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How Functionalist and Process Approaches to Behavior Can Explain Trait Covariation

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How Functionalist and Process Approaches to Behavior Can Explain Trait Covariation

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Abstract
Factors identified in investigations of trait structure (e.g., the Big Five) are sometimes understood as explanations or sources of the covariation of distinct behavioral traits, as when extraversion is suggested to underlie the covariation of assertiveness and sociability. Here, we detail how trait covariation can alternatively be understood as arising from units common to functionalist and process frameworks, such as self-efficacies, expectancies, values, and goals. Specifically, the expected covariation between two behavioral traits should be increased when a specific process variable tends to indicate the functionality of both traits simultaneously. In 2 empirical illustrations, we identify a wide array of specific process variables associated with several Big Five-related behavioral traits simultaneously, and which are thus likely sources of their covariation. Many of these, such as positive interpersonal expectancies, self-regulatory skills, and preference for order, relate similarly to a broad range of trait perceptions in both studies, and across both self- and peer-reports. We also illustrate how this understanding of trait covariation provides a somewhat novel explanation of why some traits are uncorrelated. As we discuss, a functionalist understanding of trait covariation as arising through functionalist or process variables has implications for many basic issues in personality psychology, such as how personality traits should be measured, mechanisms for personality stability and change, and the nature of personality traits more generally.

Keywords: Personality traits, functionalism, expectancy-value models, social cognition, covariation

Supplemental materials are included following the **References**.

Why do individual differences in levels of traits such as assertiveness and sociability covary? Frequently, personality psychologists have answered this by appealing to broad factors identified by investigations of trait structure, such as the extraversion, agreeableness, conscientiousness, neuroticism, and intellect/openness factors that constitute the Big Five and Five Factor Model (FFM) frameworks (Goldberg, 1993; McCrae & Costa, 2008), or the similar HEXACO factors (Ashton & Lee, 2007). Factors of this sort have sometimes been considered "source traits" or "basic tendencies" due to the assumption that they show some approximation to the most important sources "underlying" the more specific traits used to identify them (Cattell, 1950; McCrae & Costa, 1995).

Here, we will describe how trait covariation can be accounted for by functionalist or process approaches to behavior. Such frameworks understand behaviors as being means toward desired ends, and enlist constructs such as self-efficacies, expectancies, and values as preferred explanatory units (e.g., Ajzen, 1991; Bandura, 1977; Feather, 1982; Heckhausen, 1977; Mischel & Shoda, 1995; Vroom, 1964). Functionalist and process frameworks have typically been applied to understanding between-person or within-person variation of a single behavioral tendency; however, they have not typically been applied to understanding trait covariation, which is among the central phenomenon structural factors are enlisted to help explain (Ashton & Lee, 2005; Tellegen, 1991).

Here, we will first briefly describe how structural approaches have traditionally been enlisted to account for trait covariation. We then describe how functionalist and process frameworks tend to explain behavioral trait levels, and how this understanding can be extended to explanations of trait covariation without invoking structural factors in an explanatory fashion. We illustrate this approach to trait covariation

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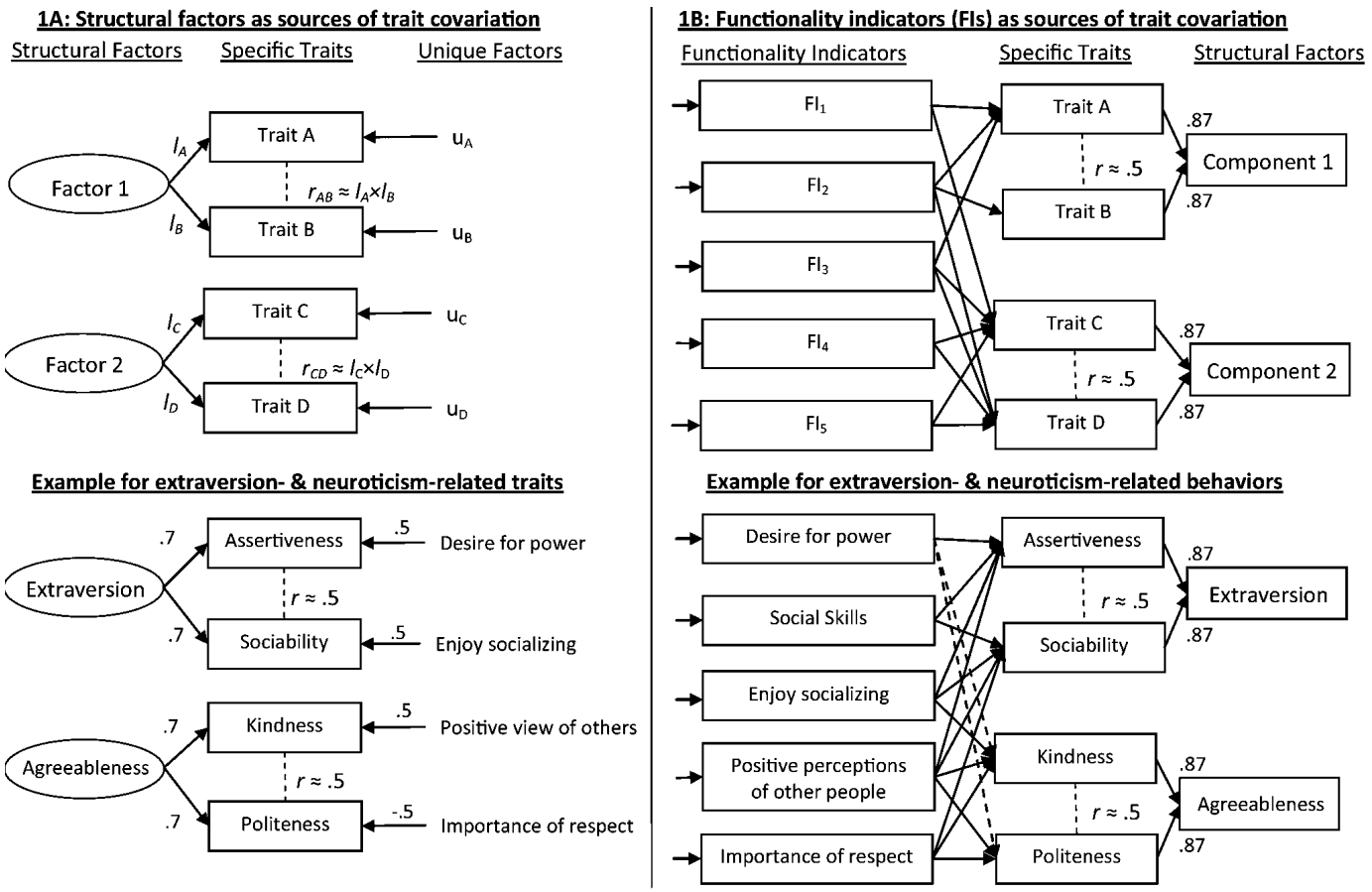

Figure 1. Conceptualizations of sources of trait covariation consistent with structural equation models (Figure 1A) and functionalist frameworks (Figure 1B). Circles represent factors identified by structural analyses, boxes represent measured variables. Solid lines indicate positive effects and dashed lines indicate negative effects. In Figure 1A, structural factors are considered underlying factors of the measured traits; in Figure 1B, structural factors are considered composite averages ("components") of the measured traits.

through two empirical illustrations. As we will show, this results in a picture of the sources of trait covariation that looks quite different from the picture provided by structural factors. Finally, we will discuss some ways in which this functionalist approach to covariation might be reconciled with structural approaches. Given the considerable role of structural factors such as the Big Five in contemporary personality psychology, we also outline some of the broader implications of a functional model of trait covariation.

