CHAPTER 13

WHAT MAKES A GOOD STRUCTURAL MODEL OF PERSONALITY? EVALUATING THE BIG FIVE AND ALTERNATIVES

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Research on personality structure addresses two basic questions: What are the units (constructs, variables) that one can use to describe and study personality and in what ways are those units related or organized? Gordon Allport (1958) identified the problem of personality structure—the *units problem*—as the foundational question for personality psychology; no substantive research can proceed without first attempting to answer these questions, however partially or provisionally. This chapter's goal is to discuss and critique various proposals about what constitutes a "good" solution to the units problem and then to review approaches that have drawn personality descriptors from language. After explaining the rationale for studies of person descriptors in diverse languages, this chapter discusses insights that have been gained from such studies, including insights about the strength and limitations of the well-known Big Five model. Because inquiries into the structure of attributes depend significantly on how personality and character are defined, we begin there.

DEFINING PERSONALITY (AND CHARACTER AND TEMPERAMENT)

Definitions of personality are consequential. These definitions, along with ancillary assumptions (both stated and unstated), affect how researchers select and organize variables when studying personality phenomena. Allport (1937) cataloged 50 distinct meanings of the concept of personality. These meanings can be arrayed in a continuum ranging from one's externally observable manner to one's internal self. Allport's own preferred definition—"personality is the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment" (p. 48)—was a *biophysical* conception focusing on attributes within a person—"what an individual *is* regardless of the manner in which other people perceive his qualities or evaluate them" (p. 40). Allport's definition is consistent with his desire to see personality in terms of neuropsychic dispositions reflected in trait names that describe more than evaluate. For Allport, the more evaluative (or censorial) the term, the less reference to personality and the less value for the psychologist.

Other ways of defining personality, consistent with what Allport (1937) called a *biosocial* view, emphasize more external or transactional types of attributes. These include (a) the role one assumes or the status one has achieved in society, (b) one's external appearance (including one's attractiveness), and (c) the reactions of others to the individual as a stimulus—the person's social stimulus value (May, 1932)—including social effects that may contribute to a person's reputation. Including such variables, one arrives at a broad definition: Personality is all of the attributes, qualities, and characteristics that distinguish the behavior, thoughts, and feelings of individuals. This definition corresponds roughly to that guiding selection of variables in some lexical studies (Benet-Martínez & Waller, 1997; Saucier, 1997; Tellegen & Waller, 1987).

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A workable middle-of-the-road definition is that of Funder (2001): Personality is "an individual's characteristic patterns of thought, emotion, and behavior, together with the psychological mechanisms—hidden or not—behind those patterns" (p. 2). This means characteristics that are simultaneously (a) ascribed to individuals, (b) stable over time, and (c) psychological in nature are linked to psychological mechanisms. Whether external types of attributes are, by this definition, part of personality can be ambiguous.

Terms like *temperament* and *character* tend to be defined more narrowly than personality. Rothbart and Bates (1998) defined temperament as "constitutionally-based individual differences in emotional, motor, and attentional reactivity and self-regulation" (p. 109). Definitions of the term character, in contrast, emphasize volition and morality. Allport (1937) stated that when "personal effort is judged from the standpoint of some code" (p. 51) based on social standards, it is called character. "Character is personality evaluated" (1937, p. 52), stated Allport: He considered such an ethical standpoint on personality unnecessary for psychology. And indeed, during the period of Allport's greatest influence, use of the term *character* became uncommon in personality psychology. Recently, the term *character* has been resuscitated in reference to personality dimensions (such as self-directedness, cooperativeness, or self-transcendence) that are, in contrast to dimensions of temperament, theorized to be less heritable, later developing, influenced by processes of maturation, and representing individual differences in self–object relationships (Cloninger, Bayon, & Svrakic, 1998). Whether evidence will support this way of differentiating character and temperament is uncertain (cf., Ando et al., 2002).

A fuzzy and often implicit boundary of many definitions of personality (and temperament and character) is that the units are selected and operationally defined at a level of analysis that is relevant to social meaning or subjective conscious experience (Funder & Colvin, 1991). For example, individual differences in handedness or subcomponents of working memory often are not included in lists of personality attributes, even though they are temporally stable and cross-situationally consistent tendencies of behavior and thinking, respectively, and thus would fit many explicit definitions of personality when read literally. Other approaches to personality have employed units that are not themselves part of social discourse or the individual's phenomenal experience but nevertheless are theorized as the direct precursors or underpinnings of socially or personally meaningful behavior (such as implicit motives).

Three Views of Personality Attributes

These conceptual matters are not merely pedantic. They influence the formation of theories and hypotheses, the selection of variables, and the choice of measures. We can distinguish two quite different views of what personality is, views that are evident not only in the previous discussion but also in lines of dispute between models of personality–attribute structure.

In a *realist* view, which traces back to Allport, personality involves primarily latent dispositions that arise from within an individual and account for much of the consistency in one's behavior. When attempting to characterize someone's personality, the fundamental goal is to provide an accurate description of actual or potential behavior (of oneself or of someone else). Following on this assumption, observable indicators of personality—whether they be natural-language terms or something else—should be descriptions of objectively measurable behavior or neuropsychic structures that produce behavioral tendencies. These indicators should demonstrate stability and should reflect traits that presumably exist objectively in the person described and do not merely reflect a perceiver's reactions or evaluations. For example, *talks a lot* implies stability whereas *is surprised* obviously would be transitory and less relevant; *introversion* would seem to be intrinsic to the individual, whereas *famous* describes reputation and *evil* reflects the perceiver's moral evaluation of the target. Observability may depend on unusual or specific circumstances, but it still must be possible in principle; for example, *courageous* may refer to behavior that is exhibited only rarely, and *dishonest* may reflect lying only in strategic circumstances. Nevertheless, in the realist view, there must be an objective difference that is at least potentially observable between people who are more

or less courageous or more or less honest. The realist view is well reflected in Five-Factor theory (McCrae & Costa, 1996), according to which patterns of responses to self-report items reveal biologically driven endogenous dispositions that are the bases for the key dimensions of personality. The capacity of self-report to reveal (ultimately) biology depends on the proposition that the self-report is telling us what the individual is really like.

A *constructivist* view would critique the realist view on several counts. According to this perspective, the realist approach starts from perceptions that are shaped by the biases, stereotypes, and lay theories of the perceiver (perhaps including the scientist, who after all is a human perceiver, too) and then reifies them into objective descriptions of purportedly intrinsic properties. The strong version of the constructivist critique suggests that personality descriptions—particularly Allportian traits—have little to no validity (Mischel, 1968) and reflect biased or arbitrary constructions by perceivers (D'Andrade, 1965; Mischel, 1968; Nisbett & Ross, 1980; Shweder, 1975). The strong constructivist critique became prominent in the 1960s and 1970s and greatly dampened interest in personality. Ultimately, strong constructivism was not supported empirically, and its demise gave rise to a growing interest in personality research since the 1980s (see reviews in Kenrick & Funder, 1988; Swann & Seyle, 2005).

