There is a fifth dimension, beyond that which is known to man. It is a dimension as vast as space and as timeless as infinity. It is the middle ground between light and shadow, between science and superstition; and it lies between the pit of man's fears and the summit of his knowledge. This is the dimension of imagination"

Rod Serling

This thesis represents an important update to how we understand the Openness/Intellect domain in terms of engagement with informational stimuli and situations. Particularly, Openness is proposed to be the aspect of the domain that explains individual differences in engagement with such stimuli, and is proposed to be the knowledge emotion core within the Big Five. A mechanism for this relationship is proposed to be reactivity to novelty. Intellect on the other hand, was mainly related to greater self-assessed understanding of semantic stimuli, failing to consistently predict engagement with information. The appraisal based process evidence—the novelty-reactivity of the open—connects to biological accounts of novelty and information seeking, and provides a mechanism for how Openness/Intellect manifests in lifelong learning and ability development as has been proposed for investment traits.

In stretching out the domain of Openness/Intellect the BFAS scales aimed to resolve the debate between lexical and questionnaire conceptualisations of the domain. The empirical method of separating the aspects has, in my opinion, gone too far and stretched the Intellect aspect away from assessing a pure engagement construct. In seeking to empirically resolve the feisty debate as to who's fifth dimensions was really "as vast as space and as timeless as infinity" (Sterling, 1959), the model may have lost its curiosity. While Openness is well represented—a construct that measures emotional engagement in

response to information—Intellect may have some face and predictive validity issues. While ability adjectives were present in the lexical measures of Intellect, they reflected a small portion of the overall scales (Goldberg, 1993), and the construct was broad enough to share substantial variance with Openness to Experience (Johnson, 1994; Saucier, 1994). In seeking to find two distinct aspects of the elusive Openness/Intellect domain, what materialised is an aspect that conflates personality assessment with ability, and fails to properly represent a crucial part of the fifth dimension—the intellectual curiosity that predisposes people to engage with abstract information, regardless of their abilities.

Saucier (1992, 1994) suggested that the distinction between Openness to Experience and Intellect models was "much ado about nothing" in that they represented peripheral aspects of the same domain linked by imagination, and similarly Johnson (1994) concluded that Openness and Intellect were reflective of interests in beauty versus truth. Given both the evidence presented in this thesis and reviewed above, I am sceptical regarding the interested nature of those scoring high on Intellect. The distinction between Openness and Intellect as it is conceptualised—rather than measured—seems a viable division of the domain. Several studies have demonstrated such a divide which indeed seems to reflect two different ways of engaging with information, one facilitated by perceptual and sensory processes and the other as engagement with abstract information (Jang et al., 2002; Johnson, 1994; Mussel, Winter, Gelléri, & Schuler, 2011; Trapnell, 1992). Critically, these findings did not include measurements that included self-assessed intelligence. Such findings reflect that non-ability based assessments of the domain can be split to reflect two types of engagement with information. The BFAS measurement model of Openness and Intellect—according to my findings—does not seem to represent such a distinction. Future updates to the Openness/Intellect measurement model should try to get its curiosity back.

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Appendices

Appendix A – Stimuli used in studies

Study 1

Quotations

"The moment of winning is much too short to live for that and nothing else. “`

"Curiously enough, one cannot read a book: one can only reread it. A good reader, a major reader, an active and creative reader is a rereader. "

"In the darkness ... the sound of a man Breathing, testing his faith
On emptiness, nailing his questions
One by one to an untenanted cross."

"Do not go gentle into that good night, Old age should burn and rave at close of day.
Rage, rage against the dying of the light."

"A stand can be made against invasion by an army; no stand can be made against invasion by an idea."

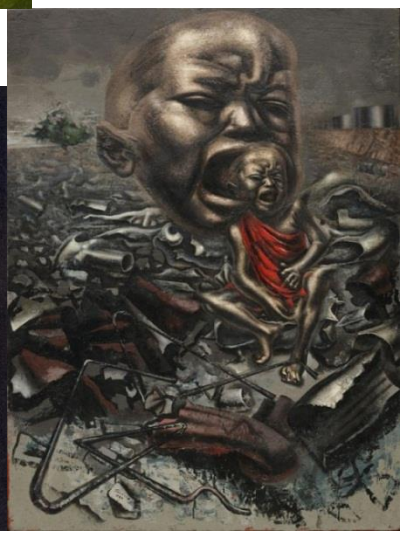
"The mind is its own place, and in itself can make a heaven of hell, a hell of heaven."

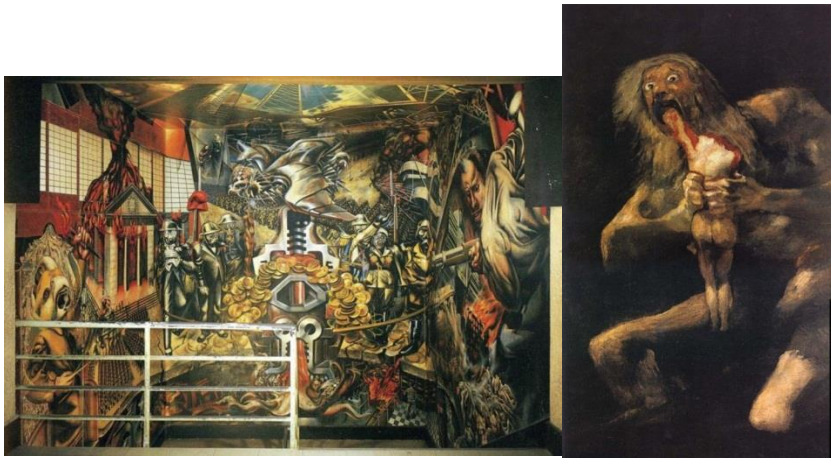
"We have a beautiful mother
Her green lap
Immense
Her brown embrace
Eternal
Her blue body
Everything
we know."