Explanation of Behavioral Trait Covariation Through Broad Structural Factors

Beginning with Cattell's (1946, 1950) work, structural approaches to the covariation of behavioral traits have regularly proceeded by using factor analysis to identify factors (e.g., extraversion) which, in conjunction with factor loadings, can roughly reproduce the observed interrelationships between distinct behavioral traits (e.g., sociability, assertiveness, positive affectivity). In the simplest case where we are examining the correlation between two variables, factor analysis can always extract a single factor with factor loadings which will be precisely equal to the square root of the correlation between the two variables. For instance, as shown in Figure 1A, if we were interested in identifying a factor underlying the covariation between assertiveness and sociability, and these two traits show an association of $r = .49$, we can use factor analysis to identify a factor which has .70 loadings with both traits. These loadings mathematically serve as a way to externalize the correlation between the variables into a structural factor. In this example, by multiplying the .70 loadings with the factor together, we can say that assertiveness and sociability have an indirect .49 correlation "through" the common factor, which we might label "extraversion."

When we are looking at the association of two variables, factor analysis and other structural techniques can always identify a single factor which can recover the association between variables perfectly. As the number of items in the analysis increases, a small number of factors will no longer be able to reproduce the correlations between items perfectly but may nonetheless be able to reproduce the original matrix quite well. Similarly, with more than two items the empirical factor estimates given to individuals will shift from a straight averaging of the variables to a weighted average where items are weighted by their factor loadings.

There are a number of ways we might interpret the variables that result from analyses of trait structure. However, a

particularly influential perspective has been the understanding that these may approximate the major *causes* of covariation among diverse traits. Cattell (1946) regularly discussed a factor resulting from these analyses as potentially approximating a "source trait," which can be thought of as a "cause or determiner of several trait-elements showing covariation" (Cattell, 1950, p. 33), and a "possible explanation of how the actually existing forms may have originated" (Cattell, 1946, p. 79). We believe this is the most intuitive way to interpret the usual graphical representation of structural factors, which depict them as having causal effects on the narrower traits in the analysis, as shown in Figure 1A.

In more contemporary personality psychology, this interpretation of structural factors most clearly approximates the view traditionally described within the Five Factor Theory of McCrae and Costa (1995), where the Five Factors (which largely approximate the Big Five factors identified in lexical studies; Goldberg, 1993) are understood as "underlying tendencies [that] cause and thus explain (in general and in part) the consistent patterns of thoughts, feelings, and actions that one sees" (p. 236). However, other personality investigators and methodologists sometimes discuss structural factors as approximating "underlying" constructs which "impact" the narrower traits used to identify them (e.g., Caspi et al., 2014; DeYoung, Quilty, & Peterson, 2007; Lewis & Bates, 2014; Roberts, Chernyshenko, Stark, & Goldberg, 2005).

There are a range of views as to the meaning of structural factors. Many personality investigators see such factors as providing a means to *summarize* and *organize* a person's standing on diverse traits. For instance, Eysenck (1970) suggests "we would be wrong in saying that a person behaves in a sociable fashion because he has the trait of sociability, but then trait psychologists . . . [generally] postulate the trait in question simply as a *descriptive* variable" (p. 26), and similarly, Saucier and Goldberg (2001) note that analyses of trait structure "can provide a framework for description, but not necessarily for explanation" (p. 848). From this perspective, an "extraversion" factor might be best regarded as a *summary* rather than as approximating a *cause* of tendencies to be sociable, assertive, happy, sensation-seeking (e.g., John, Naumann, & Soto, 2008; Ozer & Reise, 1994; Wiggins, 1997; **Wood**, in press). As detailed in Figure 1B, this understands an individual's standing on structural factors as caused by their standing on narrow factors (by means of a mathematical averaging) and not vice versa: the causal arrows should point from the specific traits toward the structural factor. However, interpreting structural factors in this manner means that structural analyses may not get us much closer to understanding the sources of trait covariation. We are more or less back to square one: If extraversion is a summary rather than a common cause of the covarying tendencies to be sociable and assertive, than what causes these tendencies to covary?

Functionalist Approaches to Trait Levels and Their Covariation

We argue that trait covariation can be understood by an extension of how many functionalist or process approaches already explain trait variation. Consequently, we will first discuss how behavioral trait levels are considered to be shaped within a range of functionalist and process approaches, and then detail additional principles useful for extending this to the problem of trait covariation.

First, it is useful to describe how we will be using the term "trait." There is a frequent tendency for researchers to equate traits with factors identified in studies of trait structure, as when investigators ask "How are values and goals associated with traits?" by correlating measures of such motivational units with a Big Five measure (e.g., Roberts & Robins, 2000; Roccas, Sagiv, Schwartz, & Knafo, 2002). However, we wish to clearly distinguish between these terms. First, we will refer to *structural factors* as variables such as the Big Five or HEXACO factors that are identified by statistical procedures such as factor analysis. In contrast, we will use the term *trait* in a manner somewhat closer to Guilford's (1959) definition of a trait as "any distinguishable, relatively enduring way in which one individual differs from others" (p. 6; Johnson, 1999; Roberts, 2009). That is, a trait may range from an individual's tendency to be tall, male, right-handed, well-liked, sociable, trusting, like vanilla ice cream, or have a high testosterone level. Given the very wide range of traits individuals can have, it is useful to identify conceptually important trait classes, and how they should relate to one another.

We use the term *behavioral traits* to be essentially synonymous with *behavioral tendencies*. This largely parallels models which conceptualize an individual's level of a behavioral trait as the individual's observed or expected likelihood of performing a certain class of behaviors (Buss & Craik, 1983; Fleeson, 2001; Wiggins, 1997). From a functional perspective, behaviors are generally understood as means to ends. For instance, Almlund, Duckworth, Heckman, and Kautz (2011) consider an individual's personality system to be "a strategy function for responding to life situations" (p. 8). Similar assumptions are represented in a wide range of social–cognitive, self-regulatory, evolutionary, and economic models of behavior (e.g., Ajzen, 1991; Carver & Scheier, 1998; Fleeson & Jolley, 2006; Gintis, 2007; Kenrick et al., 2009; Kruglanski et al., 2002; Minsky, 2007). We will refer to the idea that an individual's behavioral trait levels are shaped, in large part, by their real or perceived functionality toward achieving the individual's desired ends as the *functionality assumption*.