Much fertile ground lies between the strong realist view and the strong constructivist view. Contemporary research supports the idea that personality descriptions in large part can correspond to real characteristics of the described person but still reflect the perspective of the perceiver (Funder, 1995; Kenny, 1994; Vazire, 2010). One important perspective to arise out of this middle ground is the *functionalist* view. According to the functionalist view, personality description (whether done by the self, by social others, or by scientists) is a perceptual process that cannot be separated fully from the perceiver's goals and the context. When the realist says that a structural model of personality identifies the important dimensions of individual differences, the functionalist asks, "Important to whom and for what purpose?" Personality attributes do not exist in language or in psychologists' inventories merely for decontextualized and bloodless description. Rather, attributes exist for perceivers, who have some reason for using them (Mollaret, 2009; Srivastava, 2010; Swann, 1984; Zebrowitz & Collins, 1997), hence the findings that most natural-language personality terms are evaluative rather than neutral (Saucier, 1994) and that people make more differentiated judgments when rating others' social effects or affordances than when rating concrete behaviors or abstract traits (Mignon & Mollaret, 2002). Even expert personality models reflect the concerns of the experts who made them, which is perhaps why neuroticism is represented so heavily in clinical assessment instruments even though in studies of natural-language personality attributes, it accounts for the second-smallest share of variance among the Big Five (John & Srivastava, 1999).

Some functionalists are critical of the very idea of creating a general model of personality structure, arguing that trait terms have no meaning outside of usage patterns and context (Mollaret, 2009). But others are more open to such efforts and propose that the resulting models will reflect aggregated concerns and social functions for perceivers, whose perceptions typically are grounded in (but not isomorphic with) the real characteristics of targets (Srivastava, 2010). From a functionalist perspective, the link from questionnaire items to biology would be more complicated because biology-driven dispositions interact with various sociocultural imperatives about what makes a person worthwhile or useful (or not) to produce personality judgments and their covariance structure.

We might allow that ascribed attributes indeed could be relatively objectively verifiable, particularly when there is convergent validation across observers and across time, situations, types of data, and types of items that all tap into the same attribute. But even then, by a functionalist view, the attributes are not fixed internal properties. One critique holds that personality attributes simply reflect the perception of a relative position within a distribution of variation among individuals (Mollaret, 2009). For example, Mollaret (2009) compared personality attributes to the attribute of reliability in an automobile. Reliability is something that car buyers care about (the construct serves a function for them). But reliability

is not literally a piece of the structure of a car in the way that an engine or radiator is. Mollaret also posited that reliability must be assessed relative to some reference set (one car in comparison to other cars) and argued that the same is true of personality attributes—they do not have an independent existence in the way that an engine or a brain does.

Attributes often inform perceivers' decisions even when not fully verified in this manner (indeed, given the pace of life, they must), and they are used in ways outside of a disinterested search for truth about what a person is really like. For one thing, they sometimes simply may reflect the effect the person has on others. More broadly, human social life involves many decisions—whom to select for this or that role (e.g., whom to hire, whom to marry), or which actions in which to engage or not engage with respect to a person already in a role (e.g., can I be openly critical or not?). Personality judgments inform and guide these decisions. People typically "characterize" people for a decision-making purpose, which involves an attempt to make the most accurate and objective possible description (like a scientist) but also implies a judgment regarding some kind of functional worth. Thus, personality includes what we infer about someone regarding their worth or usefulness for various particular purposes that are recurrently important in social life, the inferences being based on observed, characteristic patterns of thought, emotion, and behavior. Cultural contexts can introduce differences in how personality judgments are made because cultural contexts (the rule system in the environment) shape the particular array of purposes that are recurrently important for the person making the judgment.

Let us annotate, therefore, the middle-of-the-road definition provided earlier. Dimensions of personality will reflect patterns of behavior, feeling, and thinking. But such patterns will be interpreted through—and may be organized by—schemas for whatever are judged to be the most crucial criteria on which to evaluate people. In that way, dimensions reflect the primary questions to ask about another person's worth or usefulness, and these questions cannot be assumed necessarily to be invariant across individuals or across populations; within differing cultural contexts (because of variant standards and values) questions may be variously given less importance or more importance.

Parsimony in Personality Models

Among the scales in current personality inventories, one finds a bewildering variety of constructs. Among single words potentially referring to personality attributes in modern world languages, the variety is overwhelming: Allport and Odbert (1936), for example, catalogued nearly 18,000 words from *Webster's Second International Dictionary* referring to characteristics that might be used to distinguish one human being from another. Some parsimonious summary of this vast domain is needed, and thus the interest in finding a scientifically compelling taxonomy of all personality attributes. A taxonomy systematically divides phenomena into ordered groups or categories, providing a standard scientific nomenclature that facilitates communication and aids in the accumulation of empirical findings. As implied by our previous discussion, a taxonomy developed within any particular population may be influenced by the kind of questions about people (or decision purposes) most recurrently emphasized within that population. If one wishes to minimize this variation in emphasis, one should look at taxonomies generated from multiple populations and emphasize what these taxonomies have in common.

The most useful procedure for grouping the phenomena in a personality taxonomy has been factor analysis. Factor analysis can be considered to be a variable-reduction procedure, in which many variables are organized by a few factors that summarize the interrelations among the variables. Factor analysis has been used to develop a wide range of personality inventories, each of which represents essentially a proposed taxonomy of the most important attributes.

What Makes a Structural Model Good?

Personality inventories have differed in their selection of variables. Applying the functionalist perspective to scientists (a special class of person perceivers), we can say that *variable selection inevitably is guided by the investigator's beliefs about what makes a structural model good.* These beliefs involve criteria that can be applied both to variables and factors formed

from variables, and they tend to focus on criteria from among the following eight alternatives:

1. ***Social importance*** of the variables or factors—that is, whether they are "shown to interact powerfully with social activities widely regarded as important" (Eysenck, 1991, p. 785).
2. ***Predictive power and validity*** of the variables or the factors they form. This criterion relates to social importance but relies more on predictive efficacy in specific practical contexts.
3. ***Comprehensiveness*** of the set of variables or factors, so that they cover "a wide field, and [are] not restricted to a narrow segment of personality research" (Eysenck, 1991, p. 774).
4. ***Reliability and cross-time stability*** is an important criterion because personality attributes are expected to be relatively consistent across time. Findings from studies with multiple time points are therefore relevant to evaluating a model.
5. ***Generalizability across types of data***—for example, we should be less interested in a variable or factor found only in self-report data than in one found to be important also in ratings by knowledgeable others or in observer data. Thus, findings from studies with multiple observers are relevant to evaluating a model.
6. ***Generalizability across cultures and languages*** might be termed *universality* (Costa & McCrae, 1992, p. 653) or independence of "national, racial and cultural differences" (Eysenck, 1991, p. 784).
7. ***Causal basis*** established for the variables or factors—for example, personality characteristics are known to be moderately heritable (Bouchard, 1994), which has led to efforts to identify gene variants associated with personality factors (Terracciano et al., 2010). There may be causal factors in the social environment as well.
8. ***A theory***, plausible and logically consistent, related to personality functioning or dynamics, that is linked to the model. A theory enables testable deductions and hypotheses to explain known phenomena and predict phenomena that are not yet known (cf. Eysenck, 1991, p. 774). All other things being equal, a wide-scope theory that accounts for many phenomena is superior to one of narrow scope. For personality, an ideal structural model would afford an integration of findings from related fields, such as emotion, motivation, and cultural psychology.

