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SPECIAL SECTION: Openness to Experience

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## Opening Up Openness: A Theoretical Sort Following Critical Incidents Methodology and a Meta-Analytic Investigation of the Trait Family Measures

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Existing taxonomies of Openness's facet structure have produced widely divergent results, and there is limited comprehensive empirical evidence about how Openness-related scales on existing personality inventories align within the 5-factor framework. In Study 1, we used a critical incidents sorting methodology to identify 11 categories of Openness measures; in Study 2, we meta-analyzed the relationships of these categories with global markers of the Big Five traits (utilizing data from 106 samples with a total sample size of  $N = 35,886$ ). Our results identified 4 true facets of Openness: aestheticism, openness to sensations, nontraditionalism, and introspection. Measures of these facets were unadulterated by variance from other Big Five traits. Many traits frequently conceptualized as facets of Openness (e.g., innovation/creativity, variety-seeking, and tolerance) emerged as trait compounds that, although related to Openness, are also dependent on other Big Five traits. We discuss how Openness should be conceptualized, measured, and studied in light of the empirically based, refined taxonomy emerging from this research.

The Openness to Experience dimension of personality in the Five-factor model tradition has been named and conceptualized inconsistently, being called Openness to Experience by Costa and McCrae (1992a) and Intellect by those in the lexical tradition (Goldberg, 1981). Whereas Openness to Experience emphasizes a preference for and excitement by aesthetic beauty and novelty, Intellect focuses on intelligence, cleverness, and interests in deep thoughts, imagination, and self-reflection. Several studies have found that the broader Openness/Intellect domain consisted of two factorially separable subcomponents corresponding directly to an openness (experiencing) component and an intellect component (DeYoung, Quilty, & Peterson, 2007; Jang, Livesley, Angleitner, Riemann, & Vernon 2002). DeYoung et al. (2007) referred to these components as "aspects" akin to meso-facets—traits that are narrower and more specific than the broad five factors but still more general than the facet traits that represent more specific manifestations of the general five-factor traits. Openness and intellect components have generally been found to correlate strongly ( $.50 < r < .55$ ), suggesting that these are separable but related components within the same domain. We use the term *Openness* to refer to the broad factor domain and the terms *experiencing* and *intellect* to refer to the more specific meso-facets. Thus, contemporary research on the expe-

riencing and intellect meso-facets has done much to resolve the historic debates about how Openness should be defined and to propel a more fine-grained approach to studying the Openness domain.

Within the Openness domain, however, most personality researchers conceptualize the broad Openness factor as including some set of lower level facet traits that govern a narrower set of feelings, thoughts, and behaviors than broad Openness, intellect, or experiencing. For example, narrow traits like imagination, traditionalism, creativity, and tolerance each conceptually implicate Openness, but the particular meaning of these specific traits extends beyond that of their shared variance at the domain or meso-facet level. However, unlike in the domain of Conscientiousness (Roberts, Bogg, Walton, Chernyshenko, & Stark, 2004; Roberts, Chernyshenko, Stark, & Goldberg, 2005), no consensus and meager empirical exploration exists in defining the number and type of facets belonging within Openness. In addition, of the broad set of traits related to Openness, it remains generally unclear which of these might stand independent as facets of only Openness (i.e., relatively orthogonal to the other Big Five) and which might be trait compounds that blend Openness with one or more of the other Big Five. Disentangling Openness compounds from facets has important implications for understanding traits' causal origins and for interpreting their ability to incrementally predict above and beyond the Big Five. The general purpose of this article is to refine existing taxonomies of Openness traits using theoretically informed empirical approaches and meta-analysis.

Exploring, developing, and refining a taxonomy of Openness facets stands to serve personality research in several

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ways. First, defining the component facets of Openness will direct researchers toward the thoughts, feelings, behaviors, and ultimately fields of study in which Openness is relevant. Thus, simply forming a taxonomy of Openness traits will more clearly define the breadth and depth of the Openness domain. Second, having a taxonomy of Openness facets and components would point researchers toward the specific trait mechanisms through which broad Openness affects a criterion of interest. Knowing that a trait is a facet or compound of Openness affords researchers specificity in prediction (where appropriate; cf. Ones & Viswesvaran, 1996) without divorcing the criterion from what is known about the broader Openness domain. Third, although the Big Five model has spread widely, many fields focus on a particular personality trait that is relevant for understanding the behaviors of interest but that does not align perfectly with one of the five factors (e.g., social dominance orientation in research on prejudice). Although these traits often correspond to Openness facets or compound, this linkage often remains somewhat unclear. Locating such traits within a more comprehensive taxonomy of Openness would more clearly link Openness to these domains. Fourth, a refined taxonomy of Openness can serve to improve construct validity of measures used to assess the domain at factor, meso-facet, or facet levels of specificity.

Existing taxonomies of Openness define the facets of the trait based on one of three approaches: (a) facets included in specific measures (e.g., NEO PI-R and its six facets of Openness [openness to ideas, actions, feelings, values, fantasy, and aesthetics]; Personal Characteristics Inventory [PCI] and its two facets of Openness [abstract thinking and creative thinking]), (b) factor analyses utilizing lexical or questionnaire data (e.g., Saucier & Ostendorf, 1999), or (c) theoretical considerations (e.g., Peabody & De Raad, 2002). Researchers have also used hybrid approaches relying both on theory and empirical data (e.g., Hough & Ones, 2001). In this study, we bring two unique approaches to the table: a theoretically based sort and re-sort of existing Openness measures and a meta-analytic investigation involving the Openness factor and facet convergent and divergent validities with each of the Big Five dimensions.

Thus, to arrive at a taxonomy of Openness traits, we conducted two studies. Study 1 presents the results of a qualitative sorting of extant measures of Openness that provides an initial taxonomy of Openness traits as presently assessed. In Study 2, we meta-analyze the relationships between these trait categories and markers of the Big Five to determine which traits are empirically independent of Openness, which are uniquely Openness facets, and which are Openness compounds. We conclude by discussing how this empirically grounded, refined taxonomy shapes the way Openness should be conceptualized and measured.

#### STUDY 1: A TAXONOMY OF OPENNESS MEASURES FOLLOWING CRITICAL INCIDENTS METHODOLOGY

Our goal in Study 1 was to develop a taxonomy for categorizing existing measures of Openness-related traits—that is, facets of Openness as well as compound traits incorporating elements of Openness. To that end, we used a qualitative data analysis technique referred to as critical incident sorting. Although the process for sorting critical incidents was developed in the 1950s (Flanagan, 1954), its process is in line with more contemporary grounded theory approaches to qualitative data analysis (e.g., Strauss & Corbin, 1998). Critical incident sorts involve three

steps: (a) compiling a set of “incidents” to be sorted, (b) using subject matter experts (SMEs) to conduct an initial sort of these incidents into conceptually homogenous categories, and (c) using a separate set of SMEs to re-sort the set of incidents into the categories developed in the initial sort. Thus, the critical incident methodology has a step that is exploratory (the initial sort) and a step that is confirmatory (the re-sort). Critical incident sorting has become widely used to develop taxonomies (with the original Flanagan [1954] article that developed the technique receiving more than 1,600 citations), ranging from taxonomies of strategies that dual-career couples use to balance work versus home demands (Wiersma, 1994) to taxonomies of patient reflections on general practitioners (Jung, Van Horne, Wensing, Hearnshaw, & Grol, 1998) to taxonomies of workplace misbehavior of senior-level executives (Birkland, 2008; H. L. Jackson, 2006). We detail the specifics of our critical incidents sort next.