1. Note that factor loadings can be used more effectively to reproduce the correlation matrix when using principal axis factoring (PAF) than principal component analysis (PCA). This is because factor analysis by PAF will summarize only the interitem correlations, whereas PCA will additionally base factor loadings on item variances (i.e., the diagonals of the correlation matrix). If an individual's level of a factor (e.g., *extraversion*) is considered simply a *summary* of the observed variables (e.g., *extraversion* equals the mean of the individual's estimated *sociability* and *assertiveness*, as represented in Figure 1B), the correlation between the individual's standing on the structural factor and the original items will more closely approximated by the PCA loadings (in this example: approximately .87) than by the PAF loadings. Technically, when the variables identified in a factor analysis is considered as "unobserved hypothetical variables that underlie and explain the observed correlations" they are regarded as *factors* and if considered as "linear composites of observed variables" they are regarded as *components* or *principal components* (Loehlin, 2004, pp. 28–29). For simplicity however, we will refer to variables such as the Big Five or HEXACO dimensions as *structural factors* regardless of whether they are understood as causes or summaries of covarying traits.

Functionality Indicators

Several models suggest that a behavior's functionality to the actor can be understood as being established by the operation of three additional broad trait classes; see especially Ajzen (1991), Bandura (1977), Feather (1982), Gintis (2007), Heckhausen (1977), Tolman (1938), and Vroom (1964). Specifically, the functionality of a behavior to an actor can be understood as being established by (a) *ability/efficacy traits,* which concern the individual's expected ease of performing trait-identifying behaviors; (b) *expectancy traits,* which concern the expected outcomes of an individual's performance of such behaviors; and (c) *valuation traits,* which indicate the individual's expected valuation of particular outcomes. We will refer to more specific traits that can be classified into these three trait classes collectively as *functionality indicators,* or *FIs,* to indicate that they can be understood to influence levels of a behavioral trait primarily by indicating or shaping the behavior's functionality to the actor. Specifically, an individual should have a higher level of a behavioral trait if he or she (a) tends to find the associated behaviors easy to do; (b) tends to expect them to increase the likelihood of particular outcomes (e.g., attention, power, acceptance); and (c) tends to value those outcomes.

These units also correspond highly with major classes found in a range of social–cognitive and process models of behavior (e.g., Dweck & Leggett, 1988; Fleeson & Jolley, 2006; Mischel & Shoda, 1995). A theme we will revisit is that individuals' own explanations for their high or low levels of a behavioral trait regularly enlist FIs. These three functionalist trait classes can thus be used to organize or classify different forms of explanations regarding why individuals have the traits that they do. We continue by elaborating on the nature of these trait classes, how they are linked to units in other prominent models of behavior, and their role in influencing behavioral trait levels.

Abilities/efficacies. If we understand an individual's behavior as means to desired ends, then abilities and efficacies concern which means the individual has available. Abilities and efficacies are largely analogous to units such as *intention-behavior* or *efficacy expectancies* (Bandura, 1977; Heckhausen, 1977), and *affordances, competencies, skills, capabilities, constraints,* and *perceived behavioral control* described in other frameworks (Ajzen, 1991; Almlund, Duckworth, Heckman, & Kautz, 2011; Dweck & Leggett, 1988; Gibson, 1977; Gintis, 2007). Units such as *resources* or *self-regulatory plans/scripts* (Fleeson & Jolley, 2006; Mischel & Shoda, 1995) can be thought of as linking to behavioral traits in large part by impacting more general abilities to perform associated behaviors.

Within these and several other frameworks, individuals are assumed to operate by a *law of least effort*, choosing behaviors that require less expenditure of effort or resources (Brehm & Self, 1989; Kahneman, 2011; Thorndike, 1913). For instance, Ramona and Beatrice may both try to keep their rooms clean, but Ramona has an easy time doing so while Beatrice experiences this as more difficult and effortful; this difference in expected ease of performance will likely result in Ramona having a cleaner room. Ability traits do not concern specifically *how* or *why* the person finds an action easy or hard to perform. Ramona might find it easier to keep her room clean due to having better organizational skills, having more energy or better cleaning supplies, or for other reasons. Abilities simply indicate that the actor somehow finds the behaviors associated with the behavioral trait easier to perform. An individual's abilities and efficacies are indicated by explanations that begin with phrases such as "I [can/can't] . . ." or "I find it [easy/difficult] to . . ."

Expectancies. Whereas abilities concern the expected ease of performing a behavior, expectancies concern how the environment is expected to change or react after the behavior has been performed. Expectancies in this manner are most directly analogous to *behavior-outcome expectancies* (Bandura, 1977; Heckhausen, 1977), and *norms* and *contingencies of reinforcement* in other frameworks (Ajzen, 1991; Cialdini & Trost, 1998; Skinner, 1965).

Within these and many other models, an individual's behavioral tendencies are expected to follow the *law of effect*: increasing when they tend to have desirable or useful effects on the environment, and decreasing when they do not (Skinner, 1981; Thorndike, 1913). To alter our previous example slightly, perhaps Ramona and Beatrice are equally capable of keeping their room clean, but it is the consequences of keeping their rooms clean that differ: Ramona finds having a clean room leads to greater approval from her parents, while Beatrice does not. This will again likely result in Ramona having a cleaner room, due now to differences in this behavior's expected effects. More generally, although many individuals may be equally afforded the opportunity to behave in a certain way, they may nonetheless differ in their behavioral traits due to differences in how their environment reacts to these behaviors. Such expectancies are indicated from explanations of behavior that begin with phrases such as "I [believe/feel/expect] that . . ." and "I find [doing X] to . . ."

Valuations. Although different individuals may experience the same outcomes after performing a behavior, they may differ in the extent to which the outcomes are experienced as desirable and valuable, or useful to other ends. Whereas expectancy traits concern relations between behaviors and outcomes, valuation traits concern what outcomes the actor finds desirable, or which ends they are trying to maximize. Valuation traits have been referred to as *instrumentalities* (Feather, 1982; Vroom, 1964) in other expectancy-value frameworks, and as *motives, needs, values, preferences,* and *contingencies of utility* in other frameworks (Almlund et al., 2011; Atkinson, 1957; Gintis, 2007; Mischel & Shoda, 1995; Schwartz, 1992). *Goals* serve an analogous function in a range of social–cognitive and self-regulatory frameworks (Carver & Scheier, 1998; Dweck & Leggett, 1988; Fleeson & Jolley, 2006; Kruglanski et al., 2002) in that they specify the ends a person would like to attain.

Broadly, valuation traits should impact behavior by specifying the outcomes individuals are trying to promote. To alter our example a final time, perhaps both Ramona and Beatrice can keep their rooms clean with equal ease, and both receive equal approval from their parents if their room is clean. However, Ramona experiences her parents' approval as rewarding and desirable, whereas Beatrice does not. This should again result in Ramona having a cleaner room. Valuation traits are indicated from explanations of behavior that begin with phrases such as "I [like/dislike] . . .", I [value/care about] . . .", and "I typically [try/want] to . . ."