Each is a useful criterion, but which is the most important? Because of the diversity of criteria (and of combinations of criteria) employed by developers of personality inventories, the long tradition of packaging structural models into multiscale inventories led to little agreement on the most important variables of personality. The literature on the structure of personality characteristics was formerly a maelstrom of competing inventories, mostly proprietary, embedded in a mass of mutually isolated research measures. The lexical approach has brought more order to the field. This approach, although not perfectly engaging *all* relevant criteria, has enabled the simultaneous application of *most* of the major criteria for the goodness of a structural model and has created more potential for agreement on a scientific taxonomy.

The Basis for the Lexical Approach

As has long been recognized (e.g., Allport, 1937; Cattell, 1943; Goldberg, 1981; Norman, 1963), some of the most basic personality attributes might be discovered from studying conceptions implicit in use of the natural language. If a distinction is highly represented in the lexicon, it can be presumed to have practical importance. Folk concepts of personality (Tellegen, 1993) provide basic but not exhaustive (necessary but not sufficient) components for a science of personality attributes (Goldberg & Saucier, 1995). The degree of representation of an attribute in language has some correspondence with the general importance of the attribute in real-world transactions. This key premise of the lexical approach links semantic representation directly with the *social importance criterion.*

If terms in a language are used as variables, an attribute that is represented by multiple terms likely will appear as a factor. Moreover, if the factor includes terms that are used with high frequency, the social importance of the factor is underscored. Such factors are but a starting point: The lexicon could omit some scientifically important variables,

and the meaning of single natural-language terms can be vague, ambiguous, or context dependent (John, Angleitner, & Ostendorf, 1988). The vagueness and ambiguity can be analyzed, of course. In many cases, an attribute-descriptive adjective can be understood alternatively in numerous ways (Mollaret, 2009). Take for example *outgoing*. One meaning might be behavioral—"socializes a lot." Another would be a subjective mental state—"feel comfortable around strangers." There are also effects on others—"is considered charming"—and affordances—"am easy to get to know." One who emphasizes intrinsic traits would prefer the first two meanings to the latter two, but perceivers may be meaning any of these when labeling someone as outgoing. When a descriptor has two meanings that differ widely in evaluation (e.g., *curious* as inquisitive or as strange), the ambiguity will lead to high variability.

Many variables, and potential factors, might have rich semantic representation and thus satisfy a social-importance criterion, so we should not rely on this criterion alone. The lexical-study paradigm has relied especially on a singularly demanding criterion that is the most potentially efficient in rapidly reducing the field of candidate structures. The *cross-cultural generalizability criterion* can be used to judge among competitor taxonomic structures. Structural models derived within one limited population or sample are prone to reflect the unique patterns found—or the uniquely emphasized combination of questions recurrently asked—about people within that population or sample. Culture-specific patterns surely are interesting. But a model that transfers well across populations—either by providing one structure that applies well everywhere or a flexible framework that specifies a priori how and why a structure will vary with local conditions—better realizes the scientific ideals of replicability and generalizability.

Cross-cultural generalizability might be applied either leniently or stringently. The lenient way is to export a set of variables (most often, those found in a single personality inventory) for use in other populations, and then examine whether these preselected variables (after translation, if necessary) generate the same factor structure in each new language or culture (as in Rolland, Parker, & Stumpf, 1998; Rossier, Dahouru, & McCrae, 2005). If the scales in a personality inventory generate similar factors across populations, one might argue (as in McCrae & Costa, 1997) that the structure is generalizable. This relatively undemanding test shows only that the model can be recovered when personality variables in a new language are cut down, in a manner akin to the mythical Procrustes, to the specifications of one model. A large variety of models may be highly exportable in this manner, which does not mean each of them is a human universal.

A more stringent test is to identify the most salient and important personality concepts within each linguistic or cultural context, derive an indigenous factor structure from those variables, and then examine the extent to which this new structure corresponds to previously proposed models. A model that could meet this test in any language could be considered far more universal than a structure that simply showed a high degree of translatability.

The lexical approach involves the more stringent test. Analyses are carried out separately within each language, using a representative set of native-language descriptors, rather than importing selections of variables from other languages (e.g., English). Generally, factors identified by the lexical approach have fared well with respect to the first six of our criteria, generating a relatively comprehensive set of socially important personality constructs that evidence consistency across time, good predictive validity, and generalizability across differing types of data as well as across cultures. Thus, these factors deserve in-depth consideration.

WHAT WE LEARN FROM NATURAL-LANGUAGE PERSONALITY DESCRIPTIONS

The majority of lexical studies of personality descriptors have attempted to test the most widely influential personality model of the past two decades—the Big Five factor structure (Goldberg, 1990, 1993; John, 1990). The Big Five factors customarily are labeled extraversion, agreeableness, conscientiousness, emotional stability (or its opposite, neuroticism), and intellect (or, in some inventories, openness to experience). Much earlier studies

(see Digman, 1990; Goldberg, 1993; John, 1990) showed signs of the Big Five structure, but its identification in studies of natural-language descriptors in English (e.g., Goldberg, 1990) was decisive. If we value cross-cultural generalizability, however, applicability to one language is not enough. And beyond English, lexical studies have provided only mixed support for the Big Five.

Lexical studies have been completed in some 16 languages—English, Dutch, German, Polish, Czech, Croatian, French, Italian, Spanish, Hungarian, Hebrew, Greek, Turkish, Filipino, Korean, and Chinese. These lexical studies have revealed a great deal about the relative robustness of the Big Five as well as provided information about other less well-known candidate models with a different number of factors. We now discuss the most consistent findings from lexical studies to date by describing models with successively more factors. The more consistent findings suggest a panhuman pattern. Because they should remove by force of aggregation many of the culturally specific emphases in personality content, they should have increased correspondence with biological factors. They also may have increased correspondence with those aspects of cultural contexts that are relatively universal.

What If We Allowed Ourselves Only One Factor?

Several lexical studies have reported evidence about factor solutions containing only one factor (Boies, Lee, Ashton, Pascal, & Nicol, 2001; Di Blas & Forzi, 1999; Goldberg & Somer, 2000; Saucier, 1997, 2003). The findings from these studies have been quite consistent. The single factor contrasts a heterogeneous mix of desirable attributes at one pole with a mix of undesirable attributes at the other pole. This unrotated factor can be labeled evaluation.

Recent empirical results have identified a similar, partly heritable "Big One" factor in personality-questionnaire scores (Musek, 2007; Rushton, Bons, & Hur, 2008; for an exception, see de Vries, 2011). The content emphases of this factor may vary considerably, of course, within a given cultural context depending on what variables are entered into the analysis. Its content emphases also may vary systematically by cultural context. Thus, the interpretation of this factor remains unclear. An individual's score on this large factor may have as much to do with fit to culturally normative expectations as with superiority of adaptive performance. In other words, it is not clear what single question the scores on this factor would answer.

Findings of a single large evaluative factor are no doubt related to a classic finding in psychology. In judgments about the meanings of diverse objects in a wide array of cultural settings, a global evaluation factor (good vs. bad) was found recurrently to be the first and largest factor (Osgood, May, & Miron, 1975). Evaluation is also the first factor to emerge in the cognitions of young children. Whereas older children employ more differentiated trait concepts, younger children typically rely on global, evaluative inference (Alvarez, Ruble, & Bolger, 2001).