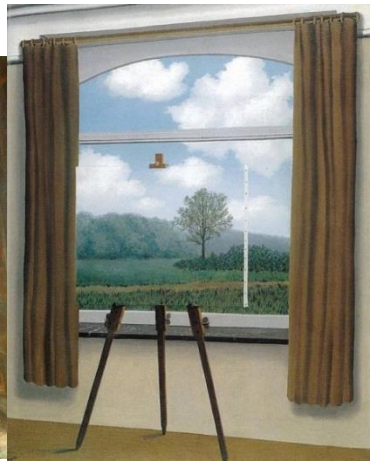
Study 2

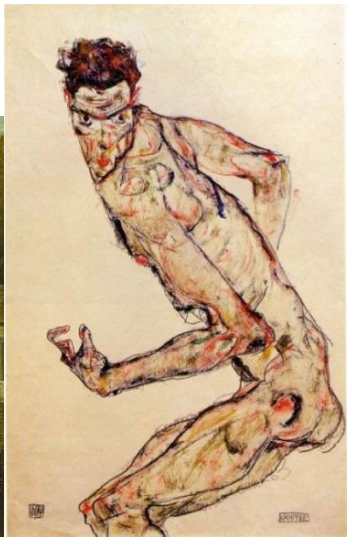
(a)

(b)









Study 3

Voyager 1 Officially Exits Our Solar System

"A new study released today indicates that the Voyager 1 spacecraft has become the first man-made object to exit our solar system. Instrumentation data sent back to NASA indicate the historic event likely occurred on August 25, 2012, evidenced by drastic changes in radiation levels as the craft ventured past the heliopause. What remains to be seen, however, is whether Voyager 1 has actually made it to true interstellar space, or whether it has entered a separate, undefined region beyond our solar system. Either way, the achievement is truly monumental. 'It's outside the normal heliosphere, I would say that. We're in a new region,' said Bill Webber, professor emeritus of astronomy at New Mexico State University in Las Cruces. 'And everything we're measuring is different and exciting.'"

Vegetative State Man 'Talks' By Brain Scan

"'Severely brain-injured Scott Routley hasn't spoken in 12 years. None of his physical assessments since then have shown any sign of awareness, or ability to communicate, thus being diagnosed as vegetative (vegetative patients emerge from a coma into a condition where they have periods awake, with their eyes open, but have no perception of themselves or the outside world).' Scott Routley was asked questions while having his brain activity scanned in an fMRI machine. British neuroscientist Prof Adrian Owen said Mr Routley was clearly not vegetative. 'Scott has been able to show he has a conscious, thinking mind. We have scanned him several times and his pattern of brain activity shows he is clearly choosing to answer our questions. We believe he knows who and where he is.' As a consequence, medical textbooks would need to be updated to include Prof Owen's techniques, because only observational assessments (as opposed to using mind-readers) of Mr. Routley have continued to suggest he is vegetative. Functional MRI machines are expensive (up to $2 million), but it's quite possible that a portable high-end EEG machine, costing about $75,000, can be used at a patient's bedside. Phillip K. Dick's world is one step closer."

Quantum Teleportation Sends Information 143 Kilometers

"Scientists from around the world have collaborated to achieve quantum teleportation over 143 kilometers in free space. Quantum information was sent between the Canary Islands of La Palma and Tenerife. Quantum teleportation is not how it is made out in Star Trek, though. Instead of sending an object (in this case a photon) from one location to another; the information of its quantum state is sent, making a photon on the

other end look identical to the original. 'Teleportation across 143 kilometres is a crucial milestone in this research, since that is roughly the minimum distance between the ground and orbiting satellites.' It is the hope of the research team that this experiment will lead to commercial use of quantum teleportation to interact with satellites and ground stations. This will increase the efficiency of satellite communication and help with the expansion of quantum internet usage."

Analyzing Tweets To Identify Psychopaths

"Researchers presenting at Defcon next week have developed a psychopathy prediction model for Twitter. It analyzes linguistic tells to rate users' levels of narcissism, machiavellianism and other similarities to Patrick Bateman. 'The FBI could use this to flag potential wrongdoers, but I think it's much more compelling for psychologists to use to understand large communities of people,' says Chris Sumner of the Online Privacy Foundation. Some of the Twitter clues: Curse words. Angry responses to other people, including swearing and use of the word "hate." Using the word "we." Using periods. Using filler words such as 'blah' and 'I mean' and 'um.' So, um, yeah."

Researchers Tweak Mouse Neurons To Activate Specific Memories

"According to new study published in Nature, MIT researchers have figured out how to trigger specific memories in rats by hitting certain neurons with a pulse of light. From the article: 'The researchers first identified a specific set of brain cells in the hippocampus that were active only when a mouse was learning about a new environment. They determined which genes were activated in those cells, and coupled them with the gene for channelrhodopsin-2 (ChR2), a light-activated protein used in optogenetics. The light-activated protein would only be expressed in the neurons involved in experiential learning — an ingenious way to allow for labeling of the physical network of neurons associated with

a specific memory engram for a specific experience. Finally, the mice entered an environment and, after a few minutes of exploration, received a mild foot shock, learning to fear the particular environment in which the shock occurred. The brain cells activated during this fear conditioning became tagged with ChR2. Later, when exposed to triggering pulses of light in a completely different environment, the neurons involved in the fear memory switched on — and the mice quickly entered a defensive, immobile crouch.'"