#### *Critical Incident Sort Methods*

*Creating critical incidents from descriptions of Openness-related measures.* To identify as many existing Openness scales as possible, two PhD students reviewed a collection of more than 200 psychological test manuals to identify scales conceptually related to Openness. Compared to scales used in published literature, manuals are much more likely to provide in-depth descriptions of scales, their meanings, and their correlates. Because we would later conceptually and empirically prune out measures not assessing elements of Openness, we were broad in our search and preferred erring on the side of including too many rather than too few measures at this early stage of the taxonomy development. We identified 128 such scales from 36 different personality manuals. For each scale, we recorded all descriptive information possible that was presented in the test manual, including the scale’s name, the scale’s description, descriptions of high and low scorers, adjectival correlates, and sample items. Thus, we treated each scale and its descriptive information as a “critical incident” to be sorted.

*Initial sorting of Openness measures and preliminary taxonomy.* Each scale’s descriptive information was printed on notecards and provided in random order to the first three authors, three SMEs (at the time, two psychology PhD candidates and one faculty member, all of whom have focal research interests in personality). We independently sorted the scales into categories that each represented a homogenous cluster of scales within categories. We then named each of their categories and wrote brief descriptions of the defining features of each category. We three sorters varied only slightly in the number and names of the categories they identified (Sorter 1 identified 15 categories of Openness measures, Sorter 2 identified 14 categories, and Sorter 3 identified 14 categories).

We then met as a group to reach consensus on the name, number, and description of the categories, as well as placement of incidents within each category. Through this meeting, we identified 16 distinct trait categories related to Openness. Ten (63%) of these categories were present in all three sorters’ categories, five categories (31%) were present in just two sorters’ categories, and one category (6%) emerged in the consensus meeting as a broader trait encompassing several facets without being so broad as global Openness. In addition to these 16 categories, however, we identified an additional category (emotion- vs. thought-based decisions, perhaps best anchored

by the Thinking vs. Feeling scale of the Myers–Briggs Type Inventory [Myers & McCaulley, 1985]) that was problematic in that opposite poles of this dimension conceptually related to aspects of high Openness. In addition, we also identified 21 scales that we agreed were not related to Openness (e.g., the Eysenck Personality Questionnaire’s Psychoticism scale [H. J. Eysenck & Eysenck, 1994]) and 10 scales that could not be cleanly classified within one category (e.g., the 16PF Sensitivity scale [Conn & Rieke, 1994]). Scales that fell within this emotion- versus thought-based decisions category, that were identified as not being related to Openness, or that could not be cleanly classified were set aside and not considered further. Thus, through this process, the critical incidents were paired down to 85 Openness-related scales spread across 16 categories: global openness, openness to ideas, complexity, curiosity, imagination, innovation, introspection, variety-seeking, thrill-seeking, value tolerance, openness to emotions, aesthetics, openness to sensations, autonomy, nontraditionalism, and independence from others.

These categories were conceptualized at different levels of breadth. Specifically, global openness describes a general preference for thinking and understanding problems, seeking out new experiences, having aesthetic interests, and tending to be reflective about emotions and behaviors. Notably, somewhat more nuanced Openness traits generally clustered around the intellect/openness to ideas themes of the trait. The openness to ideas category corresponds to DeYoung et al.’s (2007) intellect meso-facet, with measures in this category tapping a general tendency to be curious, imaginative, innovative, introspective, and to prefer complex thinking. However, some measures were more specific and focused on one of these particular facet traits. We did not identify any measures that focused generally on only the experiencing meso-facet of the trait, but the categories of variety-seeking, aesthetics, openness to emotions, and openness to sensations reflect a clustering of traits aligned with the experiencing aspect. Finally, we also identified some categories of measures that appear to be trait compounds. Specifically, thrill-seeking measures have elements of both high Extraversion and low Conscientiousness along with high Openness, and tolerance measures have elements of both high Openness and high Agreeableness. Among these compound traits, we also identified a cluster of traits related to the desire for autonomy as manifested in a desire for independence from traditional, conservative values (nontraditional) and a desire for social independence from others (independence from others). However, some measures seemed to assess both of these independence tendencies and were thus categorized within the broader autonomy category.

*Re-sorting Openness measures into categories from the initial sort.* We placed 40% of the Openness measures into identical categories prior to discussion. This indicated strong agreement about those particular measures belonging in and defining the particular categories. However, for the remaining 60% of Openness measures, there was not perfect agreement among the initial sorters about category placement (often because two sorters placed the measure in a category not identified by the third sorter). Thus, we conducted a re-sort process to identify the appropriate category placements for those remaining measures and, more generally, to confirm that the distinctions between our categories were useful and apparent.

For this re-sort process, we solicited the expertise of a set of four new SMEs. These SMEs were all PhD students in industrial/organizational psychology who had taken doctoral-level courses in personality and therefore were well familiar with personality, the Five-factor model, and measurement. After being trained on the taxonomy as initially determined, these re-sorters read the set of descriptive information about each Openness measure and used this information to categorize the scale within the initial sort’s taxonomy.

### *Critical Incidents Re-Sorting Results*

The most important statistic for evaluating the appropriateness of our taxonomy through the re-sort process was the percentage of scales “correctly” sorted back into their categories from the initial sort. Overall accuracy was perfect for imagination, variety-seeking, openness to emotions, openness to sensations, nontraditional, tolerance, and thrill-seeking, and quite strong for aestheticism. For some of the categories, however, re-sorters had considerable difficulty differentiating the appropriate category in which to place incidents. First, there was considerable overlap in how re-sorters placed scales across global openness (overall accuracy = 61%), openness to ideas (51%), complexity (0%), and curiosity (58%). This suggests that the conceptual distinctions might be unclear between these categories, or that measures might often stretch beyond a single clear-cut category. Such overlap among these categories is not surprising: The desire to explore (curiosity) and understand (complexity) intricate processes and problems is clearly at the core of openness to ideas. Moreover, this desire to think and reflect is often spurred on by the richness of experience, making it perhaps difficult for measures and re-sorters to disentangle the intellect from the experiencing components of global openness. Thus, although intellect and experiencing might indeed be two separable meso-facets (DeYoung et al., 2007), existing measures of Openness do not align cleanly and distinctly with just one of these two meso-facets. Thus, we revised our taxonomy by merging openness to ideas, complexity, and curiosity into global openness.

There was also considerable overlap in re-sorters’ categorizations of autonomy (overall accuracy = 50%) and independence from others (65%). The initial distinction between these categories was that autonomy was conceptualized as a higher order facet or compound incorporating both a general preference for nonconformity to both social pressures (independence from others) and to traditional conservative values (nontraditional). However, the results of the re-sort indicated that the emphasis of these more general autonomy measures seems to mostly be on social independence. Thus, we merged autonomy and independence from others into a single autonomy category separate from nontraditional.

After merging openness to ideas, complexity, and curiosity into global openness and independence from others into autonomy, we recomputed category overlap and overall accuracy for the revised taxonomy. Table 1 shows that the overall accuracy for global openness (94%) and for autonomy (88%) improved considerably as a result of this category merging. Thus, our final and revised taxonomy consisted of 12 categories of Openness measures, with nearly all categories showing strong overall accuracy. Table 2 presents the 12 categories, their descriptions, and sample measures.

TABLE 1.—Re-sort agreement with initial sort after category merging.