Are Two Factors as Replicable as One?

Two-factor solutions from several lexical studies also suggest a consistent pattern: One factor includes attributes associated with positively valued dynamic qualities and individual ascendancy, whereas the other factor includes attributes associated with social self-regulation, socialization, solidarity, and community cohesion (Caprara, Barbaranelli, & Zimbardo, 1997; Di Blas & Forzi, 1999; Digman, 1997; Goldberg & Somer, 2000; Høebícková, Ostendorf, Osecká, & Cermák, 1999; Paulhus & John, 1998; Saucier, 1997, 2003; Shweder, 1972; White, 1980). Such a factor structure resembles that embodied in the theoretical model of Bakan (1966), who labeled the two factors agency and communion. In addition, these two factors may be aligned with some of the other sets of dual personological constructs reviewed by Digman (1997) and by Paulhus and John (1998), including Hogan's (1983) distinction between "getting ahead" (dynamism) and "getting along" (social self-regulation).

Exemplifying this "Big Two" is a basic bivariate structure of personality attributes evident across lexical studies in nine languages, selected to maximize linguistic diversity (Saucier et al., in press). In this multilanguage comparison, the adjectival concepts best representing social self-regulation were honest, kind, gentle, generous, good, obedient,

respectful, and unselfish—or the opposites thereof. Those best representing dynamism were active, brave, lively, bold, and cheerful and (representing the opposite pole) timid, weak, and shy.

To date, this two-factor structure appears to be as ubiquitous across languages and cultures as is the one-factor structure. Moreover, unlike structures described later, both of these structures are relatively impervious to variable-selection effects; they appear whether there is a relatively restricted or inclusive selection of variables (Saucier, 1997) and whether one studies adjectives or type nouns (Saucier, 2003). Indeed, Saucier (2010) found a similar Big Two even when analyses were restricted to social-effects terms. In this domain of variables, the absence of normative self-regulation is reflected in a dimension emphasizing attributes connoting that one is a source of irritation or pain to others. The other dimension (related to dynamism) emphasizes attributes connoting that one is a source of stimulation or pleasure to others. Thus, these dimensions tend to be organized by the hedonic motivational preoccupations of perceivers.

This constellation of two factors is also related to the three most ubiquitous dimensions of affective meaning, which include potency (or strength) and activity in addition to evaluation (Osgood, May, & Miron, 1975). In judgments about human targets, potency and activity tend to merge into a single dimension that Osgood and his associates called *Dynamism*.

Interestingly, in English the descriptive phrase "s/he has a lot of personality" appears to concern mainly dynamism (e.g., active, brave, lively). The phrase "s/he has character (or has good character)," in contrast, appears to concern mainly social self-regulation (e.g., honest, kind, gentle). Allport (1937) sought to exclude ethical judgments from the study of personality, but one of the two main factors focuses largely on ethical aspects. This factor may reflect a universal preoccupation within any cultural context to distinguish those who are adhering to social and moral norms from those who are not.

In summary, we can say that, in the Big Two, one dimension involves questions about character and morality—about self-regulation—which have to do with likely safety versus aversiveness for others. The other dimension involves questions about self-expression, potency, and activity—how much "personality" someone has—which have to do with how stimulating, interesting, and even pleasurable a person is for others.

A Big Three? If So, Which Three?

Work by Peabody and Goldberg (1989) has brought out the tendency of three-factor structures in lexical studies to be more replicable than structures with four or more factors. Support comes from De Raad et al. (2010), who made pairwise comparisons among the structures generated by lexical studies in 12 languages, from structures of only one factor up to those with as many as six. Aggregating and evaluating these comparisons they concluded that structures with one to three factors are more replicable across languages than those with more factors, even if these more replicable structures have a somewhat noisy signal (so that interpair congruences are less than stellar). The study seems to have mishandled the assignment of agreeableness and honesty labels to factors in some languages (Ashton & Lee, 2010), affecting the reported estimates for the six-factor solutions. But even were this corrected, the basic conclusion would be unlikely to change. The main caveat is that the range of languages analyzed by De Raad et al. includes none from Africa and severely underrepresents Asia. Saucier et al. (in press) analyzed a wider range of languages in studying the Big Two. An important question is whether, in a wider range of languages, the robustness of the Big Three will be maintained.

What are these three recurrent factors? Because the labels applied to them are the same as for three of the Big Five (extraversion, agreeableness, and conscientiousness), they often are assumed mistakenly to be identical to Big Five dimensions. But in fact each is somewhat broader. One factor includes not only classic extraversion descriptors but also those for assertiveness, forcefulness, and even fearlessness, cleverness, imagination, and talent; it differs little from Big Two dynamism. The other two factors basically split the Big Two's social self-regulation factor. One is composed of honesty and agreeableness variables, involving self-regulation

that benefits others, is moral in nature, and may be altruistic; we might call this sociomoral self-regulation. The other reflects conscientiousness (plus stability and reflectiveness), involving self-regulation (impulse control, orderliness, industriousness) that in many cases would help one to reach personal goals; we might call this task-oriented self-regulation.

The questions addressed by the dimensions in the Big Three model partly resemble those for the Big Two. The difference is that instead of one self-regulation question there are two: One concerns moral character, typically involving shared norms and standards and being more relevant for collective cooperation, whereas the other concerns self-discipline in carrying out valued tasks, using personal norms and standards and being more directly relevant for individual goals.

Regularities at the Five-Factor Level

The Big Five model is based in good part on those lexical studies that were the first reported (prior to 1994). Lexical studies have reported mixed results since then. Lexical studies have yielded Big-Five–like structures most consistently in languages from the Germanic and Slavic language families of northern Europe: German (Ostendorf, 1990), Dutch (De Raad, Hendriks, & Hofstee, 1992), Czech (Høebícková, Ostendorf, & Angleitner, 1995), Croatian (Mlačić & Ostendorf, 2005), Polish (Szarota, 1996), and English (Goldberg, 1990; Saucier, 1997; Saucier & Goldberg, 1996). Although a study in Turkish (Goldberg & Somer, 2000) also found a structure with much resemblance to the Big Five, studies of other non–Northern European languages (e.g., Church, Katigbak, & Reyes, 1998; Church, Reyes, Katigbak, & Grimm, 1997; Di Blas & Forzi, 1998; Szirmák & De Raad, 1994) have led to results that are less clearly supportive. The most common problems have been failures of a clearly interpretable intellect factor to appear where expected in the Five-Factor solution, as in Italian (De Raad, Di Blas, & Perugini, 1998), Hungarian (Szirmák & De Raad, 1994), and Greek (Saucier, Georgiades, Tsaousis, & Goldberg, 2005). The Chinese lexical study (Zhou, Saucier, Gao, & Liu, 2009) analyzed self- and peer-rating samples separately and found somewhat different structures in these samples at the five-factor level; the Big Five was replicated marginally in self-ratings and quite poorly in the peer ratings.

Several lexical studies have included a relatively broad selection of variables, each including many terms that could be classified as referring to emotions and moods or as being unusually highly evaluative, and two of these studies (Goldberg & Somer, 2000; Saucier, 1997) included terms referring to physical appearance. None of these analyses has found the Big Five in a five-factor solution. The appearance of the Big Five as the first five factors is clearly contingent on one's variable-selection procedure.