If You're Fat, Broke, and Smoking, Blame Language

"A Yale researcher says that culture differences how much money we save, how well we take care of ourselves, and other behavior indicative of taking the long view, are all based on language. His study argues that the way a language's syntax refers to the future affects how its speakers perceive the future. For example, English and Greek make strong distinctions between the present and the future, while German doesn't, while English and Greek speakers are statistically poorer and in worse health than Germans. "

Moore's Law and the Origin of Life 265

"MIT Technology Review is running a story about an arXiv paper in which geneticists Alexei A. Sharov and Richard Gordon propose that life as we know it originated 9.7 billion years ago. The researchers estimated the genetic complexity of phyla in the paleontological record by counting the number of non-redundant functional nucleotides in typical genomes of modern day descendants of each phylum. When plotting genetic complexity against time, the researchers found that genetic complexity increases exponentially, just as with Moore's law, but with a doubling rate of about once every 376 million years. Extrapolating backwards, the researchers estimate that life began about 4 billion years after the universe formed and evolved the first bacteria just before the Earth was formed. One might image that the supernova debris that formed the early solar system could have included bacteria-

bearing chunks of rock from doomed planets circling supernova progenitor stars. If true, this retro-prediction has some interesting consequences in partly resolving the Fermi Paradox. Another interesting consequence for those attempting to recreate life's origins in a lab: bacteria may have evolved under conditions very different from those on earth."

Living In a Virtual World Requires Less Brain Power

"If you were a rat living in a completely virtual world like in the movie *The Matrix*, could you tell? Maybe not, but scientists studying your brain might be able to. Today, researchers report that certain cells in rat brains work differently when the animals are in virtual reality than when they are in the real world. In the experiment, rats anchored to the top of a ball ran in place as movie-like images around them changed, creating the impression that they were running along a track. Their sense of place relied on visual cues from the projections and their self-motion cues, but they had to do without proximal cues like sound and smell. The rodents used half as many neurons to navigate the virtual world as they did the real one."

Manga Girls Beware: Extra Large Eyes Caused Neanderthal's Demise

"The BBC reports on a new study of prehistoric skulls which suggests that Neanderthals became extinct because they had larger eyes than our species. As a consequence of having extra sized eyes, an average 6 millimetres larger in radius, more of their backside brain volume was devoted to seeing, at the expense of frontal lobe high-level processing of information and emotions. This difference affected their ability to innovate and socialize the way we, modern people (Homo Sapiens Sapiens) do. When the last Ice Age set on 28,000 years ago, Neanderthals had no sewn clothes and no large organized groups

to rely on each other, hastening their fall. Yet, they were not stupid, brutish creatures as portrayed in Hollywood films, they were very, very smart, but not quite in the same league as the Homo Sapiens of Cromagnon."

The New AI: Where Neuroscience and Artificial Intelligence Meet

"We're seeing a new revolution in artificial intelligence known as deep learning: algorithms modeled after the brain have made amazing strides and have been consistently winning both industrial and academic data competitions with minimal effort. 'Basically, it involves building neural networks — networks that mimic the behavior of the human brain. Much like the brain, these multi-layered computer networks can gather information and react to it. They can build up an understanding of what objects look or sound like. In an effort to recreate human vision, for example, you might build a basic layer of artificial neurons that can detect simple things like the edges of a particular shape. The next layer could then piece together these edges to identify the larger shape, and then the shapes could be strung together to understand an object. The key here is that the software does all this on its own — a big advantage over older AI models, which required engineers to massage the visual or auditory data so that it could be digested by the machine-learning algorithm.' Are we ready to blur the line between hardware and wetware?"

Philosophy stimuli

We have already gone beyond whatever we have words for. In all talk there is a grain of contempt.

Written words differ from spoken words in being material structures. A spoken word is a process in the physical world, having an essential time-order; a written word is a series of pieces of matter, having an essential space-order.

There is no logical impossibility in the hypothesis that the world sprang into being five minutes ago, exactly as it then was, with a population that "remembered" a wholly unreal past. There is no logically necessary connection between events at different times; therefore nothing that is happening now or will happen in the future can disprove the hypothesis that the world began five minutes ago.

The foot feels the foot when it feels the ground.
Beyond a critical point within a finite space, freedom diminishes as numbers increase. The human question is not how many can possibly survive within the system, but what kind of existence is possible for those who do survive.

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.

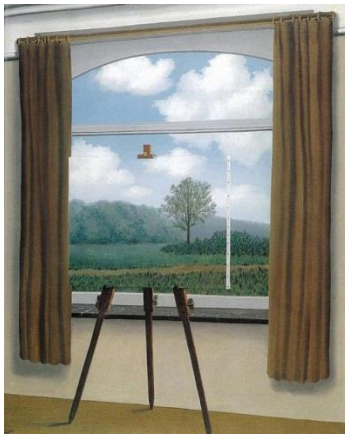
It may be true that "Thou canst not stir a flower without troubling a star", but in computing the motion of stars and planets, the effects of flowers do not loom large. It is the disregarding of the effect of flowers on stars that allows progress in astronomy. Appropriate abstraction is critical to progress in science.