Initial Categories	Overall Accuracy	Scales in Category	# Initially Agreed	# Re-Sorted	Re-Sort Category Placement												
					Global Openness to Experience	Imagination	Innovation	Introspection	Variety-seeking	Aesthetics	Openness to Emotions	Sensations	Autonomy	Nontraditional	Tolerance	Thrill-seeking	
Global	94%	32	3	29	94%	0%	1%	2%	2%	2%	0%	0%	0%	0%	2%	0%	0%
Openness to Experience	100%	1	0	1	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Imagination	58%	7	4	3	58%	0%	17%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Innovation	67%	3	0	3	0%	0%	0%	67%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Introspection	100%	8	8	0	—	—	—	—	—	—	—	—	—	—	—	—	—
Variety-seeking	75%	5	4	1	50%	25%	0%	0%	0%	0%	0%	25%	0%	0%	0%	0%	0%
Aesthetics	100%	3	3	0	—	—	—	—	—	—	—	—	—	—	—	—	—
Openness to emotions	100%	2	0	2	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%
Openness to sensations	88%	10	0	10	3%	0%	0%	3%	0%	0%	0%	0%	0%	88%	5%	0%	3%
Autonomy	100%	7	7	0	—	—	—	—	—	—	—	—	—	—	—	—	—
Nontraditional	100%	2	1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
Tolerance	100%	5	4	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Thrill-seeking	100%	5	4	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

Note. Boldfaced values placed for emphasis for overall accuracy and along the diagonal of the matrix to indicate correct re-sorting. Scales in Category = total number of scales that were initially conceptualized within the category after category merging; # Initially Agreed = number of scales for which all three initial sorters placed the incident in the same category and thus were not re-sorted; # Re-sorted = number of scales that were re-sorted. At the right of the table, columns indicate the percentage of time when a re-sorter placed a scale initially identified within a given category (row) into a particular re-sort category. Numbers along the diagonal indicate re-sorters correctly matching a scale to the category identified by the initial sorters. Overall accuracy was calculated for each category using the following formula: Accuracy =  $100 \times \frac{3a+4b}{3a+4b}$ , where  $a$  = the number of measures where initial sorters' agreement was perfect,  $b$  = the number of incidents being re-sorted, and  $p$  = the proportion of measures re-sorted correctly (i.e., the number along the diagonal).

Our critical incidents sort indicated that the common and defining characteristic of global openness measures is a desire to think, understand, and be curious about how one experiences the world through aesthetic and sensory reactions. In addition to global openness, we hypothesized in our taxonomy that Openness has seven facet traits: aestheticism, openness to emotions, openness to sensations, variety-seeking, innovation, introspection, and imagination. These seven facet traits represent distinct ways in which that desire to think might become manifest in experiences, whether it is thinking and reflecting about art and beauty (aestheticism), the behaviors of others (introspection), a fantasy (imagination) or new solution (innovation), one's own emotions (openness to emotions) and bodily sensations (openness to sensations), or simply what might be new to experience and reflect on (variety-seeking). We hypothesized that these seven traits are likely to be facets because their relationships with other Big Five traits are not apparent. In addition, we also identified four Openness traits that appear to have elements of the other Big Five traits. For example, tolerance has elements of not only Openness, but also high Agreeableness. The desire for independent self-determination places autonomy at the intersection of high Openness and high Extraversion (assertiveness), whereas holding ideologies at odds with typical or conservative customs places nontraditional between high Openness and low Conscientiousness. Finally, the adventures and risks associated with thrill-seeking cross the desire for new experiences of high Openness with the energy of high Extraversion and the lack of cautiousness of low Conscientiousness. In Study 2, we specifically examine how these traits relate to each of the Big Five to distinguish true facets from compound traits.

### STUDY 2: META-ANALYTICALLY LINKING OPENNESS CATEGORIES TO BIG FIVE GLOBAL MARKERS

Study 1 represented a systematic method for determining conceptually distinct components of Openness and provided a theoretically based and empirically informed taxonomy for categorizing existing measures of Openness. In addition to measures assessing the broad domain of openness to experience/intellect (i.e., global openness measures), we identified 11 categories of measures belonging within the domain of Openness either as facet traits or as compounds. However, these traits' belongingness within the broader Openness domain was determined mostly conceptually (even though critical incident methodology provided scientific rigor and potential replicability to our analyses) rather than purely empirically, based on actual openness measurements of individuals. Thus, in Study 2, we meta-analyzed the relationships between each of these 11 trait categories and markers of global openness to quantitatively evaluate Study 1's qualitative conclusions.

The definitions of some of these Openness-related traits suggest that they might involve one or more of the other Five-factor traits. However, it remains somewhat unclear which of these traits should be conceptualized as pure facet traits that define the domain of Openness and which might be trait compounds. In Study 2, we meta-analytically examine the relationships of each Openness trait with global markers of Emotional Stability, Extraversion, Agreeableness, and Conscientiousness. If a trait is a true Openness facet, it should show strong correlations with measures of global openness and modest correlations with the remainder of the Big Five. If, however, the trait is a

TABLE 2.—Study 1: Final Openness trait categories, definitions, and sample measures.

Category	Definition	Sample Measures
Global openness	The central element to openness is a desire to think and understand problems. Individuals seek out new experiences, are curious, liberal and independent minded, have artistic or scientific interests, are moved by aesthetics, and are introspective about emotions and behavior.	HPI (Hogan & Hogan, 1992) Intellectance; 16PF (Conn & Rieke, 1994) Abstractedness; GZTS (Guilford, Zimmerman, & Guilford, 1976) Thoughtfulness; Omnibus (Heist & Yonge, 1968) Thinking Introversion
<b>Hypothesized Openness facets</b>		
Aestheticism	Appreciates artwork, music, natural beauty; might be strongly moved by these aesthetic or artistic aspects.	NEO (Costa & McCrae, 1992b) Aestheticism; HPI Culture
Openness to emotions	Thinks about and interprets deeply one's own emotions; conscious about own moods and emotions.	EJI (Bedwell, 2003) Aware of Emotions; NEO Feelings
Openness to sensations	Tends to savor sensory experiences; is particularly sensitive and attuned to sights, sounds, smells, and tactile stimuli.	PRF (D. N. Jackson, 1989) Sentience; SLIP (Singer & Loomis, 1984) Sentience
Innovation	Is creative and inventive; likes to come up with new ideas and develop clever new solutions to problems.	JPI (D. N. Jackson, 1994) Innovation; OPQ (SHL, 2006) Innovative
Variety-seeking	Seeks out novelty, prefers variety, and avoids routine; likes to travel.	ACL (Gough & Heilbrun, 1983)/PRF Change; NEO Actions
Introspection	Likes to think about and tries to understand the reasons for others' or one's own behavior; likes to predict how others will act.	EPPS (Edwards, 1959) Intraception; OPQ Behavioural
Fantasy	Has an overactive imagination; might often day-dream or have an active fantasy life.	NEO Fantasy
<b>Hypothesized Openness compounds</b>		
Tolerance	Tolerance and appreciation for differences in others' values; broad-mindedness; freedom from prejudice.	CPI (Gough & Bradley, 1996)/JPI Tolerance; Inwald (Inwald, Knatz, & Shusman, 1982) Rigid Type
Autonomy	Wants to choose and determine own behavior; resists prescribed behavior from groups; prefers to determine own course and is a nonconformist.	ACL/PRF Autonomy; SFPQ (D. N. Jackson, Paunonen, & Tremblay, 2000) Independence
Nontraditional	Endorses socially and politically liberal values rather than conservative values; avoids being dogmatic in applying and following moral conventions.	POI (Science Research Associates, 1983) Existentiality; NEO Values; Omnibus Autonomy
Thrill-seeking	Seeks excitement, thrills, and stimulation; has a sense of adventure; may be easily bored; may be reckless or a risk taker.	NEO Excitement-Seeking; Omni (Loranger, 2001) Excitement