Among the five factors, the single most problematic from the lexical-study standpoint is intellect–openness, although neuroticism or emotional stability also demonstrates poor cross-cultural validity (Rolland, 2002; cf. Peabody & De Raad, 2002). These problems tend to vanish if one compares translated versions of the Revised NEO Personality Inventory (NEO–PI–R; Costa & McCrae, 1985) in analyses with various populations. Reports from using translated measures in Zimbabwe and elsewhere, however, continue to raise doubts about true cross-cultural applicability of the openness construct (Cheung et al., 2008; Piedmont, Bain, McCrae, & Costa, 2002). Piedmont et al. noted that "in a traditional society, where options and innovations are distinctly limited, individual differences in O may not be perceived, or may not be sufficiently important in daily life to warrant the development of a relevant vocabulary" (p. 171), implying that openness is not a salient dimension in a preindustrialized, rural world. Elsewhere, Piedmont and Aycock (2007) found that, among the five domains, openness vocabulary in English was the last to emerge historically, with a large group of these terms entering the lexicon in the mid-19th century.

Over the past few decades, the Big Five (and its sibling the Five-Factor) Model has been immensely helpful to scientists in organizing and standardizing knowledge, accomplishments that should not be denigrated as one points to limitations in the degree to which lexical studies actually have supported this model. The limitations do suggest, however, that alternative models might have generated the same

accomplishments had they been proposed, say, in the 1980s (and had the first lexical studies been in, say, French, Korean, and Filipino rather than English, Dutch, and German) and that moving to an alternative model is worth consideration.

Lexical Six-Factor Models

Ashton et al. (2004) have presented evidence that many of the lexical studies conducted to date yield a consistent pattern in six-factor solutions. Although the structure was first detected in studies of Korean (Hahn, Lee, & Ashton, 1999) and French (Boies et al., 2001), it has appeared to a recognizable degree in Dutch, German, Hungarian, Italian, Polish, and Turkish. This structure seems less bound to the Germanic and Slavic language families than is the Big Five.

Empirically, the extraversion, conscientiousness, and openness–intellect factors in this Six-Factor Model differ relatively little from corresponding factors in the Big Five. The other three factors emerge largely out of the interstitial areas between Big Five factors: emotionality from Big Five (low) emotional stability and (low) extraversion, agreeableness from Big Five agreeableness and emotional stability, and honesty–humility from Big Five agreeableness and conscientiousness. Especially in the case of honesty–humility, however, these factors are not entirely reducible to combinations of the two Big Five factors mentioned. This explains why six-factor predictive multiple *R* values can well exceed those for the Big Five (Ashton & Lee, 2001a).

Evidence to date indicates that the replicability of the six-factor structure across languages may be about equal to that for the Big Five (e.g., De Raad et al., 2010), if one emphasizes primarily European languages. It may exceed that for the Big Five, if emphasizing languages with origins beyond north Europe. Even if cross-language replicability were about equal, the Six-Factor Model might be judged superior because it provides more information than the Big Five.

Analyses leading to the Big Five, and the six-factor structure of Ashton et al. (2004), have involved, in effect, removal of the most extremely evaluative terms at an early stage of the variable-selection process. This follows the Allportian practice; Allport and Odbert (1936) and Norman (1963) carried out removal of purely evaluative terms. Also among those removed have been terms that can refer to either stable and temporary attributes (e.g., happy, tired, bored), tendencies to affect others in a particular way (e.g., likeable, annoying, attractive), and relative eccentricity (e.g., average, strange, unusual). Saucier (2009) examined factors from previous lexical studies using a wider selection of attributes, including all or most of these exclusion categories, in seven languages (Chinese, English, Filipino, Greek, Hebrew, Spanish, and Turkish), finding six recurrent factors: conscientiousness, negative valence (including honesty and propriety), agreeableness, resiliency (vs. internalizing negative emotionality), extraversion, and originality or talent. These six factors were related quite strongly to those found by Ashton et al. (2004). In U.S. data, markers for this wideband Big Six showed substantial incremental prediction of important criterion variables over and above that provided by standard Big Five markers (for a different study with similar conclusions, see Thalmayer, Saucier, & Eigenhuis, 2011). The Big Six was not derived mainly out of languages of north European origin, so we might expect its cross-cultural generalizability to exceed that for the Big Five.

Beyond the Big Six level, no set of relatively independent factors has appeared to be highly replicable. A proposed Big Seven structure (Tellegen & Waller, 1987) turned out to have inconsistent replication across languages, although most of its elements are incorporated in the Big Six delineated by Saucier (2009), a structure derived partly from the Big Seven studies. There have been attempts to identify replicable subcomponents using lexical variables (Peabody & De Raad, 2002; Saucier & Ostendorf, 1999), but these have not yet led to any consensual model.

A HIERARCHICAL MODEL OF FACTOR EMERGENCE

Figure 13.1 presents a visual conception of the pattern of factor emergence evident from lexical studies. This is a radial hierarchy: One begins in the middle. If only one factor is allowed, that is a general evaluation factor. If two are allowed, one is social

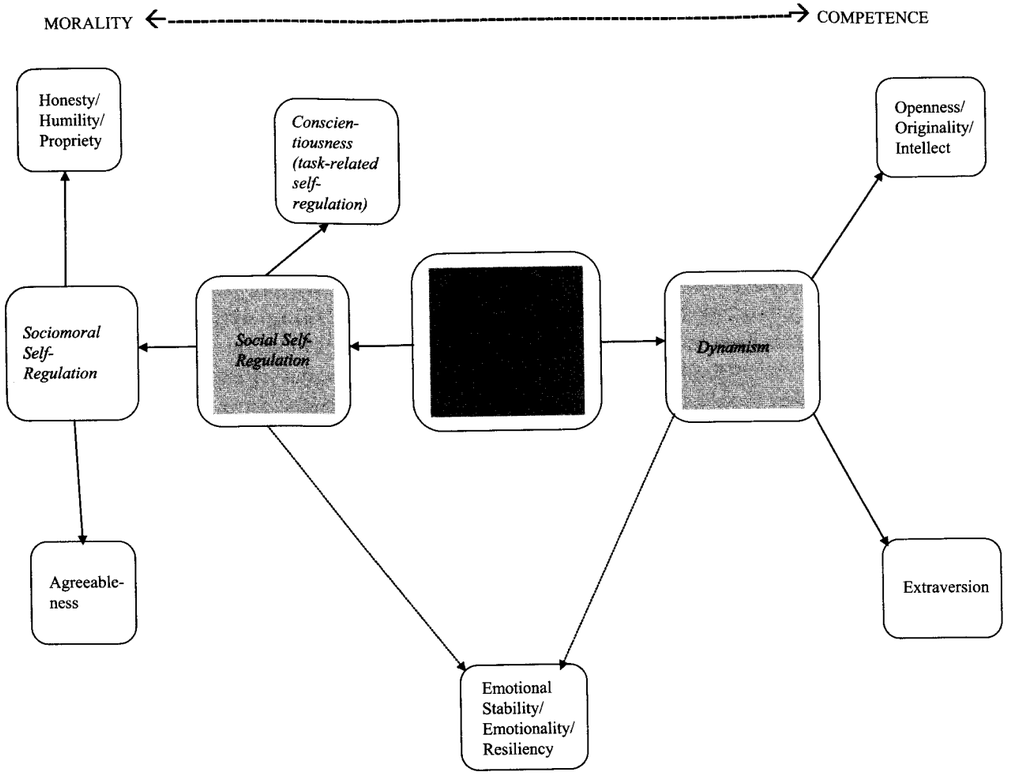

FIGURE 13.1. A radial hierarchy: The pattern of emergence of personality-attribute dimensions given evidence from lexical studies

self-regulation, and the other is dynamism, evident along the central axis. This split tends to divide the evaluation factor along a fault line separating morality-related attributes from competence-related attributes, although one could label the fault line as self-regulation-related versus self-expression-related attributes. If three factors are allowed, we see the factors labeled in italics, the split being on the morality and self-regulation side (i.e., the left side of the figure). That is, conscientiousness (task-related self-regulation) splits from a sociomoral self-regulation factor (combining agreeableness and honesty content).