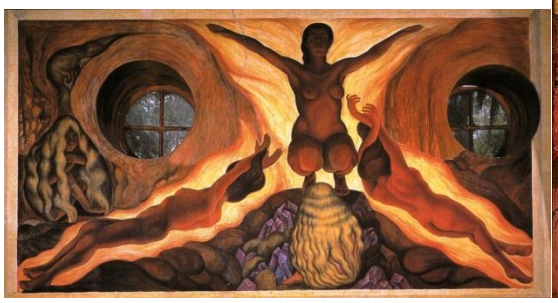
Power is everywhere: not that it engulfs everything, but that it comes from everywhere.

Mathematics takes us still further from what is human, into the region of absolute necessity, to which not only the world, but every possible world, must conform.

History is not like some individual person, which uses men to achieve its ends. History is nothing but the actions of men in pursuit of their ends.

Images





Appendix B - Questions and scales

Study 1

Big Five Aspect Scales (BFAS)

Reference: DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 Aspects of the Big Five. *Journal of Personality and Social Psychology, 93,* 880-896.

Instructions: Here are a number of characteristics that may or may not describe you. For example, do you agree that you seldom feel blue? Please fill in the number that best indicates the extent to which you agree or disagree with each statement listed below. Be as honest as possible, but rely on your initial feeling and do not think too much about each item.

Use the following scale:

1 - - - - - - - - **2** - - - - - - - - - - **3** - - - - - - - - - - **4** - - - - - - - - **5**

Strongly Disagree **Neither Agree Nor Disagree** **Strongly Agree**

1. ___ Seldom feel blue.
2. ___ Am not interested in other people's problems.
3. ___ Carry out my plans.
4. ___ Make friends easily.
5. ___ Am quick to understand things.
6. ___ Get angry easily.
7. ___ Respect authority.
8. ___ Leave my belongings around.

9. ___ Take charge.
10. ___ Enjoy the beauty of nature.
11. ___ Am filled with doubts about things.
12. ___ Feel others' emotions.
13. ___ Waste my time.
14. ___ Am hard to get to know.
15. ___ Have difficulty understanding abstract ideas.
16. ___ Rarely get irritated.
17. ___ Believe that I am better than others.
18. ___ Like order.
19. ___ Have a strong personality.
20. ___ Believe in the importance of art.
21. ___ Feel comfortable with myself.
22. ___ Inquire about others' well-being.
23. ___ Find it difficult to get down to work.
24. ___ Keep others at a distance.
25. ___ Can handle a lot of information.
26. ___ Get upset easily.
27. ___ Hate to seem pushy.
28. ___ Keep things tidy.
29. ___ Lack the talent for influencing people.
30. ___ Love to reflect on things.
31. ___ Feel threatened easily.
32. ___ Can't be bothered with other's needs.
33. ___ Mess things up.
34. ___ Reveal little about myself.
35. ___ Like to solve complex problems.
36. ___ Keep my emotions under control.
37. ___ Take advantage of others.
38. ___ Follow a schedule.
39. ___ Know how to captivate people.
40. ___ Get deeply immersed in music.

41. ___ Rarely feel depressed.
42. ___ Sympathize with others' feelings.
43. ___ Finish what I start.
44. ___ Warm up quickly to others.
45. ___ Avoid philosophical discussions.
46. ___ Change my mood a lot.
47. ___ Avoid imposing my will on others.
48. ___ Am not bothered by messy people.
49. ___ Wait for others to lead the way.
50. ___ Do not like poetry.
51. ___ Worry about things.
52. ___ Am indifferent to the feelings of others.
53. ___ Don't put my mind on the task at hand.
54. ___ Rarely get caught up in the excitement.
55. ___ Avoid difficult reading material.
56. ___ Rarely lose my composure.
57. ___ Rarely put people under pressure.
58. ___ Want everything to be “just right.”
59. ___ See myself as a good leader.
60. ___ Seldom notice the emotional aspects of paintings and pictures.
61. ___ Am easily discouraged.
62. ___ Take no time for others.
63. ___ Get things done quickly.
64. ___ Am not a very enthusiastic person.
65. ___ Have a rich vocabulary.
66. ___ Am a person whose moods go up and down easily.
67. ___ Insult people.
68. ___ Am not bothered by disorder.
69. ___ Can talk others into doing things.
70. ___ Need a creative outlet.
71. ___ Am not embarrassed easily.

72. ___ Take an interest in other people's lives.
73. ___ Always know what I am doing.
74. ___ Show my feelings when I'm happy.
75. ___ Think quickly.
76. ___ Am not easily annoyed.
77. ___ Seek conflict.
78. ___ Dislike routine.
79. ___ Hold back my opinions.
80. ___ Seldom get lost in thought.
81. ___ Become overwhelmed by events.
82. ___ Don't have a soft side.
83. ___ Postpone decisions.
84. ___ Have a lot of fun.
85. ___ Learn things slowly.
86. ___ Get easily agitated.
87. ___ Love a good fight.
88. ___ See that rules are observed.
89. ___ Am the first to act.
90. ___ Seldom daydream.
91. ___ Am afraid of many things.
92. ___ Like to do things for others.
93. ___ Am easily distracted.
94. ___ Laugh a lot.
95. ___ Formulate ideas clearly.
96. ___ Can be stirred up easily.
97. ___ Am out for my own personal gain.
98. ___ Want every detail taken care of.
99. ___ Do not have an assertive personality.
100. ___ See beauty in things that others might not notice

Image associated Questions

This stimulus is:

Simple ---Complex

Familiar--Unfamiliar

Easy to understand---Hard to understand

Comprehensible----Incomprehensible

According to **your** impressions to what extent do you find this stimulus (Strongly agree to strongly disagree):

- Interesting
- Boring

Study 2

The Gratitude Questionnaire–6 (GQ-6)

Using the scale below as a guide, write a number beside each statement

to indicate how much you agree with it.