Explaining Behavioral Trait Levels by Functionality Indicators

Considered collectively, behaviors which an individual finds easy to perform and which are expected to result in effects the individual finds valuable can be understood as having higher *functionality, utility,* or *expected value* (Atkinson, 1957; Eccles & Wigfield, 2002; Feather, 1959; Gintis, 2007; Tolman, 1938). In turn, such behaviors should have greater *motivational force* (Vroom, 1964), and become the individual's *behavioral intentions* (Ajzen, 1991). Through this process, behaviors with high real or perceived functionality to the actor should be expected to increase in frequency, and consequently behavioral trait levels should come to be correlated with their functionality to the actor. There are a couple points worth briefly noting concerning this manner of explanation.

First, it is not necessary to posit individuals as consciously calculating the functionality of every behavior they perform to understand behavioral traits as shaped in this manner. Considerations of whether the behavior is more desirable than alternatives may often be made in a very quick manner outside of conscious awareness (Gigerenzer & Goldstein, 1996; Kahneman, 2011). Behavioral tendencies can also be effectively shaped by their functionality by simple learning processes rather than by conscious deliberation (Skinner, 1981; Thorndike, 1913). An individual's current levels of behavioral traits can frequently be understood as being shaped by their *past* functionality, and then operate principally as habits (Allport, 1937; James, 1890; W. **Wood** & Neal, 2007). This can lead current behavioral trait levels to depart from their current functionality.

Second, as noted by McCabe and Fleeson (2012), the shaping of behavior by process variables should be understood as operating first and foremost at the within-person level of analysis. For instance, individuals will tend to act extraverted in moments when they want to promote extraverted-related ends (e.g., make friends, convey information, entertain others), and more introverted when they don't. However, as they also note, individuals also differ in how much they typically desire such ends, and consequently functional explanations should be able to be generalized to explaining not just within-person variation, but much between-person variation in behavioral trait levels as well.

Third, a given behavior should be understood as having a wide range of effects on the environment (Bertalanffy, 1968; Katz & Shapiro, 1985; Kruglanski et al., 2002). For instance, behaving in the manner we label *responsible* may tend to increase the fulfillment of commitments to others, interpersonal relatedness, status, effort expenditure, among many other things. In turn, functional frameworks regard behavioral trait levels as being considerably shaped by the functionality of their effects. In an important sense, the behavior's effects *are* the behavior's causes: through various mechanisms, behaviors with the more functional effects are selected over alternatives (Skinner, 1981; Tooby & Cosmides, 1990).

This leads fairly directly to the expectation that functional explanations of behavioral trait levels should be fairly complex. The overall functionality which shapes behavioral trait levels is itself conceptualized as representing the sum of probabilities that a behavior will affect diverse outcomes, weighted by the actor's valuation of each outcome (Feather, 1982; Fishbein, & Ajzen, 1975; Gintis, 2009). Consequently, we should be able to influence an individual's level of a behavioral trait by influencing a wide range of FIs. For example, we may be able to increase an actor's level of responsible behavior by making the actor care more about others impacted by such actions, making "irresponsible" alternatives less tempting or less available, increasing the link between responsible action and long-term goal attainment (e.g., raises, promotions), making it easier to behave responsibly, or by several other routes (Magidson, Roberts, Collado-Rodriguez, & Lejuez, 2012; Wood, Larson, & Brown, 2009). This can be understood more generally as the principle that there are usually multiple means to a given end (Austin & Vancouver, 1996; Bertalanffy, 1968; Kruglanski et al., 2002), and parallels social–cognitive explorations of the diverse processes that influence a specific behavioral trait (e.g., Dweck & Leggett, 1988; McCabe & Fleeson, 2012; Metcalfe & Mischel, 1999; Morf & Rhodewalt, 2001).

Explaining Behavioral Trait Covariation by Functionality Indicators

We have just described that a particular behavioral trait should have diverse effects. However, *any* particular trait should be understood as potentially affecting many other traits simultaneously. Particularly important to our functionalist explanation of trait covariation is the fact that any particular FI or process variable may affect the functionality of several distinct behavioral traits simultaneously (e.g., Lukaszewski, 2013).

Mathematically, when one of the various FIs that affects one behavioral trait also affects a distinct behavioral trait, we can multiply this FI's correlations with the two traits together to estimate the expected correlation between the two traits "through" the FI. For instance, the tendency to see others positively has been found to show moderate correlations with traits in all Big Five trait domains (**Wood**, **Harms**, & Vazire, 2010), which suggests that seeing others positively might tend to increase levels of kindness, sociability, assertiveness, responsibility, and so on. Because multiple traits are impacted by a common FI in this example, this should result in some level of covariation between these traits. As depicted hypothetically in Figure 1B, if perceiving others positively has a .30 effect on assertiveness and a .40 effect on sociability, this should result in a .30 × .40 = .12 increase in the correlation between these two traits "through" the tendency to see others positively.

More generally, when a particular FI tends to influence two behaviors in the same direction simultaneously, this will serve to increase the correlation between the behavioral traits, and when a particular FI tends to increase levels of one behavioral trait but decrease levels of another, this will serve to decrease the correlation between the two traits (i.e., make the correlation more negative). Note that this is largely the same way that structural factors are enlisted to explain covariation: By comparing Figures 1A and 1B, we see that structural factors such as extraversion and FIs such as "perceiving others positively" are both cast as *common causes* of diverse behavioral traits, and thus sources of covariation.

Differences in structural and functional explanations of correlated traits. However, beyond this similarity there are some important differences. One concerns the nature of the explanatory variable. A structural factor is not measured separately from the traits it is posited to influence, but rather is generally "inferred" from their covariation. It is this concern

that has led some to regard such explanations of covariation as circular (e.g., Cervone, 1999; Mischel, 1968). In contrast, there are various reasons to think that explanations of behavioral trait covariation by FIs are less prone to circularity. For instance, when we find a tendency to see others positively (a type of expectancy) to relate to behavioral traits in several different Big Five domains (Wood, Harms, et al., 2010), it is not difficult to see functional reasons for these relationships. Individuals who expect others to have negative traits may sensibly see little value in meeting and socializing with others (acting extraverted and open), being nice to others (acting agreeably), and completing their commitments (acting conscientious), and adjust their behavioral tendencies accordingly.

A second important difference concerns the number of variables that will be necessary to explain covariation. Controlling for an FI will tend to reduce the association of the two variables toward zero, but because several FIs should influence levels of a given behavioral trait independently of one another, several distinct FIs should typically be necessary to fully explain the correlation between two variables, analogous to multiple mediation. For instance, we may find that positive perceptions of others, social skills, enjoyment of attention, disliking solitude, and other distinct FIs may be necessary to fully explain the covariation between assertiveness and sociability. Whereas structural factor models may explain the covariation of several distinct behavioral traits through a single structural factor, a functionalist explanation of covariation suggests that there will generally be several distinct FIs that must be identified to understand why even two behavioral traits covary at the level they do.