*Note.* HPI = Hogan Personality Inventory; GZTS = Guilford–Zimmerman Temperament Survey; NEO = NEO Personality Inventory–Revised; EJI = Emotional Judgment Inventory; PRF = Personality Research Form; SLIP = Singer Loomis Inventory of Personality; JPI = Jackson Personality Inventory; OPQ = Occupational Personality Questionnaire; ACL = Adjective Checklist; EPPS = Edwards Personal Preference Schedule; CPI = California Psychological Inventory; SFPQ = Six Factor Personality Questionnaire; POI = Personal Outlook Inventory.

compound trait that blends aspects of Openness with other Big Five traits, it should show strong correlations with Openness as well as other relevant Big Five trait(s). Specifically, we expect that aestheticism, imagination, innovation, introspection, openness to emotions, openness to sensations, and variety-seeking will emerge as true facets, whereas we expect tolerance (OE+, A+), autonomy (OE+, Ex+), nontraditional (OE+, C–), and thrill-seeking (OE+, Ex+, C–) to be Openness compounds. Accurate alignment of these facet and compound traits with the Five Factors necessitates (a) precise point estimates of correlations (i.e., using relatively large samples to reduce sampling error problems) and (b) a cross-inventory approach. Meta-analysis is a particularly useful tool because it pools data across samples and allows for systematic investigation of differences across studies such as differences in measures used.

### Meta-Analytic Methods

*Sampling of studies.* To meta-analytically estimate the correlations between each Openness category identified in Study 1 and global markers of the Big Five, we created our meta-analytic database by culling studies from a collection of more than 200 psychological test manuals. Compared to more traditional meta-analytic data sources (e.g., journal articles, dissertations, and conference presentations), test manuals have several

advantages. First, test manuals are more likely to have administered multiple personality inventories to a sample and to report the cross-inventory correlations (usually to provide supporting evidence for the inventory's scales' construct validity). Second, the samples used in test manuals are more likely to be normative or community samples. Thus, test manuals' samples are less likely to be restricted in range, allowing sample correlations to more accurately reflect those in the population. Finally, test manuals generally elaborate on the constructs measured by providing scale descriptions, adjectival correlates, and sample items. Such detail about scales facilitates accurate alignment with our Openness taxonomy, but this detail is less likely to be provided in journal articles.

To be included in the meta-analytic database, the study had to present the sample size and the correlation between an Openness trait aligned with one of Study 1's categories and a marker of one of the global Big Five traits. We imposed several inclusion criteria among these potential data sources. First, to ensure a homogenous set of measurement methodologies, we included only correlations between self-report personality scales (informant-report scales and interview-based measures were omitted). Second, any correlations in which the two scales had overlapping item sets (e.g., the correlation between the NEO PI–R Fantasy facet and the NEO PI–R Openness domain scale) were omitted to avoid upward bias from part–whole correlations. Third,

because ipsatively scored inventories force a pattern of correlations between their scales, we excluded correlations based on ipsative scales. Finally, in some cases, manuals selectively reported only significant correlations, correlations above a particular threshold, or the correlations that were highest for a particular scale when describing study results. These correlations might be partly capitalizing on sampling error, and including these results would upwardly bias meta-analytic estimates. Thus, studies in which correlations were selectively reported were wholly excluded to avoid such upward bias (Kuncel, Hezlett, & Ones, 2004; McDaniel, Rothstein, & Whetzel, 2006). Altogether, our meta-analytic database contained data from 106 samples presented in 25 personality manuals, with a corresponding total sample size of  $N = 35,886$ .

*Coding of data.* Openness scales included in this study were coded according to the taxonomy presented in Table 2. Global markers of Emotional Stability, Extraversion, Agreeableness, and Conscientiousness were identified based on the taxonomy presented in Hough and Ones (2001) where available. Otherwise, these scales were independently identified by the first and third authors, with the second author resolving any discrepancies. We also coded whether the correlations reported between scales came from the same or different inventories. Inventory creators often (and appropriately) select items to create scales that are factorially distinct. Specifically, a scale's final item set might have been selected partially to minimize its correlations with scales in unrelated domains (e.g., the Occupational Personality Questionnaire [SHL, 2006] normative Variety Seeking scale and its Conscientious scale) or to increase correlations with scales in the same domain (e.g., the Hogan Personality Inventory's [Hogan & Hogan, 1982] Curious scale and its Intellectance scale). Thus, we examined whether our meta-analytic findings remained robust when we only included correlations between scales from different inventories.

*Meta-analytic procedures.* To meta-analyze the correlations in our database, we used the Hunter and Schmidt (2004) psychometric meta-analytic procedures. Hunter–Schmidt meta-analysis is a form of random effects meta-analysis (i.e., its model does not assume that studies are sampled from a population of studies with identical population parameters). Random effects models provide more accurate meta-analytic point estimates and confidence intervals, and they also better avoid Type I errors in detecting meta-analytic moderators than do fixed effects meta-analyses (Hunter & Schmidt, 2000; Schmidt, Oh, & Hayes, 2009). In addition, Hunter–Schmidt procedures correct meta-analytic mean and variance estimates of correlations for the effects of statistical artifacts such as unreliability. Specifically, not only does unreliability attenuate observed correlations, but because reliabilities vary across studies, unreliability introduces artifactual variance in correlations. Hunter–Schmidt meta-analyses correct meta-analytic mean correlations for this attenuating effect of measurement error (indicated as  $\rho$ ), as well as adjusting estimates of the variability in correlations for variability caused by variability in reliabilities (indicated as  $SD_\rho$ ). Hunter–Schmidt procedures make these adjustments by creating artifact distributions. Just as meta-analyses examine the mean and variability of effect sizes across a set of studies, artifact distributions model the mean and variability in statistical artifacts across studies. We applied corrections for unreliability

but not for range restriction because samples were generally community samples for which range restriction is less likely. Because we were interested in the overlap among personality constructs rather than personality measures (i.e., correlations with the attenuating effects of measurement error removed), Hunter–Schmidt meta-analysis was an especially appropriate meta-analytic method. Finally, to avoid violating independence assumptions, cases with several correlations from one sample for a given analysis were either averaged within the sample or composited (Nunnally, 1978, pp. 166–167) before contributing to the overall analysis.

### *Meta-Analytic Results*

Table 3 presents the results from meta-analyzing each hypothesized Openness facet's relationship with markers of global openness, global emotional stability, global extraversion, global agreeableness, and global conscientiousness. In addition to providing observed estimates of the mean correlation ( $\bar{r}_{obs}$ ) and its standard deviation ( $SD_{obs}$ ), we used Hunter–Schmidt meta-analysis to correct the observed variance in correlations for variance due to cross-study differences in reliability ( $SD_{res}$ ). Finally, we also used Hunter–Schmidt meta-analysis to correct the mean correlation for the attenuating effects of unreliability (i.e., the “true score” correlation, denoted as  $\rho$ ) and to provide estimates of the variability in true score correlations across studies ( $SD_\rho$ ). For meta-analyses in which one or more sample correlations came from within the same inventory, we reran the meta-analysis including cross-inventory correlations only; values from these meta-analyses are presented parenthetically in Table 3. We discuss the findings in turn for each trait.