1 strongly disagree

2 disagree

3 slightly disagree

4 neutral

5 slightly agree

6 agree

7 strongly agree

____1. I have so much in life to be thankful for.

____2. If I had to list everything that I felt grateful for, it would be a very long list.

____3. When I look at the world, I don't see much to be grateful for.

____4. I am grateful to a wide variety of people.

____5. As I get older I find myself more able to appreciate the people, events, and situations that have been part of my life history.

____6. Long amounts of time can go by before I feel grateful to something or someone. Items 3 and 6 are reverse scored.

GRAT Scale

Please provide your honest feelings and beliefs about the following statements which relate to you. There are no right or wrong answers to these statements. We would like to know how much you feel these statements are true or not true of you. Please try to indicate your true feelings and beliefs, as opposed to what you would like to believe. Respond to the following statements by circling the number that best represents your real feelings. Please use the scale provided below, and please choose one number for each statement (i.e. don't circle the space between two numbers), and record your choice in the blank preceding each statement.

1	2	3	4	5	6	7	8	9
I strongly disagree		I disagree somewhat		I feel neutral about the statement		I mostly agree with the statement		I strongly agree with the statement

_____ 1. I couldn't have gotten where I am today without the help of many people.

_____ 2. Life has been good to me.

_____ 3. There never seems to be enough to go around and I never seem to get my share.

_____ 4. Oftentimes I have been overwhelmed at the beauty of nature.

_____ 5. Although I think it's important to feel good about your accomplishments, I think that it's also important to remember how others have contributed to my accomplishments.

_____ 6. I really don't think that I've gotten all the good things that I deserve in life.

_____ 7. Every Fall I really enjoy watching the leaves change colors.

_____ 8. Although I'm basically in control of my life, I can't help but think about all those who have supported me and helped me along the way.

_____ 9. I think that it's important to "Stop and smell the roses."

_____ 10. More bad things have happened to me in my life than I deserve.

_____ 11. Because of what I've gone through in my life, I really feel like the world owes me something.

_____ 12. I think that it's important to pause often to "count my blessings."

_____ 13. I think it's important to enjoy the simple things in life.

_____ 14. I feel deeply appreciative for the things others have done for me in my life.

_____ 15. For some reason I don't seem to get the advantages that others get.

_____ 16. I think it's important to appreciate each day that you are alive.

The curiosity and exploration inventory-II

(strongly disagree, disagree, neutral, agree, strongly agree)

1. I actively seek as much information as I can in new situations.
2. I am the type of person who really enjoys the uncertainty of everyday life.
3. I am at my best when doing something that is complex or challenging.
4. Everywhere I go, I am out looking for new things or experiences.
5. I view challenging situations as an opportunity to grow and learn.
6. I like to do things that are a little frightening.
7. I am always looking for experiences that challenge how I think about myself and the world.
8. I prefer jobs that are excitingly unpredictable.
9. I frequently seek out opportunities to challenge myself and grow as a person.
10. I am the kind of person who embraces unfamiliar people, events, and places.

Instructions: rate the statements below for how accurately they reflect the way you generally feel and behave. Do not rate what you think you should do, or wish you do, or things you no longer do. Please be as honest as possible.

Items 1, 3, 5, 7, and 9 reflect stretching.

Items 2, 4, 6, 8, and 10 reflect embracing. Items are anchored on the following scale: 1= very slightly or not at all; 2 = a little; 3 = moderately; 4 = quite a bit; 5 = extremely.

Promotion prevention scale

Using the scale below, please indicate your level of agreement with the following statements

(strongly disagree, disagree, neutral, agree, strongly agree)

1. In general, I am focused on preventing negative events in my life.

2. I am anxious that I will fall short of my responsibilities and obligations.

3. I frequently imagine how I will achieve my hopes and aspirations.

4. I often think about the person I am afraid I might become in the future.

5. I often think about the person I would ideally like to be in the future.

6. I typically focus on the success I hope to achieve in the future.

7. I often worry that I will fail to accomplish my academic goals.

8. I often think about how I will achieve academic success.

9. I often imagine myself experiencing bad things that I fear might happen to me.

10. I frequently think about how I can prevent failures in my life.

11. I am more oriented toward preventing losses than I am toward achieving gains.

12. My major goal in school right now is to achieve my academic ambitions.

13. My major goal in school right now is to avoid becoming an academic failure.

14. I see myself as someone who is primarily striving to reach my “ideal self ”—to fulfil my hopes, wishes, and aspirations.

15. I see myself as someone who is primarily striving to become the self I “ought” to be—to fulfil my duties, responsibilities, and obligations.

16. In general, I am focused on achieving positive outcomes in my life.

17. I often imagine myself experiencing good things that I hope will happen to me.

18. Overall, I am more oriented toward achieving success than preventing failure.

BFAS Openness and Intellect Scale

Openness/Intellect	
	Combine Intellect and Openness for 20-item scale
Intellect	
	5-item scale (Strongly agree to strongly disagree)
+ keyed	Am quick to understand things.
	Can handle a lot of information.
	Like to solve complex problems.
	Have a rich vocabulary.
	Think quickly.
	Formulate ideas clearly.
– keyed	Have difficulty understanding abstract ideas.
	Avoid philosophical discussions.
	Avoid difficult reading material.
	Learn things slowly.
Openness	
	5-item scale (Strongly agree to strongly disagree)
+ keyed	Enjoy the beauty of nature.
	Believe in the importance of art.
	Love to reflect on things.
	Get deeply immersed in music.
	See beauty in things that others might not notice.
	Need a creative outlet.
– keyed	Do not like poetry.
	Seldom get lost in thought.
	Seldom daydream.
	Seldom notice the emotional aspects of paintings and pictures.