Differences in structural and functional explanations of uncorrelated traits. Structural investigations frequently place a considerable emphasis on identifying orthogonal factors. This effort is motivated in part by the understanding that correlated traits have common causes, while uncorrelated factors may not (Ashton, Lee, Goldberg, & de Vries, 2009; DeYoung, 2006). However, given that functionalist frameworks construe levels of any particular behavioral trait as being shaped by many distinct FIs or process variables (e.g., Cramer et al., 2012; Fleeson & Jolley, 2006; Kruglanski et al., 2002; Mischel & Shoda, 1995), it may actually be more surprising to find that uncorrelated behavioral traits share none of these in common. Instead, we expect that uncorrelated behavioral traits will generally share some common FIs, but that the FIs that increase the correlation between the two traits are equal in strength to the FIs that decrease the correlation, and thus pull for correlations between the two traits in opposite directions which suppress one another (mathematically cancel out; MacKinnon, Krull, & Lockwood, 2000).

To illustrate, as shown in Figure 1B, we might observe that tendencies to be assertive and polite have an estimated correlation near $r = 0$. However, if we were to examine the various FIs which influence an individual's levels of assertive and polite behavior, we might find that these two tendencies do in fact share some FIs that influence both traits simultaneously. For instance, desiring power likely increases assertiveness but decreases politeness (**Harms**, Roberts, & **Wood**, 2007; Roberts, O'Donnell, & Robins, 2004), while perceiving others positively likely increases both assertiveness and politeness (**Wood**, **Harms**, et al., 2010). These and other FIs may suppress one another, resulting in a negligible correlation between the two traits. Thus, an observed correlation near zero between two behavioral traits may regularly mask the fact that various specific FIs or process variables are common influences on both traits.

Two Empirical Illustrations

Although some investigators have begun to provide empirical accounts of how diverse behavioral traits central to the Big Five may be shaped by a common FI (e.g., Lukaszewski, 2013; **Wood**, **Harms**, et al., 2010), past empirical research has typically only examined one or a few FIs that may promote a range of behaviors or self-perceptions associated with Big Five traits within a single investigation. We thus conducted two studies to identify more comprehensively the major FIs that may shape levels of Big Five-related behavioral traits and their covariation. We aimed to identify specific FIs which may be common causes of traits within the same Big Five domain (e.g., sociability and assertiveness), of correlated traits in different Big Five domains (e.g., sociability and politeness), and of negligibly correlated traits (e.g., orderliness and anxiety).

For Study 1, we adapted a qualitative-to-quantitative approach frequently utilized by Buss and colleagues (e.g., Buss, Gomes, Higgins, & Lauterbach, 1987; Kyl-Heku & Buss, 1996; Meston & Buss, 2007; see also Yang et al., 2014) where many reasons for performing trait-related behaviors are first generated through a qualitative method, and then transformed into questionnaire items and empirically evaluated as correlates of these behavioral traits in a new sample. This method was adopted in large part because, as noted by Johnson (1999), people spontaneously explain actions by "suggesting that the actor (a) desired a certain goal, (b) believed that the action would help him/her reach the goal, and (c) had the ability to perform the act" (p. 449; Malle, 1999). That is, the reasons people give can typically be classified as FIs.

For Study 2, we aimed to replicate the major contours of Study 1 by utilizing the massive International Personality Item Pool (IPIP) and other resources collected within the Eugene-Springfield Community Sample (ESCS) to replicate major features of the FIs that may underlie trait covariation identified in Study 1. Because these participants were also rated by close others, we were afforded the opportunity to examine how FIs were associated not just with self-perceptions, but with how participants were perceived by others.

Measurement Strategy

Many of the FIs that promote behavioral traits and trait perceptions central to the Big Five are certain to be indicated by items already found in existing personality trait measures. For instance, people regularly explain that they act sociably because they enjoy social interactions, and items concerning enjoyment of social interactions can be found within common Extraversion scales. A functionalist framework can be used as a classification framework which suggests that items referring to FIs (e.g., enjoying social interactions; having social skills) and to behavioral tendencies (e.g., socializing) should be classified into separate categories even if highly correlated. In essence, placing such items on a single scale confounds functional causes with their behavioral effects. Consequently, we separate items referring to behavioral tendencies and abstract trait perceptions from items referring fairly explicitly to abilities/efficacies, expectancies, and valuations.

An important reason for doing this is because we are interested in documenting the wide range of distinct behavioral traits and self-perceptions that might be associated with a single FI. Indeed, this is central to our functionalist explanation of trait covariation. Separating the measurement of FIs from behavioral traits affords the ability to identify whether a particular FI is associated with behavioral traits across multiple trait domains simultaneously. For instance, although liking other people may relate highly to sociability, it may also relate to tendencies to be assertive, warm, polite, and responsible. First aggregating such items into a measure of a structural factor renders such associations almost invisible.

Analysis Strategy

The models outlined in Figures 1A and 1B provide very different explanations of trait covariation that are not easily compared statistically. For instance, it may not be particularly impressive to show that a large number of FIs do a better job of explaining behavioral trait covariation than a small number of structural factors, as a large number of variables will always better predict an outcome (e.g., obtain a greater R^2) relative to a small number of variables when other conditions are held equal (Cohen, Cohen, West, & Aiken, 2003). Nor would fixing the number of FIs to the number of structural factors offer a fair test, as structural factors are identified precisely by their capability to maximally "explain" trait covariation and are not measured independently of these traits, whereas the FIs are measured with unreliability and independently from the behavioral traits they are associated with.

The overarching goal of these analyses can be considered to be the identification of a more empirically informed specification of Figure 1B, by identifying specific FIs that are associated with the variation and covariation of different Big Five-related traits. As noted above, we generally expect that (a) highly correlated traits will have several distinct FIs that are associated with both traits; and that (b) uncorrelated traits will typically also have various FIs that are associated with both traits, but in a configuration where some FIs relate positively or negatively to both traits (serving to increase their positive correlation), while others relate positively to one trait but negatively to the other (serving to increase their negative correlation).

Study 1: Relations Between FIs and Big Five-Related Behavioral Traits

Method

A summarized description of the Method is given here, which is expanded in the Supplementary Materials (S1).

Generating potential FIs involved in shaping Big Five-related behavioral trait levels. A total of 529 Wake Forest University undergraduates completed an online survey for credit toward a course research participation requirement (*Mage* = 18.7; 59% female).

Participants completed the Big Five Inventory (BFI; John et al., 2008), the Inventory of Individual Differences in the Lexicon (IIDL; **Wood**, Nye, & Saucier, 2010), and items from the IPIP (Goldberg, 1999) identified as highly associated with Big Five trait levels; scores for each dimension were standardized and averaged. Five to six individuals with the highest and lowest levels of each Big Five trait were interviewed for additional credit, resulting in a total of 52 interviews. Interviewed participants were asked to describe the extent that they performed behaviors related to the trait they were selected for, and their reasons for doing so. Additionally, approximately half of the participants (N = 229) were asked to describe someone they knew who was high or low on one Big Five trait, to describe instances of this person acting in this way, and to suggest their reasons for doing so.