First, note that measures of global openness were relatively independent of the rest of the Big Five traits. This finding is perhaps not surprising given that the Big Five scales have been developed not to be highly correlated. Global openness's highest unreliability corrected correlation was with Extraversion ( $\rho = .14$ ), a pattern consistent with theorizing that Openness and Extraversion might be manifestations of a higher order factor beyond the Big Five (Chang, Connelly, & Geeza, 2010; DeYoung, 2006; Digman, 1997). Relationships with other global Big Five constructs were smaller. Finding that global openness showed nonzero relationships with global markers of the other Big Five has implications for determining whether Openness traits are facets or compounds. For example, an Openness trait might correlate with global extraversion not because it is an Openness/Extraversion compound trait but simply because global openness itself correlates with global extraversion. Thus, we estimated semipartial corrected correlations predicting the global markers Openness trait from each Openness trait, controlling for global openness ( $s\rho_{xy.OE}$ ). These semipartials indicate whether the Openness trait relates to one of the other markers of the Big Five beyond global openness.

*Meta-analytic results for the hypothesized facets of Openness.* We hypothesized that aestheticism would be a pure facet of Openness, and the results in Table 3 strongly confirm this hypothesis. Aestheticism has the strongest corrected correlation with global openness of any of the Openness traits ( $\rho = .62$ ). In addition, aestheticism's relationships with each of the other Big Five traits are minimal; this pattern of correlations holds even when the correlations are restricted to those from different inventories. Thus, the absence of adjectives related to

TABLE 3.—Meta-analytic correlations of Openness measures with global markers of the Big Five.

Trait	K		N		$\bar{r}_{obs}$		$SD_{obs}$		$\rho$		$SD_{\rho}$		$s\rho_{xy,OE}$	
Global openness with														
ES	51	(42)	46,728	(18,292)	.15	(.10)	.18	(.11)	<b>.20</b>	<b>(.12)</b>	.23	(.13)	—	—
Ex	83	(62)	47,466	(17,053)	.13	(.11)	.20	(.16)	<b>.16</b>	<b>(.14)</b>	.25	(.19)	—	—
A	44	(29)	44,060	(6,364)	.09	(-.03)	.17	(.13)	<b>.11</b>	<b>(-.04)</b>	.22	(.14)	—	—
C	36	(29)	41,503	(6,144)	.02	(-.05)	.22	(.17)	<b>.03</b>	<b>(-.07)</b>	.29	(.20)	—	—
<b>Hypothesized Openness facets</b>														
Aestheticism with														
OE	3		965		.47		.13		<b>.62</b>		.15		—	—
ES	2		1,257		.00		.01		<b>-.01</b>		.00		-.08	—
Ex	9		3,908		.13		.08		<b>.17</b>		.09		.08	—
A	3	(2)	2,241	(1,241)	.08	(.04)	.05	(.03)	<b>.10</b>	<b>(.05)</b>	.03	(.00)	.12	(.07)
C	2	(1)	1,257	(257)	.04	(-.09)	.07	(N/A)	<b>.05</b>	<b>(-.12)</b>	.07	(N/A)	.07	(-.08)
Fantasy with														
OE	2		881		.40		.03		<b>.52</b>		.00		—	—
ES	2	(1)	1,257	(257)	-.19	(-.03)	.08	(N/A)	<b>-.24</b>	<b>(-.04)</b>	.09	(N/A)	-.31	(-.10)
Ex	4	(2)	2,138	(881)	.19	(.18)	.05	(.05)	<b>.24</b>	<b>(.22)</b>	.03	(.04)	.17	(.15)
A	2	(1)	1,624	(624)	-.15	(-.11)	.03	(N/A)	<b>-.19</b>	<b>(-.14)</b>	.00	(N/A)	-.17	(-.12)
C	2	(1)	1,257	(257)	-.30	(-.33)	.02	(N/A)	<b>-.39</b>	<b>(-.44)</b>	.00	(N/A)	-.37	(-.40)
Innovation with														
OE	9		2,465		.44		.09		<b>.56</b>		.08		—	—
ES	8	(6)	3,669	(834)	.27	(.23)	.04	(.06)	<b>.34</b>	<b>(.28)</b>	.00	(.00)	.27	(.22)
Ex	12		2,814		.34		.10		<b>.42</b>		.10		.35	—
A	4		1,673		-.07		.10		<b>-.09</b>		.10		-.07	—
C	6	(5)	2,893	(865)	.18	(-.05)	.16	(.06)	<b>.23</b>	<b>(-.07)</b>	.19	(.00)	.25	(-.03)
Introspection with														
OE	20		3,228		.25		.21		<b>.32</b>		.24		—	—
ES	35	(34)	9,915	(7,887)	.10	(.12)	.24	(.26)	<b>.13</b>	<b>(.15)</b>	.28	(.31)	.09	(.11)
Ex	32		13,896		.16		.13		<b>.20</b>		.15		.16	—
A	12		2,379		.06		.09		<b>.08</b>		.06		.09	—
C	13	(12)	4,381	(2,353)	.14	(.05)	.12	(.09)	<b>.18</b>	<b>(.07)</b>	.13	(.07)	.19	(.09)
Openness to emotions with														
OE	3		1,340		.23		.10		<b>.30</b>		.12		—	—
ES	4	(3)	2,350	(1,350)	.02	(.21)	.25	(.16)	<b>.03</b>	<b>(.27)</b>	.31	(.19)	-.03	(.24)
Ex	5	(4)	2,974	(1,974)	.25	(.17)	.13	(.09)	<b>.32</b>	<b>(.22)</b>	.16	(.10)	.25	(.18)
A	4	(3)	2,148	(1,148)	-.03	(-.05)	.09	(.12)	<b>-.04</b>	<b>(-.07)</b>	.10	(.14)	-.02	(-.06)
C	4	(3)	2,350	(1,350)	.05	(.08)	.09	(.11)	<b>.07</b>	<b>(.11)</b>	.11	(.13)	.09	(.13)
Openness to sensations with														
OE	9	(1)	6,932	(225)	.25	(.21)	.13	(N/A)	<b>.34</b>	<b>(.29)</b>	.16	(N/A)	—	—
ES	3		2,171		.00		.05		<b>.01</b>		.04		-.04	—
Ex	3		2,138		.06		.05		<b>.08</b>		.04		.03	—
A	3		266		.02		.07		<b>.03</b>		.00		.04	—
C	3		442		-.01		.09		<b>-.01</b>		.05		.00	—
Variety-seeking with														
OE	17	(9)	10,321	(2,260)	.26	(.30)	.10	(.10)	<b>.37</b>	<b>(.42)</b>	.13	(.11)	—	—
ES	15	(14)	7,250	(5,222)	.01	(.00)	.07	(.08)	<b>.02</b>	<b>(.00)</b>	.08	(.09)	-.03	(-.05)
Ex	28	(18)	15,011	(5,771)	.21	(.14)	.12	(.12)	<b>.29</b>	<b>(.20)</b>	.16	(.15)	.24	(.15)
A	11	(7)	4,589	(1,672)	-.03	(-.07)	.06	(.07)	<b>-.04</b>	<b>(-.10)</b>	.04	(.04)	-.03	(-.09)
C	12	(11)	5,365	(3,337)	-.12	(-.18)	.12	(.11)	<b>-.17</b>	<b>(-.27)</b>	.16	(.14)	-.16	(-.24)
<b>Hypothesized Openness compounds</b>														
Autonomy with														
OE	5	(3)	2,702	(964)	.15	(.20)	.07	(.09)	<b>.21</b>	<b>(.27)</b>	.08	(.10)	—	—
Es	11	(7)	5,008	(3,926)	.04	(.00)	.09	(.06)	<b>.05</b>	<b>(.00)</b>	.10	(.05)	.02	(-.04)
Ex	17	(15)	7,406	(5,668)	.01	(.06)	.21	(.21)	<b>.01</b>	<b>(.09)</b>	.28	(.27)	-.02	(.05)
A	9	(5)	4,217	(1,300)	-.23	(-.30)	.27	(.17)	<b>-.31</b>	<b>(-.41)</b>	.36	(.21)	-.30	(-.40)
C	11	(7)	3,279	(2,197)	-.07	(-.14)	.17	(.13)	<b>-.09</b>	<b>(-.20)</b>	.21	(.16)	-.08	(-.18)
Nontraditional with														
OE	12	(11)	5,363	(2,863)	.35	(.38)	.09	(.12)	<b>.46</b>	<b>(.49)</b>	.11	(.14)	—	—
ES	9	(6)	6,656	(1,128)	.13	(.16)	.06	(.05)	<b>.16</b>	<b>(.21)</b>	.06	(.00)	.11	(.15)
Ex	20		4,821		.09		.14		<b>.12</b>		.16		.06	—
A	8	(7)	2,838	(1,838)	-.01	(.02)	.08	(.09)	<b>-.01</b>	<b>(.02)</b>	.08	(.09)	.01	(.04)
C	11	(7)	7,704	(1,176)	-.08	(-.18)	.13	(.17)	<b>-.11</b>	<b>(-.25)</b>	.16	(.20)	-.09	(-.21)
Thrill-seeking with														
OE	4	(3)	2,498	(1,498)	.19	(.14)	.08	(.07)	<b>.25</b>	<b>(.18)</b>	.10	(.07)	—	—
ES	2	(1)	1,257	(257)	-.02	(.04)	.03	(N/A)	<b>-.03</b>	<b>(.05)</b>	.00	(N/A)	-.06	(.03)
Ex	5		1,636		.32		.10		<b>.42</b>		.12		.39	—
A	5	(4)	2,379	(1,379)	-.15	(-.08)	.08	(.04)	<b>-.20</b>	<b>(-.11)</b>	.09	(.00)	-.19	(-.10)
C	4	(3)	1,395	(395)	-.07	(-.17)	.09	(.12)	<b>-.09</b>	<b>(-.22)</b>	.10	(.12)	-.08	(-.21)