NEO-FFI

This questionnaire contains a number of statements. For each statement, please write the number that best represents your opinion, using the following scale:

strongly disagree, disagree, neutral, agree, strongly agree

_____ 1. I am not a worrier.

_____ 2. I like to have a lot of people around me.

_____ 3. I don't like to waste my time daydreaming.

_____ 4. I try to be courteous to everyone I meet.

_____ 5. I keep my belongings neat and clean.

_____ 6. I often feel inferior to others.

_____ 7. I laugh easily.

_____ 8. Once I find the right way to do something, I stick to it.

_____ 9. I often get into arguments with my family and co-workers.

_____ 10. I'm pretty good about pacing myself so as to get things done on time.

_____ 11. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.

_____ 12. I don't consider myself especially "light-hearted."

_____ 13. I am intrigued by the patterns I find in art and nature.

_____ 14. Some people think I'm selfish and egotistical.

_____ 15. I am not a very methodical person.

_____ 16. I rarely feel alone or blue.

_____ 17. I really enjoy talking to people.

_____ 18. I believe letting students hear controversial speakers can only confuse and mislead them.

_____ 19. I would rather cooperate with others than compete with them.

_____ 20. I try to perform all the tasks assigned to me conscientiously.

_____ 21. I often feel tense and jittery.

_____ 22. I like to be where the action is.

_____ 23. Poetry has little or no effect on me.

_____ 24. I tend to be cynical and skeptical of others' intentions.

_____ 25. I have a clear set of goals and work toward them in an orderly fashion.

_____ 26. Sometimes I feel completely worthless.

_____ 27. I usually prefer to do things alone.

_____ 28. I often try new and foreign foods.

_____ 29. I believe most people will take advantage of you if you let them.

_____ 30. I waste a lot of time before settling down to work.

_____ 31. I rarely feel fearful or anxious.

_____ 32. I often feel as if I'm bursting with energy.

_____ 33. I seldom notice the moods or feelings that different environments produce.

_____ 34. Most people I know like me.

_____ 35. I work hard to accomplish my goals.

_____ 36. I often get angry at the way people treat me.

_____ 37. I am a cheerful, high-spirited person.

_____ 38. I believe we should look to our religious authorities for decisions on moral issues.

_____ 39. Some people think of me as cold and calculating.

_____ 40. When I make a commitment, I can always be counted on to follow through.

_____ 41. Too often, when things go wrong, I get discouraged and feel like giving up.

_____ 42. I am not a cheerful optimist.

_____ 43. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.

_____ 44. I'm hard-headed and tough-minded in my attitudes

_____ 45. Sometimes I'm not as dependable or reliable as I should be.

_____ 46. I am seldom sad or depressed.

_____ 47. My life is fast-paced.

_____ 48. I have little interest in speculating on the nature of the universe or the human condition.

_____ 49. I generally try to be thoughtful and considerate.

_____ 50. I am a productive person who always gets the job done.

_____ 51. I often feel helpless and want someone else to solve my problems.

_____ 52. I am a very active person.

_____ 53. I have a lot of intellectual curiosity.

_____ 54. If I don't like people, I let them know it.

_____ 55. I never seem to be able to get organized.

_____ 56. At times I have been so ashamed I just wanted to hide.

_____ 57. I would rather go my own way than be a leader of others.

_____ 58. I often enjoy playing with theories or abstract ideas..

_____ 59. If necessary, I am willing to manipulate people to get what I want.

_____ 60. I strive for excellence in everything I do.

Image associated Questions

This image made me introspective. (Strongly agree to strongly disagree)

This image made me reflective. (Strongly agree to strongly disagree)

This image is thought provoking. (Strongly agree to strongly disagree)

This is the kind of art that I usually enjoy. (Strongly agree to strongly disagree)

This image fits with my outlook on life. (Strongly agree to strongly disagree)

This image fits with my values. (Strongly agree to strongly disagree)

I would like more information on this image (YES/NO)

On Facebook I would like this image (YES/NO)

On Facebook I would share this image on my wall. (YES/NO)

I would like to own a copy of this. (YES/NO)

This image is:

Simple ---Complex

Familiar--Unfamiliar

Easy to understand---Hard to understand

Comprehensible----Incomprehensible

According to **your** impressions to what extent do you find this image (Strongly agree to strongly disagree):

- Interesting
- Confusing
- Exceptional
- Fascinating
- Profound
- Awe Inspiring
- Moving
- Gives me goose bumps/chills
- Lovely
- Beautiful
- Pleasing
- Enjoyable
- Scary
- Disgusting
- Disturbing
- Haunting
- Upsetting

Study 3

Aesthetic fluency scale

Reference: Smith, L. F., & Smith, J. K. (2006). The nature and growth of aesthetic fluency. In P. Locher, C. Martindale, & L. Dorfman (Eds.), *New directions in aesthetics, creativity, and the arts* (pp. 47–58). Amityville, NY: Baywood.