Research assistants extracted reasons for trait-related behavior from the participant interviews and reports of others' behavior. We considered appropriate reasons for trait-related behavior to be those that could be classified into roughly the FI classes described earlier: statements of abilities and efficacies; expectancies of behavioral effects; and of valuations and goals. A total of 1,985 reasons for performing trait-related behaviors were initially extracted from these sources, which was reduced to a smaller set of 463 by eliminating redundancies.

Linking functionality indicators to Big Five-related traits. A second group of students (N = 511; age M = 18.7; 57% female) completed items describing their levels of these FIs and of Big Five-related traits via an online survey.

Measures of Big Five-related behavioral traits. Using items from the BFI (John et al., 2008) and IIDL (**Wood**, Nye, & Saucier, 2010), we estimated two behavioral traits within each Big Five trait domain. We excluded items that concerned self-perceptions of valuations or goals, abilities, or expectancies. We also attempted to measure traits close to the two major subfacets within each Big Five domain as described by DeYoung, Quilty, and Peterson (2007) and Soto and John (2009). Following these considerations, the items used to construct these 10 scales are given in Appendix A; alpha values are provided in Table 1.

Functionality indicators of Big Five-related behaviors. The 463 reasons identified above were adapted into questionnaire statements using four different question-response formats. Items pertaining to likes and dislikes were rated under the instruction "How much do you *like or dislike* the following things?" (1 = *strongly dislike this* to 5 = *strongly like this*), and to goals under the instruction "How much do you *try or want to do* the following behaviors?" (1 = *I try very hard to avoid doing this* to 5 = *I try very hard to do this*). Items pertaining to abilities were rated under the instruction "How *easy or hard* do you find doing the following things when you try to (or feel that you should)?" (1 = *I find it very difficult to do this* to 5 = *I find it very easy to do this*). All remaining items were rated under the general instruction "How much do you agree with each statement?" (1 = *strongly disagree* to 5 = *strongly agree*). The complete item set is available from the first author.

We then reduced the set of 463 items to a more manageable set of approximately 100 items using cluster analysis techniques (see **Wood**, Nye, & Saucier, 2010) resulting in the initial extraction of 87 clusters. We then correlated all 463 items with the 61 items of the IIDL to identify one item from each initial cluster that best represented the pattern of associations linking the cluster to the IIDL, and to identify additional items that showed particularly large correlations with a single IIDL item, or correlated above an absolute magnitude of .20 with 10 or more IIDL items, resulting in the identification of 12 additional items for a total of 99 FI items.

Results and Discussion

Interrelationships between self-perceptions of Big Five-related traits. The interrelationships between the 10 Big Five-related traits are shown in Table 1. Generally there were strong relationships between aspects usually regarded as being within the same Big Five domain. However, we also found regular correlations between traits considered to be in different domains. Consistent with past research (DeYoung, 2006), traits across the agreeableness, conscientiousness, and emotional stability domains tended to correlate with one another, as did traits across the extraversion and intellect/openness domains.

Relations between functionality indicators and trait covariation. We explored three main questions concerning the interrelations of FIs and behavioral traits: (a) which specific FIs may underlie the covariation found between traits within the same Big Five trait domain (e.g., sociability and assertiveness); (b) which specific FIs are associated with correlated traits in different trait domains (e.g., sociability and politeness or creativity); and (c) are there specific FIs that are commonly associated with negligibly correlated behavioral traits (e.g., assertiveness and politeness)? To explore these questions, we correlated all 99 FI items with the 10 Big Five-related traits. In Table 2, FI items are ordered by the trait they have the largest association with, except for items #89–#99, which are placed at the bottom of the table due to having no associations above $|r| = .20$. To draw out more general themes, we summarize themes of how FI items related to these traits by paraphrasing the items while indicating where the full items can be found in Table 2 in parentheses.

Question 1: What FIs are associated with behavioral traits within the same Big Five domain? For each pair of Big Five-related traits, we list the number of FI items that correlate above $|r| = .20$ for both traits, and then enter these traits into a cluster analysis to organize similarities. We then describe each large group of items from these cluster analyses in the text, and also single items that were associated with both traits but that appeared unassociated with these clusters. A virtue of this method is that different groups described in the text will generally contribute to covariation independently of one another if entered into a simultaneous regression, and thus provide relatively distinct paths to the covariation of the two traits.

Assertiveness and sociability. As shown in Table 2, assertiveness and sociability were commonly associated with 21 of the 99 FI items which could be roughly organized in four groups. The first (#1, #7, #9, #10, #18) largely concerned positive social expectations (e.g., feeling unafraid of social situations). The second (#6, #8, #11, #12, #16, #14) concerned feeling it was important and enjoyable to be part of social interactions. The third (#4, #15) concerned liking and being able to open up to others. The fourth (#82, #83, #84) concerned ease of taking risks and trying new things. Fairly distinct from these groups, individuals who reported being able to put things in perspective (#74) and follow through with plans (#59), and liking confronting others (#2) and debating ideas with others (#3) tended to report greater sociability and assertiveness.

Kindness and warmth. Both traits were commonly associated with 35 FI items, in roughly three clusters. The first (#9, #7, #13, #16, #19, #20, #24) concerned feeling able to be friendly and comfortable toward others. The second (#21, #22, #23, #25, #33, #35, #37, #58, #60) concerned perceptions that one should accept and act dependably toward others. The third (#29, #38, #39, #40, #41, #42, #43, #44) concerned finding disrespecting others acceptable/enjoyable. Additionally, individuals who reported trying to see the beauty in things (#86), and being able to regulate their actions (#64) and anger (#77), and to act "normally" (#88) tended be report both more kindness and warmth.

Orderliness and reliability. Both traits were commonly associated with seven items, in approximately two clusters. The first (#52, #55, #59) concerned ease of managing time and tasks. The second (#50, #51, #57, #65) concerned feeling that orderly was important.

Anxiety and irritability. Both traits were commonly associated with 12 items, in roughly two clusters. The first (#72, #73, #74, #75, #77) concerned ease of putting things in perspective and brushing off negative judgments. The second (#24, #29, #69) concerned perceptions that others were not helpful or good-natured. Somewhat distinctly, individuals who reported being unable to keep attention on tasks (#55), feeling upset when plans change (#68), and who enjoyed gossiping about others (#42) reported both greater anxiety and irritability.

Table 1. Relationships Between Big Five-Related Traits.