What happens next appears less predictable from one language to another, but it tends to culminate in the factors identified by the small shapes away from the central axis. Dynamism tends to split into extraversion and some form of openness–originality–intellect factor. An emotional-stability-related factor is prone to emerge; some components of this (e.g., lack of hostility or irritability) relate more to social self-regulation, whereas others (e.g., lack of fearfulness) are more related to dynamism. And, particularly if as many as six factors are extracted, a split between agreeableness and honesty tends to arise. If the variable selection is relatively narrow, the latter is likely to be better labeled as honesty–humility; if it is wide, the better label would be honesty–propriety. By this model, if a measure of Big Five agreeableness is suffused strongly with honesty content—more true for the NEO–PI–R (Costa & McCrae, 1985) version than for some others—it might more closely approximate sociomoral self-regulation than agreeableness on this figure. It is not proposed that

studies in every language will reveal this pattern of emergence. We suggest only that the central tendency will be to do so.

The constructs in the figure might be understood as progressively more narrow (presumably shared) schemas for evaluating the worth and usefulness of a person (whether oneself or others), a frame that seems to work especially well for the broader constructs. The constructs alternatively might be understood as clusters of covarying traits arising because of common biological precursors; this frame seems to work especially well for the narrower constructs. It may well be that personality attributes are organized at the broadest level by sociocultural schemas, with biological determinants driving covariation at a slightly more specific level. If this is the case, we should see some rise in environmental (as opposed to genetic) sources of variance as one moves toward the broadest constructs in this figure.

Studies With Multiple Time Points and Multiple Observers

We earlier identified evidence related to cross-time stability and cross-observer agreement as relevant to evaluating a structural model. This section briefly reviews such evidence; most of it necessarily concerns the Big Five.

Temporal stability. Stability plays an important role in definitions of personality. No modern personality psychologists take an absolutist stance on stability (in the sense that "personality change" would be a logical self-contradiction). Short of the absolutist stance, there historically has been much disagreement over the amount of stability or instability in personality and its theoretical significance (e.g., Costa & McCrae, 1994; Helson, Kwan, John, & Jones, 2002). As empirical and definitional work have proceeded and informed one another over time, the field has started to move toward some consensus on how stable personality traits are in adulthood, although it has by no means reached full agreement.

Change and stability can be defined in different ways. Different definitions may give different results. Rank-order stability refers to the ordering of individuals relative to age mates, and it usually is indexed with test–retest correlations. A meta-analysis of rank-order stability coefficients in adulthood found that all of the Big Five traits become more stable with age: When the retest interval is held constant, retest correlations in young adulthood (around .50) are lower than retest correlations in later adulthood (around .70; Roberts & DelVecchio, 2000).

A second way to conceptualize change is mean-level differences: This approach compares whether people's trait levels at one age are different, on average, than at another age. There is partial consensus about change during adulthood. One meta-analysis concluded that people become more socially dominant (an aspect of extraversion), more conscientious, and more emotionally stable (less neurotic) across adulthood; that they increase in social vitality (another aspect of extraversion) and openness until middle adulthood thereafter; and that they decrease in agreeableness in old age (Roberts, Walton, & Viechtbauer, 2006). Some single studies have produced findings that partially converge and partially diverge with the meta-analysis; for example, a cross-sectional study of 130,000 Internet users (a larger sample than the meta-analysis but studied with a single method) found evidence of increases in conscientiousness and agreeableness and decreases in neuroticism during adulthood (Srivastava, John, Gosling, & Potter, 2003). Srivastava et al. (2003) also found that for some factors, mean-level change was greater in magnitude after age 30 years than before.

A third form of stability—and one that is particularly relevant for evaluating structural models like the Big Five—is measurement and structural invariance over time. Invariance is tested by evaluating whether the pattern of covariances among traits and factors remains the same at different ages. Invariance can be tested within confirmatory factor analyses (CFA), but a challenge for their application to the Big Five has been the poor fit of CFA models in item- or facet-level data (Borkenau & Ostendorf, 1990; McCrae, Zonderman, Costa, Bond, & Paunonen, 1996). One alternative approach has been to conduct item-level exploratory factor analyses in different age-groups and examine factor congruence coefficients; this approach has given rough evidence that the factor structure is emerging in childhood

and stabilizes by adolescence or early adulthood (Soto, John, Gosling, & Potter, 2008; Srivastava et al., 2003). A second approach has been to calculate factor scores and use CFA to test the stability of the 5-by-5 factor correlation matrix; this approach has supported structural invariance in childhood and adolescence (De Fruyt et al., 2006). An even more sophisticated approach has been the recent integration of exploratory and confirmatory models for modeling item-level data; this approach, too, has resulted in strong evidence of invariance over time (Marsh et al., 2010).

Although consensus is growing about the ways that the Big Five traits change and the ways they are stable, disagreement continues about how to interpret the findings. Five-factor theory holds that any change in personality traits is "intrinsic maturation," determined by biological processes with no input from psychological or social experience (McCrae & Costa, 2008). By contrast, a number of other perspectives—most prominently social investment theory—hold that personality traits are shaped by interactions between biological and psychological processes (Helson et al., 2002; Roberts, Wood, & Smith, 2005; Srivastava et al., 2003). Reemerging interest in interactions between personality traits and social experience has been facilitated greatly by recent statistical advances that allow more sophisticated modeling of the effects of life events on personality. Longitudinal modeling approaches such as lagged-effects analysis have documented a number of modest but theoretically significant associations between relationship and work experiences and later changes in Big Five traits (e.g., Neyer & Lehnart, 2007; Roberts & Mroczek, 2008; Specht, Egloff, & Schmukle, 2011).

Cross-observer agreement. Research on cross-observer agreement—and more generally on agreement between different methods, including peer reports, self-reports, and behavioral observations—has found that observers often agree with one another and with self-reports greater than predicted by chance but by no means perfectly. Agreement on particular traits depends in part on the context in which the observers saw the target. From brief face-to-face meetings, observers almost immediately begin to agree with one another and with criterion measures about a target's level of extraversion, with correlations averaging around .30 (Kenny, Albright, Malloy, & Kashy, 1994). Observers who see a target's living or working space (i.e., bedroom or office) agree with one another and with the target's self-report about the target's extraversion, conscientiousness, and openness (Gosling, Ko, Mannarelli, & Morris, 2002). Other research has found both consensus and self–other agreement for various traits in a wide range of observational contexts, including music collections and Facebook profiles (for a review, see Gosling, 2008).