(Continued on next page)

TABLE 3.—Meta-analytic correlations of Openness measures with global markers of the Big Five. (Continued)

Trait	<i>K</i>	<i>N</i>	$\bar{r}_{obs}$	$SD_{obs}$	$\rho$	$SD_{\rho}$	$s\rho_{xy,OE}$
Tolerance with							
OE	20	3,859	.19	.23	<b>.27</b>	.30	—
ES	28	6,654	.13	.22	<b>.18</b>	.28	.15
Ex	33	14,120	.11	.09	<b>.16</b>	.10	.12
A	11	2,691	.24	.11	<b>.33</b>	.12	.34
C	9	1,788	.02	.12	<b>.04</b>	.14	.05

Note. Boldfaced values added for emphasis for correlations corrected for unreliability. For meta-analyses in which one or more correlations came between scales on the same inventory, values in parentheses indicate the values obtained when only correlations from different inventories' scales were included. *k* = number of independent samples contributing data; *N* = total sample size;  $\bar{r}_{obs}$  = mean observed correlation;  $SD_{obs}$  = observed standard deviation of correlations;  $\rho$  = mean correlation corrected for unreliability in both scales;  $SD_{\rho}$  = *SD* of corrected correlations accounting for variability from sampling error and unreliability;  $s\rho_{xy,OE}$  = semipartial corrected correlation between Openness trait and global Big Five marker, controlling for global openness; OE = Openness to Experience; ES = Emotional Stability; Ex = Extraversion; A = Agreeableness; C = Conscientiousness.

aestheticism and artistic interests in existing factor-analytically derived Openness facet taxonomies appears problematic.

Fantasy also showed a strong correlation with global openness ( $\rho = .52$ ); however, fantasy also had a strong negative correlation with global conscientiousness ( $\rho = -.44$ ). Fantasy's moderate relationship with Extraversion ( $\rho = .24$ ) generally dissipated after controlling for global openness. Fantasy's moderate negative relationship with global emotional stability was markedly weaker in the only study examining the relationship across different inventories ( $\rho = -.04$ ). Thus, although the results for fantasy pool from only a small number of studies (particularly when limited to different-inventory studies), the preliminary findings suggest that fantasy is a compound of high Openness and low Conscientiousness and possibly also low Emotional Stability. These findings are perhaps not surprising: Fantasizing might detract from the focus and self-discipline that characterizes conscientious individuals, and fantasizing might offer an escape from the anxiety and depressive thoughts and feelings of neurotic individuals. However, Openness appears to be the most important component of fantasy, as fantasizing offers an outlet for thinking and experiencing beyond what might be available in open individuals' immediate surroundings.

Innovation (and creativity) have long been conceptualized as an important component of Openness, and our meta-analytic results strongly support this perspective by showing that Openness is innovation's most strongly related Big Five factor ( $\rho = .56$ ). However, our results show that innovation implicates other Big Five traits: high Emotional Stability ( $\rho = .34$ ) and even higher Extraversion ( $\rho = .42$ ). Innovation's relationship with Emotional Stability and Extraversion remained strong even when controlling for global openness and when examining only different-inventory correlations. This is perhaps surprising: Innovation and creativity have typically been depicted as fundamentally cognitive processes, making the ties to Openness apparent. However, the findings observed here point to the importance of two traits closely linked to emotions (Watson & Clark, 1997). It might be that extraverted individuals' energy and positive emotions facilitate the creative process, whereas neurotic individuals' intense negative emotions impair ability and motivation for creative thought. Although these mechanisms require empirical evaluation, the findings here suggest that further research on the role of emotions in innovation might be especially fruitful.

Introspection and openness to emotions have a common core in directing thought and curiosity toward understanding others' behavior (introspection) and one's own emotions (openness to

emotions). The effects of Openness on both introspection ( $\rho = .32$ ) and openness to emotions ( $\rho = .30$ ) were more modest than for previous traits considered. However, introspection and openness to emotions were the two traits with the greatest variability around meta-analytic mean correlations. Introspection corresponds directly to intraception, a trait described by Hough and Ones (2001) as a compound of Openness and Emotional Stability. However, both introspection and openness to emotions showed generally small correlations with Emotional Stability ( $\rho = .13$  and  $\rho = .03$ , respectively) but considerable variability ( $SD_{\rho} = .28$  and  $SD_{\rho} = .31$ ). Openness to emotions was moderated by whether same-inventory correlations were included, with different-inventory only analyses showing  $\rho = .27$  ( $SD_{\rho} = .19$ ) for Emotional Stability. However, the substantial variability around mean correlations for these two categories suggests that although measures of these traits might be described similarly, the constructs measured by scales in these sets vary greatly in how much they incorporate Emotional Stability and Extraversion.

Openness to sensations showed a clear pattern consistent with being a weak facet related solely to Openness. That is, openness to sensations measures correlated moderately with global openness ( $\rho = .34$ ) but not with other Big Five traits. Thus, the sensitivity to aesthetic chills that McCrae (2007) describes as a universal marker of Openness might stem not only from a core interest in art and beauty, but also from individuals high in Openness having an enriched sensory experience of the world. Indeed, this facet of Openness might drive Openness's relationship with other compound traits like thrill-seeking.