Trait	Assert	Social	Kind	Polite	Orderly	Relia	Anxious	Irrit	Creat	Unconv
Assertive	(.83)									
Sociable	**.51**	(.89)								
Kind	.11	**.44**	(.77)							
Polite	–.09	**.24**	**.63**	(.72)						
Orderly	.05	.05	.07	.07	(.86)					
Reliable	.11	.19	**.40**	**.41**	**.32**	(.75)				
Anxious	–.14	–.16	**–.21**	**–.26**	.04	–.08	(.80)			
Irritable	.10	–.11	**–.36**	**–.48**	–.04	–.16	**.56**	(.77)		
Creative	**.28**	**.29**	**.20**	.14	–.07	.10	**–.21**	–.05	(.83)	
Unconventional	.15	–.01	**–.23**	**–.26**	–.16	–.19	–.05	.15	.15	(.36)

$N = 511$. All $|rs| \geq .09$ are significant ($p < .05$). Correlations above .20 have additionally been shown in bold. Reliabilities are shown on the diagonal in parentheses. Items used to construct the trait scales are given in the text. "Assert" = Assertive, "Social" = Sociable, "Polite" = Polite, "Relia" = Reliable, "Irrit" = Irritable, "Creat" = Creative, "Unconv" = Unconventional.

Table 2. Relationships Between Big Five-Related Traits and FI/Process Items

Functionality indicator	#	Assert	Social	Kind	Polite	Orderly	Relia	Anxious	Irrit	Creat	Unconv
L: Being a leader	*1*	**.45**	**.41**	**.22**	.09	.08	.17	−.15	−.04	**.25**	.03
L: Confronting others	*2*	**.37**	**.21**	−.08	**−.24**	−.02	−.07	−.08	.12	.08	.14
L: Debating ideas with other people	*3*	**.33**	**.20**	−.05	−.05	−.06	−.02	−.07	.09	**.26**	**.25**
L: Expressing my emotions	*4*	**.29**	**.29**	**.26**	.01	.01	−.02	.01	.16	**.20**	.00
G: Correct other people to help them	*5*	**.21**	.05	−.03	−.07	.08	.06	−.05	.09	.09	.01
A: Being talkative in group situations	*6*	**.46**	**.62**	**.28**	.08	.01	.10	−.12	−.02	**.25**	.01
A: Making friends	*7*	**.27**	**.56**	**.38**	**.23**	.00	.17	**−.24**	−.18	**.23**	−.02
L: Being talkative in social situations	*8*	**.37**	**.56**	**.25**	.06	−.05	.06	−.06	.04	**.22**	.07
P: I feel comfortable around other people	*9*	**.35**	**.50**	**.38**	**.22**	−.03	.19	**−.28**	−.18	.10	−.01
P: I am comfortable around people I don't know	*10*	**.34**	**.47**	.19	.14	−.08	.11	**−.26**	−.12	**.27**	.15
G: Start conversations with other	*11*	**.31**	**.46**	**.29**	.18	.02	.12	−.04	−.02	**.23**	−.02
L: Surrounding myself with other people	*12*	**.29**	**.45**	**.27**	.10	−.03	.07	.02	.02	.10	−.04
L: Making new friends	*13*	.19	**.42**	**.35**	**.23**	.00	.19	−.09	−.13	.14	−.08
L: Being the center of attention	*14*	**.32**	**.36**	.08	−.07	−.06	−.13	.02	.14	**.23**	.10
A: Opening up to other people	*15*	**.22**	**.36**	**.29**	.09	.05	.02	−.06	.01	.14	−.08
P: It's important to take part in conversations in social situations	*16*	**.22**	**.33**	**.27**	**.20**	.08	.15	−.07	−.12	.03	−.13
L: Making "small talk"	*17*	**.20**	**.22**	.08	.05	−.04	−.04	−.05	.02	.14	.02
P: I am scared to speak up in social situations	*18*	**−.45**	**−.50**	**−.31**	−.18	−.02	−.17	**.27**	.09	**−.26**	−.03
A: Being friendly to other people	*19*	.03	**.33**	**.43**	**.39**	−.03	.19	−.13	**−.23**	.09	−.11
A: Sympathizing with other people's feelings	*20*	−.01	**.25**	**.37**	**.28**	−.03	.18	−.08	−.10	.09	.02
P: Having a positive outlook on life is better for everyone	*21*	.14	**.28**	**.36**	**.30**	.07	.19	−.18	**−.22**	.09	−.13
L: Setting a good example for others	*22*	.09	.16	**.35**	**.30**	.08	**.29**	−.02	−.11	.06	**−.23**
P: It's important to make other people feel accepted and appreciated	*23*	−.04	.17	**.33**	**.29**	−.02	.17	.01	−.06	.06	−.09
P: People are generally good	*24*	.01	.18	**.30**	**.26**	−.04	.08	**−.20**	**−.26**	.07	−.09
P: Having a support system is important	*25*	.01	.14	**.29**	**.24**	.09	**.24**	.02	−.07	−.01	−.11
G: Have confidence in myself	*26*	.17	**.20**	**.25**	**.24**	.06	.17	−.19	−.15	.14	.02
A: Accepting people who are different from me	*27*	.09	.16	**.24**	**.23**	−.11	.15	−.14	−.15	.17	.08
G: Be liked by others	*28*	−.01	.15	**.20**	.16	.02	.08	.10	.00	−.05	**−.20**
P: Nobody is really there to help me out	*29*	−.02	−.15	**−.34**	**−.31**	−.06	−.16	**.20**	**.26**	−.02	.13
P: Talkative people are annoying	*30*	−.10	**−.27**	**−.28**	−.17	.06	−.12	.02	.11	−.07	.08
L: Silence in social situations	*31*	−.16	**−.21**	**−.22**	−.12	−.06	−.10	−.01	.05	.03	.02
P: I need concrete proof to believe in something	*32*	.07	.01	**−.20**	−.16	.05	−.08	.01	.06	−.05	.07
G: Be respectful of others	*33*	−.03	.07	**.31**	**.37**	.03	**.22**	−.09	−.12	.05	−.06
P: I would feel bad if I insulted someone	*34*	−.12	.06	**.30**	**.34**	−.02	.06	−.01	−.17	.03	**−.22**
P: My friendships are important	*35*	.01	.18	**.28**	**.29**	.05	**.25**	−.09	−.12	.08	−.03
P: It's important to be exposed to a lot of different ideas	*36*	.09	.14	.18	**.22**	−.04	.14	−.07	−.10	.11	.12
P: All people deserve respect	*37*	.00	.15	**.21**	**.21**	.05	.09	−.05	−.12	.06	−.01
L: Disappointing or angering other people	*38*	.12	−.05	**−.31**	**−.39**	−.04	**−.26**	−.01	.14	.00	.13
P: It's ok to deal with problems by being rude to others	*39*	.12	−.04	**−.29**	**−.39**	−.06	**−.25**	.02	.18	−.03	.14
P: There is no good reason to act respectful to others in social situations	*40*	.07	−.06	**−.28**	**−.32**	−.09	**−.32**	−.03	.10	−.02	.10
P: Friendly people are hard to approach	*41*	.03	−.12	**−.29**	**−.31**	−.02	**−.20**	.14	**.23**	−.02	.07
L: Gossiping about people	*42*	−.03	−.07	**−.22**	**−.31**	−.06	**−.22**	**.22**	**.28**	−.11	.09
G: Come across as being an "angry" person	*43*	.09	−.06	**−.26**	**−.30**	−.04	**−.26**	.03	.19	.01	.14
A: Thinking of good insults	*44*	.19	.00	**−.26**	**−.29**	−.04	−.08	.01	**.21**	.11	**.22**
P: I am more important than other people	*45*	.16	.03	−.19	**−.28**	−.01	**−.20**	−.04	.15	.02	.09
L: Being stressed out	*46*	.05	−.06	**−.23**	**−.25**	.02	−.18	.05	.08	.01	.05
P: I don't really care about things that I can't understand	*47*	−.01	−.03	−.19	**−.23**	.01	−.11	.07	.11	−.15	.01
P: Being worried or stressed would gain me the attention of others	*48*	−.04	−.05	−.17	**−.22**	.01	**−.20**	.13	.14	−.02	−.03
P: People who are disorganized and messy come across as rude	*49*	.01	−.06	−.18	**−.21**	.18	−.09	.11	.14	.01	.05
A: Organizing things	*50*	.13	.18	.12	.14	**.60**	**.29**	−.02	−.09	.04	−.14
P: Organization is necessary	*51*	.06	.08	.07	.08	**.51**	**.23**	.19	.07	−.08	−.15
A: Managing my time	*52*	.15	.13	.04	.03	**.41**	**.28**	−.09	−.07	−.04	−.14
L: Making detailed plans	*53*	.12	.10	.03	−.04	**.35**	.14	**.25**	.13	−.05	**−.21**
P: Having routines makes me feel comfortable and secure	*54*	−.05	.00	−.09	−.05	**.34**	.17	**.25**	.12	**−.26**	**−.26**
A: Keeping my attention on tasks	*55*	.08	.10	.08	.11	**.28**	**.26**	**−.23**	**−.22**	.12	−.13