Please rate each of these concepts on the following 5-point scale:

0: I have never heard of this artist or term

1: I have heard of this but don't really know anything about it

2: I have a vague idea of what this is

3: I understand this artist or idea when it is discussed

4: I can talk intelligently about this artist or idea in art

_____ Mary Cassatt

_____ Isamu Noguchi

_____ John Singer Sargent

_____ Alessandro Boticelli

_____ Gian Lorenzo Bernini

_____ Fauvism

_____ Egyptian Funerary Stelae

_____ Impressionism

_____ Chinese Scrolls

_____ Abstract Expressionism

The curiosity and exploration inventory-II

Reference: Kashdan, T. B., Gallagher, M. W., Silvia, P. J., Winterstein, B. P., Breen, W. E., Terhar, D., et al. (2009). The Curiosity and Exploration Inventory-II: Development, factor structure, and initial psychometrics. Journal of Research in Personality, 43, 987–998.

Instructions: rate the statements below for how accurately they reflect the way you generally feel and behave. Do not rate what you think you should do, or wish you do, or things you no longer do. Please be as honest as possible.

Items are anchored on the following scale: 1= very slightly or not at all; 2 = a little; 3 = moderately; 4 = quite a bit; 5 = extremely.

1. I actively seek as much information as I can in new situations.

2. I am the type of person who really enjoys the uncertainty of everyday life.

3. I am at my best when doing something that is complex or challenging.

4. Everywhere I go, I am out looking for new things or experiences.

5. I view challenging situations as an opportunity to grow and learn.

6. I like to do things that are a little frightening.

7. I am always looking for experiences that challenge how I think about myself and the world.

8. I prefer jobs that are excitingly unpredictable.

9. I frequently seek out opportunities to challenge myself and grow as a person.

10. I am the kind of person who embraces unfamiliar people, events, and places.

Promotion prevention scale

Reference: Summerville, A., & Roese, N. J. (2008). Self-report measures of individual differences in regulatory focus: A cautionary note. *Journal of Research in Personality, 42,* 247–254.

1. In general, I am focused on preventing negative events in my life.

2. I am anxious that I will fall short of my responsibilities and obligations.

3. I frequently imagine how I will achieve my hopes and aspirations.

4. I often think about the person I am afraid I might become in the future.

5. I often think about the person I would ideally like to be in the future.

6. I typically focus on the success I hope to achieve in the future.

7. I often worry that I will fail to accomplish my academic goals.

8. I often think about how I will achieve academic success.

9. I often imagine myself experiencing bad things that I fear might happen to me.

10. I frequently think about how I can prevent failures in my life.

11. I am more oriented toward preventing losses than I am toward achieving gains.

12. My major goal in school right now is to achieve my academic ambitions.

13. My major goal in school right now is to avoid becoming an academic failure.

14. I see myself as someone who is primarily striving to reach my “ideal self ”—to fulfill my hopes, wishes, and aspirations.

15. I see myself as someone who is primarily striving to become the self I “ought” to be—to fulfill my duties, responsibilities, and obligations.

16. In general, I am focused on achieving positive outcomes in my life.

17. I often imagine myself experiencing good things that I hope will happen to me.

18. Overall, I am more oriented toward achieving success than preventing failure.

Big Five Aspect Scales (BFAS)

Reference: DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 Aspects of the Big Five. *Journal of Personality and Social Psychology, 93,* 880-896.

Instructions: Here are a number of characteristics that may or may not describe you. For example, do you agree that you seldom feel blue? Please fill in the number that best indicates the extent to which you agree or disagree with each statement listed below. Be as honest as possible, but rely on your initial feeling and do not think too much about each item.

Use the following scale:

1 - - - - - - - - **2** - - - - - - - - - **3** - - - - - - - - - **4** - - - - - - - - **5**

Strongly Disagree | **Neither Agree Nor Disagree** | **Strongly Agree**

1. ___ Seldom feel blue.
2. ___ Am not interested in other people's problems.
3. ___ Carry out my plans.
4. ___ Make friends easily.
5. ___ Am quick to understand things.
6. ___ Get angry easily.
7. ___ Respect authority.
8. ___ Leave my belongings around.

9. ___ Take charge.
10. ___ Enjoy the beauty of nature.
11. ___ Am filled with doubts about things.
12. ___ Feel others' emotions.
13. ___ Waste my time.
14. ___ Am hard to get to know.
15. ___ Have difficulty understanding abstract ideas.
16. ___ Rarely get irritated.
17. ___ Believe that I am better than others.
18. ___ Like order.
19. ___ Have a strong personality.
20. ___ Believe in the importance of art.
21. ___ Feel comfortable with myself.
22. ___ Inquire about others' well-being.
23. ___ Find it difficult to get down to work.
24. ___ Keep others at a distance.
25. ___ Can handle a lot of information.
26. ___ Get upset easily.
27. ___ Hate to seem pushy.
28. ___ Keep things tidy.
29. ___ Lack the talent for influencing people.
30. ___ Love to reflect on things.
31. ___ Feel threatened easily.
32. ___ Can't be bothered with other's needs.
33. ___ Mess things up.
34. ___ Reveal little about myself.
35. ___ Like to solve complex problems.
36. ___ Keep my emotions under control.
37. ___ Take advantage of others.
38. ___ Follow a schedule.
39. ___ Know how to captivate people.
40. ___ Get deeply immersed in music.

41. ___ Rarely feel depressed.
42. ___ Sympathize with others' feelings.
43. ___ Finish what I start.
44. ___ Warm up quickly to others.
45. ___ Avoid philosophical discussions.
46. ___ Change my mood a lot.
47. ___ Avoid imposing my will on others.
48. ___ Am not bothered by messy people.
49. ___ Wait for others to lead the way.
50. ___ Do not like poetry.
51. ___ Worry about things.
52. ___ Am indifferent to the feelings of others.
53. ___ Don't put my mind on the task at hand.
54. ___ Rarely get caught up in the excitement.
55. ___ Avoid difficult reading material.
56. ___ Rarely lose my composure.
57. ___ Rarely put people under pressure.
58. ___ Want everything to be “just right.”
59. ___ See myself as a good leader.
60. ___ Seldom notice the emotional aspects of paintings and pictures.