The final hypothesized facet was variety-seeking. Variety-seeking had its strongest mean correlation with markers of global openness ( $\rho = .37$ ), confirming the classic notion that individuals high in Openness look for novelty and are bored by routine. However, variety-seeking was also strongly related to high Extraversion ( $\rho = .29$ ) and, when a large-*N* same-inventory correlation was removed, to low Conscientiousness ( $\rho = -.27$ ). We expected variety-seeking to simply describe a preference for change, new experiences, and avoiding routine. Thus, we expected that variety-seeking would be distinct from thrill-seeking because it would not necessarily incorporate risk-taking and impulsive behavior (and thus should be unrelated to Conscientiousness). However, the findings observed here suggest that even the preference for change might represent an aspect of risk-taking that those high in Conscientiousness often find aversive. In addition, the strong correlation with Extraversion suggests that some of the sensation-seeking aspects of Extraversion (S. Eysenck &

Zuckerman, 1978) might also promote variety-seeking. Thus, variety-seeking appears to be a compound trait consisting of high Openness, low Conscientiousness, and, to a lesser extent, high Extraversion.

*Meta-analytic results for hypothesized Openness compound traits.* In addition to this set of six hypothesized Openness facets, we meta-analyzed relationships of four hypothesized Openness compounds with markers of each of the Big Five. Hough and Ones (2001) conceptualized autonomy as a compound of low Conscientiousness and high Extraversion, and our meta-analytic findings supported Openness' role in autonomy ( $\rho = .21$ ). Rather than also correlating strongly with Extraversion and (low) Conscientiousness, however, autonomy was negatively related to Agreeableness ( $\rho = -.31$ ). These findings suggest that thoughtfulness and a drive for experience (Openness) as well as general disregard for others (Disagreeableness) are key ingredients in determining individuals' preference to be independent. However, note that the  $SD_{\rho}$  values are quite sizable for Extraversion ( $SD_{\rho} = .28$ ), Agreeableness ( $SD_{\rho} = .36$ ), and Conscientiousness ( $SD_{\rho} = .21$ ), suggesting the possible presence of moderators causing the focal correlations to vary across studies.  $SD_{\rho}$ s were not markedly changed when we limited our analyses to correlations from different inventories, although autonomy's correlation with low Conscientiousness became somewhat more pronounced ( $\rho = -.20$ ). Although the somewhat small number of studies contributing data preclude formal moderator analyses, reviewing the studies contributing data did not indicate any consistent trend based on the scales used or the samples contributing data. Although further research on autonomy is warranted, these data suggest that conceptualizing the trait should be broadened to include the effects of Openness and (Dis)Agreeableness.

Based on Hough and Ones (2001), we expected nontraditionalism to be a compound trait consisting of high Openness and low Conscientiousness. However, Table 3 shows that nontraditionalism measures are dominated by Openness ( $\rho = .46$ ), and most relationships with global markers of the other Big Five traits are modest (Conscientiousness included). The correlation with Conscientiousness becomes stronger when only different-inventory correlations are included ( $\rho = -.25$ ); however, the small  $k$  and the increase in  $SD_{\rho}$  suggest that this might simply be an effect of second-order sampling error. These findings are particularly interesting, given that facet analyses of Conscientiousness have identified traditionalism or conventionality as a facet of Conscientiousness (Roberts et al., 2004; Roberts et al., 2005) and noted that relations with Openness were relatively modest. Our findings here suggest otherwise: There is clearly a strong Openness component in these scales, whereas the influence of Conscientiousness is modest in our meta-analysis. Given the strong influence of Openness relative to the other Big Five, these results suggest that nontraditionalism is a pure Openness facet rather than a compound trait. Thus, nontraditionalism might be an expression of thoughtfulness and seeking rich and various experiences more than a spurning of obligations and norms.

We also examined global markers of the Big Five's relationships with thrill-seeking, a trait we hypothesized to be a compound of high Openness, high Extraversion, and low Conscientiousness. Thrill-seeking initially showed a moderately strong relationship with Openness ( $\rho = .25$ ), although estimates of this

relationship weakened somewhat when only different-inventory correlations were considered ( $\rho = .18$ ). However, consistent with theories emphasizing the sensation-seeking basis of Extraversion, Extraversion was the strongest Big Five correlate of thrill-seeking ( $\rho = .42$ ). In addition, once a large-sample, same-inventory correlation was omitted from the analyses, thrill-seeking showed a moderate influence of low Conscientiousness ( $\rho = -.22$ ). Interestingly, the Big Five traits implicated in thrill-seeking are the same as those in variety-seeking, although the relative importance of the Big Five differs. Perhaps the combination of high Openness and high Extraversion drives individuals to seek out sensations, but the relative balance of Extraversion and Openness directs individuals toward either variety or thrills. This particular drive could resultantly detract from individuals' Conscientiousness. Thus, our results are in line with our hypothesis that thrill-seeking is a compound trait of high Extraversion, high Openness, and low Conscientiousness.

Last, we examined the effects of each of the Big Five on tolerance, a trait describing individuals' tendency to be open-minded toward those espousing different values and traditions. Our hypothesis that tolerance would be a compound of Openness and Agreeableness is supported in these results ( $\rho = .27$  for Openness and  $\rho = .33$  for Agreeableness). Tolerance incorporates aspects of Openness's preference for thinking, experiencing, and nontraditional values. However, tolerance also adds a fundamentally interpersonal component of being willing to accept and respect others whose values are different. Thus, this compound trait results not only from open-minded thoughts and values, but also from a social orientation that is agreeable.

## GENERAL DISCUSSION

From studying 85 different Openness scales, we identified 11 conceptually distinct traits that we theoretically and empirically linked to the broad Big Five dimension Openness to Experience: aesthetics, fantasy, innovation, introspection, openness to emotions, openness to sensations, variety-seeking, autonomy, nontraditionalism, tolerance, and thrill-seeking. These traits govern a wide span of thoughts, feelings, and behaviors, ranging from vivid imagination to seeking novelty to the social and political values one holds. Across most of these traits, Openness was the Big Five global trait with the strongest relationship. Thus, although Openness has been a difficult domain of the Five-factor model to define, it is a fundamental dimension of personality that influences traits central within many domains of research.

In Study 2, we meta-analytically distinguished Openness facets from Openness compounds. Figure 1 summarizes the findings from Study 2. Four Openness traits emerged as true Openness facet traits: aestheticism, openness to sensations, nontraditionalism, and introspection. Although the 11 Openness traits identified in Study 1 indicate a variety of manifestations of Openness's general drive to experience and think about the world, aestheticism, openness to sensations, nontraditionalism, and introspection stand out as four theoretically distinct aspects of Openness that are not contingent on other Big Five traits. Aestheticism and openness to sensations conceptually align with DeYoung et al.'s (2007) openness (experiencing) meso-facet and represent a fascination and sensitivity to beauty. Nontraditionalism and introspection align with DeYoung et al.'s intellect meso-facet. These facets indicate two focal realms where individuals high in Openness direct their intellectual contemplation:

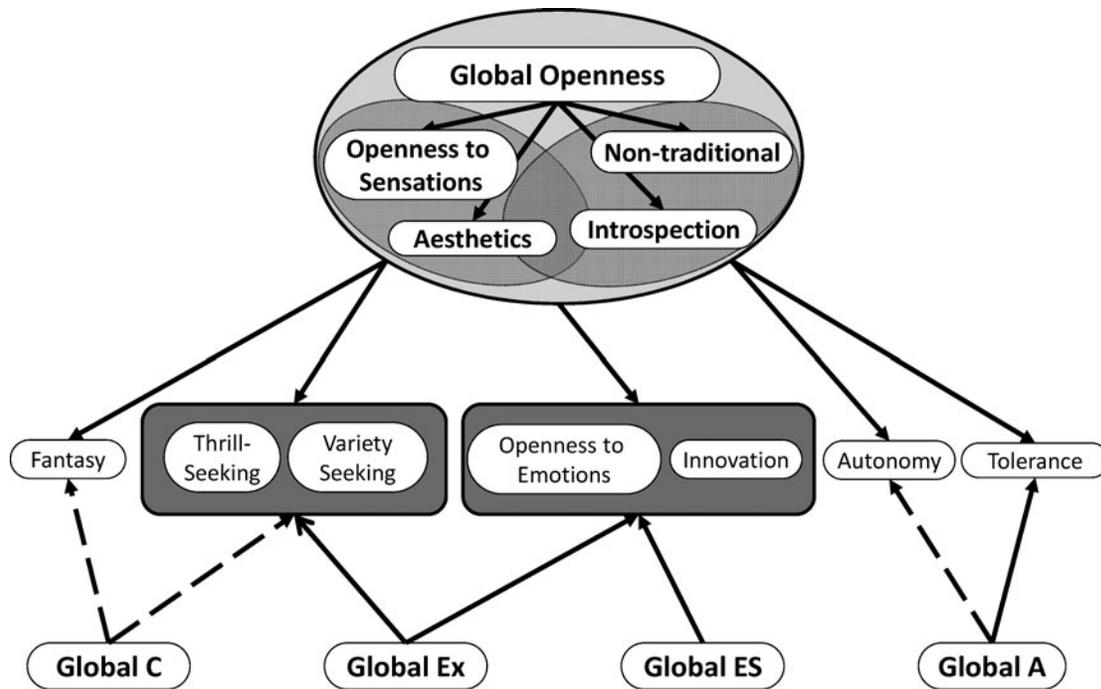


FIGURE 1.—Openness-related facets and compounds and their relationships to global markers of the Big Five. Solid lines indicate positive relationships and dashed lines indicate negative relationships.

a curiosity about the mechanisms of the mind (introspection) and self-defined views about how society should be structured (nontraditionalism).

Interestingly, these four facets have not generally appeared from factor analyses among lexical studies of the Big Five’s facets. Only nontraditionalism has shown as a distinct facet (in Perugini & Galluci [1997] as narrow-minded and unconventional factors; in Peabody & De Raad [2002] as conventionalness, a trait separate from Openness). The other facets we identified (aesthetics, openness to sensations, or introspection) do not map onto any of the facets identified in Peabody and De Raad (2002), Saucier and Ostendorf (1999), and Perugini and Galluci (1997). However, this is not surprising considering the list of adjectival descriptors that were subjected to factor analysis: Aesthetics, openness to sensations, and introspection never had more than one related adjective in any of the studies. Given that these three traits were generally strongly and uniquely related to measures of global openness, future facet measurements of the Openness domain will be incomplete if they do not also include multiple items related to these three traits.

Note that a number of Openness facets (e.g., curiosity, typical intellectual engagement, tolerance, and innovation) described in other taxonomies did not appear among the four facets in this study. In some cases (e.g., tolerance and innovation), this is because we depict these traits as Openness compounds rather than Openness facets based on their correlations with markers of other Big Five traits. In other cases, other facets (e.g., curiosity and typical intellectual engagement) might not appear in our list of facets because there are not measures that cleanly distinguish these traits from broader aspects associated with global openness. For example, although we initially identified openness to ideas, complexity, curiosity, and a meso-facet of intellect as categories of Openness traits in our qualitative sort, re-sorters

could not distinguish their associated measures from measures of global openness. Readers would be mistaken to conclude that the omission of these traits from our taxonomy indicates that they are somehow not components of Openness. Rather, our study highlights that attempts to develop measures of these narrower dimensions of Openness in personality inventories have not produced scales that appear distinctive from global openness measures. We are optimistic that emerging research that has developed distinctive measures of these narrower traits at the facet (Woo, Chernyshenko, Longley, Zhang, Chiu, Stark, this issue) and meso-facet level (DeYoung et al., 2007) can guide the field in studying these traits.

In addition to facet traits, we found that Openness is a core component of seven additional compound traits based on existing measures. Openness’s links to these compound traits should direct research on these traits’ associated cognitions, emotions, and behaviors to consider the contributions of reflective thought and a breadth of experiences. Interestingly, high Extraversion was a central important component across four of these Openness compounds. Although innovation and openness to emotions have complex thinking at their core, these compound relationships suggest that creativity and emotional self-awareness are contingent on energy or absence of lethargy (innovation) and positive affective states (openness to emotions) derived from Extraversion and Emotional Stability. The energy component of Extraversion also contributes to thrill-seeking and variety-seeking, although these traits also depict an impulsivity characteristic of low Conscientiousness. Although low Conscientiousness generally has negative consequences for success in education (Hough, 1992; Poropat, 2009), career (Barrick, Mount, & Judge, 2001), and health (Bogg & Roberts, 2004), the right combination with Openness and Extraversion promotes pursuing excitement and avoiding the mundane. In

addition, for those low in Conscientiousness, Openness promotes imagination and fantasy about a world beyond what is immediately available. Finally, two compounds involved Openness and Agreeableness. High Agreeableness pushes individuals high in Openness to accept individuals with different lifestyles and backgrounds. However, low Agreeableness pushes individuals high in Openness to prefer independence from social rules or norms.

Interestingly, the emerging distinction of intellect and experiencing as separate but related meso-facets within the Openness domain (DeYoung et al., 2007; Woo et al., this issue) did not emerge among the measures included in our studies. Although Study 1's initial sort distinguished an openness to ideas meso-facet corresponding to intellect, measures within this category were indistinguishable from global openness measures. In addition, none of the measures we reviewed emphasized a general experiencing component of Openness without also involving aspects of intellect, although more specific manifestations of experiencing seem apparent in the aestheticism and openness to sensations facets. Thus, although empirical findings suggest that experiencing and intellect represent separable components of Openness, existing measures appear to be either more broad or more specific than this meso-facet level. Continuing to develop and use measures at the meso-facet level represents an important direction for future Openness research. In addition, future research should examine the relationships among aestheticism, openness to sensations, nontraditionalism, and introspection to empirically examine how these facets align with these two meso-facet components.

Our methods for developing an Openness taxonomy differ from the factor-analytic methods most commonly used by personality researchers to study traits' dimensionality. Rather than seeing our results as a competing taxonomy, we view our approach as one that is complementary to taxonomies derived through other methods, with each having associated strengths. Our approach (a) provides clear linkages between our taxonomy and existing Openness measures, (b) capitalizes on well-developed multi-item scales administered to large samples, (c) permits examining trends and emerging differences across multiple inventories, and (d) more cleanly parses apart facet from compound traits. However, unlike factor-analytic or lexical methods, our approach is inherently bounded by the way inventory creators have developed measures. To the extent that the body of existing measures omits relevant Openness traits or blurs meaningful distinctions between narrower traits, our approach might not highlight dimensions that could appear empirically through factor analyzing individual items. Examining consistencies and discrepancies between our qualitative or meta-analytic approach and factor-analytic research might inform researchers about which traits should be included, which traits are most distinct from one another, and which traits might appear distinct because of the influence of other Big Five traits.

The role of Openness has been studied across many domains of psychology, and the broad factor of Openness is an influential component of many narrower personality traits. However, when Openness is generally conceptualized, measured, and meta-analytically integrated, researchers have generally treated Openness as a unitary construct. Although this might be most appropriate for studying and predicting multifaceted criteria (Ones & Viswesvaran, 1996), considering particular facets of Openness or Openness compounds might be more appropriate when

the criterion of interest is similarly narrow and conceptually aligned with a particular Openness facet. The taxonomy presented here serves to not only guide researchers in understanding and measuring Openness as a broad trait, but also to select the most relevant Openness facets or compounds for explaining and studying a phenomenon of interest.

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