A number of studies have indicated that as observers get to know a target better, the correlations among different observers' ratings reach a plateau at relatively low levels of acquaintanceship, and further information does not lead to substantial improvements (Blackman & Funder, 1998; Kenny et al., 1994). The agreement plateau, however, appears to mask more complex dynamics in personality perception. Observers initially become accurate by relying on knowledge, probably implicit, about what an average other person is like; as they acquire more information, they rely less on the average profile and more on uniquely differentiating information about the individual (Biesanz, West, & Millevoi, 2007; Kenny, 2004). Such work highlights problems with interpreting simple correlations between observers, which conflate different components of agreement or accuracy (Cronbach, 1955). New advances in componential modeling of interpersonal perceptions, such as Kenny's (1994) social relations model and Biesanz's (2010) social accuracy model, help advance a more nuanced view of interobserver agreement and accuracy and are a highly active area of current research.

Research comparing different data sources has identified both similarities and differences in perspective and available information. In general, there is appreciable agreement between self-reports, reports of knowledgeable peers, and standardized behavioral assessments (Funder & Colvin, 1991; Kolar, Funder, & Colvin, 1996; Vazire, 2010; Vazire & Mehl, 2008). Yet no one data source or method qualifies as a gold standard for assessing personality. Rather than attempting to adjudicate one data

source as the overall best, a better approach is to try to understand how the different perspectives and motivations of different observers will produce different information. This is where the functionalist interpretation of personality attributes (i.e., that they are units of perception that serve some purpose for the perceiver) may be helpful. One relevant body of work is research on interpersonal perception motives, such as enhancement and verification. Another consideration is the social processes by which others' perceptions and self-perceptions affect each other in relationships (Srivastava, 2012). A promising integrative framework is Vazire's (2010; see also Chapter 12, this volume) self–other knowledge asymmetry model, which identifies properties of personality traits (such as their observability and evaluativeness) that can predict when the self and others will be more or less accurate.

A limiting factor on cross-time and cross-observer stability is situation-related variance. If much of the stability in disposition is at the level of trait-in-situation rather than trait-across-situations, then both cross-time and cross-observer stability will be attenuated (individuals are in different situations at different times, and observers at the same time may be viewing the individual in different situations). A claim of low cross-situational consistency was central to Mischel's (1968) critique of traits. The poor early results may have been a consequence of testing for consistency in observations of concrete behaviors, which do not necessarily have a one-to-one relationship with personality traits. Observers in completely nonoverlapping contexts will agree substantially if the units are defined in more psychologically meaningful terms (Funder & Colvin, 1991). A downstream issue for the field is dealing with situation-related variance, as much as possible incorporating trait-in-situation variance into measurement models.

Strengths and Limitations of Lexically Derived Structural Models of Personality

There appears to be considerable (although not perfect) cross-cultural generalizability for structures of one, two, and perhaps three factors found in lexical studies. Structures of five or six factors seem to demonstrate moderate generalizability. In either case, such generalizability pertains to structure only. Even using exported, translated instruments in which content differences from language to language are minimized, structural but not metric or full-score equivalence are apparent (Poortinga, Van de Vijver, & Van Hemert, 2002). Thus, different-language versions of a personality inventory may measure the same construct, but between versions (and populations), the distance between scale points may vary and the scores may differ in meaning.

In terms of cross-cultural generalizability, more studies are needed in non-Western settings, where the majority of the world's human population resides, and with non-European languages. In terms of generalizability across data types, lexical studies have focused almost entirely on those attributes represented in adjectives, although some attributes may be represented mainly as type nouns (e.g., know-it-all) or as attribute nouns (e.g., fortitude). More studies that include attributes represented in non-adjectival forms are needed. A study of attribute nouns in Italian (Di Blas, 2005) gave evidence supporting the Big One, Two, and Three models described previously, as well as the Big Six but rather less so the Big Five.

Type nouns have been studied in three languages (De Raad & Hoskens, 1990; Henss, 1998; Saucier, 2003), with some indications of cross-language convergence among these studies, although the results did not converge consistently with those based on adjectives except at the one- and two-factor levels. The two factors in Saucier (2003) could be labeled as contemptibleness and outstandingness. As in the social-effects study, they could be characterized respectively in terms of likely avoidance and approach on the part of the perceiver (what makes one's highly aversive, or highly admirable or enviable). But type-noun descriptions may function in partly different ways than adjectival ones; matched for content (e.g., comparing cynic and cynical), type nouns seem more stigmatizing and undiplomatic than adjectives, and thus they have more force, particularly for enforcing social norms. That is, if someone is breaking social rules, labels like weasel, worm, or creep have more force than simply using a similar-meaning adjective like dishonest (or talking about integrity). Forcefully labeling social-norm violations would be one more example of how attribute terms are used for purposes beyond disinterested description.

In addition, most lexical studies to date have relied exclusively on self-descriptions, a methodology whose use should be supplemented with descriptions by knowledgeable informants. To date, there is insufficient evidence regarding whether such informant descriptions generate a different structure than do self-descriptions.

Are sets of lexical factors comprehensive? Clearly they are more comprehensive than the structural models that came before. The NEO–PI–R (Costa & McCrae, 1985) gained greater comprehensiveness after grafting two lexical factors (agreeableness and conscientiousness) onto its initial NEO structure. This lexically inspired comprehensiveness is a prime reason for that inventory's rapid gain in popularity. Clearly, however, dimensions of individual differences are beyond the Big Five, particularly if we widen the taxonomy to include abilities, values and social attitudes, and appearance-related characteristics (Saucier, 2000; Saucier & Goldberg, 1998; see also Wood, Nye, & Saucier, 2010). Consensus is not clear or precise among personality psychologists on which attributes ought to be counted as personality variables. This is true even in lexical studies; several lexical studies have included a wide range of highly evaluative, emotional, and (in a few cases) attractiveness terms, although a majority of lexical studies have excluded such variables. It is most informative to sample broadly from attributes of diverse types, classify the descriptors, and use these classifications in studies controlling for the effects of variable selection (as in Saucier, 1997).

Lexical factors have performed a service to the field in enhancing the comprehensiveness of personality models; before the Big Five, little attention was paid to agreeableness or conscientiousness. Lexical factors have shown good evidence of cross-time stability, and their predictive validity (e.g., in work settings) has contributed to their rising popularity. As our review indicates, their generalizability across types of data has been impressive. Generalizability across cultures has been good particularly for structures with relatively few factors.

Because of their derivation in commonly referenced attribute concepts, lexical factors are guaranteed strong social importance, although there is no guarantee that all socially important factors will be represented richly in the lexicon. Indications of the social importance of lexical factors can be gleaned from the broad impact of the Big Five Model on psychology.

On these six criteria, lexically based factors like the Big Five can be judged as falling between adequate and superb. Structural models might be developed that are incrementally better on one or more of these criteria, but improvements are unlikely to be huge. It is the last two criteria that reveal possible limitations of lexical factors.