61. ___ Am easily discouraged.
62. ___ Take no time for others.
63. ___ Get things done quickly.
64. ___ Am not a very enthusiastic person.
65. ___ Have a rich vocabulary.
66. ___ Am a person whose moods go up and down easily.
67. ___ Insult people.
68. ___ Am not bothered by disorder.
69. ___ Can talk others into doing things.
70. ___ Need a creative outlet.
71. ___ Am not embarrassed easily.

72. ___ Take an interest in other people's lives.
73. ___ Always know what I am doing.
74. ___ Show my feelings when I'm happy.
75. ___ Think quickly.
76. ___ Am not easily annoyed.
77. ___ Seek conflict.
78. ___ Dislike routine.
79. ___ Hold back my opinions.
80. ___ Seldom get lost in thought.
81. ___ Become overwhelmed by events.
82. ___ Don't have a soft side.
83. ___ Postpone decisions.
84. ___ Have a lot of fun.
85. ___ Learn things slowly.
86. ___ Get easily agitated.
87. ___ Love a good fight.
88. ___ See that rules are observed.
89. ___ Am the first to act.
90. ___ Seldom daydream.
91. ___ Am afraid of many things.
92. ___ Like to do things for others.
93. ___ Am easily distracted.
94. ___ Laugh a lot.
95. ___ Formulate ideas clearly.
96. ___ Can be stirred up easily.
97. ___ Am out for my own personal gain.
98. ___ Want every detail taken care of.
99. ___ Do not have an assertive personality.
100. ___ See beauty in things that others might not notice

The Gratitude, Resentment, and Appreciation Test (GRAT)

Reference: Watkins, P. C., Woodward, K. Stone, T., & Kolts, R. L. (2003). Gratitude and happiness: Development of a measure of gratitude, and relationships with subjective well-being. *Social Behavior and Personality, 31,* 431-452.

Instructions: Please provide your honest feelings and beliefs about the following statements which relate to you. There are no right or wrong answers to these statements. We would like to know how much you feel these statements are true or not true of you. Please try to indicate your true feelings and beliefs, as opposed to what you would like to believe. Respond to the following statements by filling in the number that best represents your real feelings in the blank provided next to each statement using the scale provided below.

1	2	3	4	5	6	7	8	9
I strongly disagree		I disagree somewhat		I feel neutral about the statement		I mostly agree with the statement		I strongly agree with the statement

1. ___ I couldn't have gotten where I am today without the help of many people.
2. ___ I think that life has been unfair to me.
3. ___ It sure seems like others get a lot more benefits in life than I do.
4. ___ I never seem to get the breaks or chances that other people do.
5. ___ Often I'm just amazed at how beautiful the sunsets are.
6. ___ Life has been good to me.
7. ___ There never seems to be enough to go around and I never seem to get my share.
8. ___ Often I think, "What a privilege it is to be alive."
9. ___ Oftentimes I have been overwhelmed at the beauty of nature.
10. ___ I feel grateful for the education I have received.
11. ___ Many people have given me valuable wisdom throughout my life that has been important to my success.
12. ___ It seems like people have frequently tried to impede my progress.
13. ___ Although I think it's important to feel good about your accomplishments, I think that it's also important to remember how others have contributed to my success.
14. ___ I really don't think that I've gotten all the good things that I deserve in life.
15. ___ Every Fall I really enjoy watching the leaves change colors.
16. ___ Although I'm basically in control of my life, I can't help but think about all those who have supported me and helped me along the way.
17. ___ Part of really enjoying something good is being thankful for that thing.
18. ___ Sometimes I find myself overwhelmed by the beauty of a musical piece.
19. ___ I'm basically very thankful for the parenting that was provided to me.
20. ___ I've gotten where I am today because of my own hard work, despite the lack of any help or support.
21. ___ Over the December holidays, the presents I get aren't as good or as many as others seem to get.
22. ___ Sometimes I think, "Why am I so fortunate so as to be born into the family and culture I was born into?"
23. ___ One of my favorite times of the year is Thanksgiving.
24. ___ I believe that I am a very fortunate person.
25. ___ I think that it's important to "Stop and smell the roses."
26. ___ More bad things have happened to me in my life than I deserve.
27. ___ I really enjoy the changing seasons.
28. ___ Because of what I've gone through in my life, I really feel like the world owes me something.
29. ___ I believe that the things in life that are really enjoyable are just as available to me as they are to the very rich.
30. ___ I love to sit and watch the snow fall.
31. ___ I believe that I've had more than my share of bad things come my way.
32. ___ Although I think that I'm morally better than most, I haven't gotten my just reward in life.
33. ___ After eating I often pause and think, "What a wonderful meal."
34. ___ Every spring, I really enjoy seeing the flowers bloom.
35. ___ I think that it's important to pause often to "count my blessings."
36. ___ I think it's important to enjoy the simple things in life.
37. ___ I basically feel like life has ripped me off.
38. ___ I feel deeply appreciative for the things others have done for me in my life.
39. ___ I feel that God, or fate, or destiny, doesn't like me very well.
40. ___ The simple pleasures of life are the best pleasures of life.
41. ___ I love the green of spring.
42. ___ For some reason I never seem to get the advantages that others get.
43. ___ I think it's important to appreciate each day that you are alive.
44. ___ I'm really thankful for friends and family.