The Theoretical Basis of Structural Models of Personality

One of these criteria is a biological or other causal basis. The Big Five shows evidence of heritability for all factors in the model (Bouchard, 1994; Jang, Livesley, & Vernon, 1996), but it is not clear that the factors actually maximize heritability. It is also not clear what insights heritability offers; the human mind is instantiated in a biological organism, and it would be shocking if our physical bodies had nothing to do with our minds or personalities. As Turkheimer (1998) put it succinctly, "Everything is heritable" (p. 785), a remarkable insight that, paradoxically, renders simple demonstrations of heritability uninformative.

Moreover, heritability tells us about the net effects of genotype, not about the individual action of individual genes or the network of causation between genes and the mind. No evidence indicates that the Big Five (or any other structural model of personality in current usage) corresponds closely to any clear or coherent causes in a person's genes or brain—what Meehl (1972) referred to as specific etiologies and Turkheimer (1998) called as strong (rather than weak) genetic explanations. It is not even necessary that specific etiologies even exist. Traits can depend on a large number of genes, some or all of whose action may vary across environments, in which case individual genes might be found to explain tiny bits of variance in behavioral traits without leading us toward a coherent theory.

The same principles apply to analyses of the personality and the brain. In a *reductio ad absurdum* argument against overinterpreting neuroimaging results, Poldrack (2010) noted that the structural model of personality used by phrenologists, which included mental faculties recognizable to modern psychologists (e.g., compassion, ambition), assuredly would map onto individual differences in brain function or structure. That is because once we have determined that a psychological individual-difference construct corresponds to something stable about behavior, the construct necessarily must correspond to something stable about the brain that is involved in producing the behavior. It may be possible to discover reliable relationships between personality traits and brain structures, but mapping the traits of the Big Five or any other model onto the brain does not validate the structural model (Poldrack, 2010). Perhaps, we should not expect any such personality structure to be easily mappable onto just the brain (or just social experience). Rather, a joint biocultural model may be needed to provide an adequate theoretical account for personality structures that are affected by the medium of language.

The other criterion is theory. The Big Five (and any other lexical models) are inductively and empirically derived. A theoretical view guiding their derivation is the lexical hypothesis, which leverages the accumulated judgments of perceivers about what is important to know about a person. But lexically derived models do not come with an a priori theory about what the traits say about people. If we stay within the realm of psychological understanding, where we may be on better footing than we are with connections to biology, how can a theory of personality structure be developed that connects it to topics like emotion, motivation, and culture?

One approach has been the attempt to identify a core psychological process that explains each dimension of personality. For example, researchers have debated whether extraversion is best understood as reward sensitivity (Lucas, Diener, Grob, Suh, & Shao, 2000), social attention seeking (Ashton, Lee, & Paunonen, 2002), or something else. Similar efforts to find a single core motivation or feature have been made with all of the Big Five (Denissen & Penke, 2008) and Big Six (Ashton & Lee, 2001b). Such efforts are not guaranteed to work, as it does not necessarily follow that the various indicators (i.e., narrow traits) that load on a dimension in a principal components analysis or factor analysis share a single, common underlying mechanism or cause (Markus & Borsboom, 2013). Furthermore, the functionalist critique posits that the causal basis of personality factors also may involve the functions that personality attributes serve for perceivers, rather than resting exclusively in the behavioral patterns of targets (Srivastava, 2010).

Beyond the core-features approach, there have been attempts to transplant the Big Five into some body of preexisting or ad hoc theory (e.g., MacDonald, 1995; McCrae & Costa, 1996), but it is not clear that these operations have been particularly successful. Personality researchers once asked why an empirically derived model like the Big Five would have the particular structure that it has (e.g., Fiske, 1994). That question largely has been abandoned (Srivastava, 2010), and theorists now simply take the existence of five factors as a given rather than attempting to explain them (McCrae & Costa, 2008).

Researchers interested in the biological bases of personality or other causes may prefer structural models that are designed more explicitly for such purposes, over the Big Five or other inductively derived models. That is because, as discussed earlier, an inductively derived model is guaranteed to map onto biological structures in some nonzero way (as long as the model meets the minimal criterion that its units correspond to actual behavioral regularities), but nothing guarantees that such mappings will be strong enough or coherent enough to be useful in developing theory. From a functionalist perspective, lexical models were not derived for the purpose of mapping onto biological structures and it is unlikely that they will do so by accident.

Consider the analogy of asking a nonexpert computer user what a computer can do. The user might say, "It can send e-mail, browse the web, edit documents, and play games." All of those describe real things that computers do, but if you open up a computer you will not find distinct modules, or even "networks" of modules, associated with those functions. Instead, you will find a hard drive for

long-term storage, a central processing unit for general computations, a video card for processing and displaying images, and so forth. The user's various functions may engage the hardware in different ways—for example, playing games would engage the video card more than would editing documents. This is analogous to the guaranteed mapping described by Poldrack (2010). In some cases, those mappings might provide useful insights—for example, if you want to play games, get a computer with a powerful video processor. But in other cases they will not—web browsing and e-mail are meaningfully different activities, but the hardware requirements are largely the same.

Bringing the analogy back to personality structure, lexical studies give us the structure of attributes as they are used by social actors. Nothing guarantees that the underlying biology is isomorphic with the psychological functions. For example, there are some indications that the more widely replicable Two-Factor Model can be linked to biological variables: DeYoung (2006) has proposed that a stability factor (akin to social self-regulation) is linked to serotonergic functioning, whereas a plasticity factor (akin to dynamism) is linked to dopaminergic functioning. This approach may lead to useful insights. But these relations are not strong enough to constitute a general theory of the causes of individual differences in personality. Overall, we do not yet have a consensual theory matched to a consensual model of empirical factors.

A number of personality models have been created with the more explicit purpose of mapping onto biological structures and processes, but many of them contain only one or two factors, giving them little in the way of comprehensiveness. These models have been measured exclusively via self-report methodologies with little attention paid to cross-cultural generalizability. For many general purposes, models that are lacking in so many respects give up more than they gain in comparison with a lexical model like the Big Five.

CONCLUSION

Recent decades have seen important progress in discerning the structure of personality attributes. At the broadest level, this structure has regularities at the one- and two-factor levels that appear, by a rather stringent criterion, to be generalizable cross-culturally. At a slightly less broad but more informative level are the well-known Big Five Factors. Certainly the Big Five are necessary components for a full model of personality attributes, but they probably are not sufficient. Lexical studies have tended to converge toward a Big Six Model, slightly more informative than the Big Five. It may be more replicable, particularly outside languages of northern European origin and in variable selections that are wider than sometimes has been conventional under an Allportian view of personality. Another area of insufficiency is that there are correlated facets "below" the level of the Big Five, and prediction is best at the specific level. Finally, cross-cultural ubiquity and theoretical integration may be best when using a level broader than the Big Five.

Scientific models are by definition set out tentatively, subject to the judgment of subsequent evidence. Researchers should bear in mind criteria—such as the eight described in this article—by which structural models can be compared, as these are the criteria for what makes a structural model "good." By focusing on these criteria, researchers might keep focused on the most important objective—an ultimately optimal structural model. Such a model will include explicit linkage to the psychological mechanisms that underlie individual differences and will have both basic-science foundations and real-world applications.

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