Table 2 (*continued*)

Functionality indicator	#	Assert	Social	Kind	Polite	Orderly	Relia	Anxious	Irrit	Creat	Unconv
L: Being a perfectionist	*56*	.04	.09	.02	.02	**.25**	.16	**.24**	.15	.02	−.07
P: Time management is important	*57*	.05	.07	.13	.14	**.24**	**.21**	.10	−.05	−.06	−.16
P: It's important to be reliable and dependable	*58*	.02	.08	**.27**	**.27**	.15	**.41**	.01	−.08	−.01	−.18
A: Following through with plans	*59*	**.21**	**.21**	**.21**	.18	**.30**	**.36**	−.07	−.10	.06	**−.23**
P: Other people depend on me	*60*	.14	.18	**.28**	**.26**	.10	**.33**	−.04	−.06	.11	−.06
P: I pressure myself to be as successful as possible	*61*	.13	.18	.12	.15	.15	**.32**	.15	−.01	.04	−.05
L: Working hard	*62*	.15	.15	.10	.15	.18	**.31**	−.01	−.08	.03	−.12
A: Thinking rationally	*63*	.12	.12	.17	**.22**	.08	**.30**	−.18	**−.21**	.11	−.06
A: Regulating my actions	*64*	.08	.19	**.21**	**.24**	.12	**.27**	−.13	**−.20**	.09	−.13
G: Be "on top of things" at all times	*65*	.09	.05	.11	.11	**.24**	**.27**	.12	.05	.01	−.19
G: Achieve my career goals	*66*	.11	.11	.10	.15	.13	**.24**	.02	.01	.00	−.08
P: I don't feel the need to learn new things	*67*	−.02	−.05	−.19	**−.25**	−.12	**−.27**	.11	.16	−.16	.03
P: I get stressed out if my plans change	*68*	−.01	−.09	**−.23**	**−.22**	**.21**	−.02	**.48**	**.33**	−.08	−.10
P: I feel that I won't be accepted by others	*69*	−.15	**−.27**	**−.30**	**−.28**	−.08	**−.22**	**.40**	**.31**	−.17	.04
P: I worry about messing up on school assignments	*70*	−.05	−.02	−.02	.01	.13	.11	**.31**	.18	−.16	−.10
L: Having other people know when I'm right	*71*	.02	−.05	−.03	−.08	.09	.00	**.21**	.19	−.10	.03
A: Staying calm in potentially stressful situations	*72*	.18	.08	.03	.10	−.05	.02	**−.57**	**−.35**	**.20**	.05
A: Brushing off what other people think of me	*73*	**.24**	.14	.04	.05	−.05	.04	**−.36**	**−.21**	.15	.18
A: Putting things into perspective	*74*	**.20**	**.22**	.18	.19	−.03	.15	**−.36**	**−.29**	**.20**	.02
A: Seeing the positive side of bad situations	*75*	.15	**.22**	.19	.15	−.04	−.01	**−.35**	**−.30**	**.22**	−.05
P: Staying calm in situations is beneficial for everyone	*76*	.08	.11	.17	.16	.04	.11	**−.20**	−.13	.10	.05
A: Managing my anger	*77*	−.10	.03	**.23**	**.30**	.04	.08	**−.30**	**−.43**	.05	−.09
A: Coming up with creative ideas	*78*	.15	**.21**	.14	.11	−.03	.02	−.18	−.05	**.73**	.14
A: Creating visual art (drawing, painting)	*79*	.04	.10	.07	.02	−.01	−.07	−.18	−.01	**.52**	.14
L: Abstract ideas	*80*	.12	.09	.05	.11	−.13	−.07	−.18	−.04	**.48**	**.30**
A: Appreciating art	*81*	.02	.08	.05	.09	−.02	−.01	−.15	−.05	**.41**	.16
L: Standing out by being different from the crowd	*82*	**.34**	**.28**	.15	.05	−.10	.05	−.14	−.01	**.39**	**.24**
A: Trying new things	*83*	**.28**	**.36**	**.21**	.18	−.07	.06	**−.29**	**−.20**	**.37**	.16
A: Taking substantial risks	*84*	**.26**	**.24**	.01	−.08	−.06	−.12	**−.25**	−.01	**.31**	**.25**
G: Try new things	*85*	.16	**.28**	**.26**	**.22**	−.11	.08	**−.20**	−.12	**.30**	.11
G: See beauty in everything	*86*	.04	.15	**.26**	**.26**	−.03	.08	−.11	−.12	**.27**	.02
L: Doing strange things to get a reaction out of others	*87*	**.21**	.16	−.05	−.12	−.12	−.09	−.03	.10	.19	**.26**
A: Acting normal	*88*	.02	.11	**.24**	**.26**	.13	**.23**	−.15	−.19	−.12	**−.29**
L: Making jokes	*89*	.11	.14	.01	−.02	−.12	−.01	−.09	−.02	.16	.15
P: It's better to find a single right answer to an issue than to consider multiple interps.	*90*	.01	−.02	−.10	−.10	−.02	−.10	.12	.08	−.16	−.14
A: Understanding math and science	*91*	.00	−.04	.00	.08	−.01	.16	−.16	−.10	.01	−.03
A: Getting work done in silence	*92*	.02	.06	.02	.05	.18	.10	.02	−.03	−.02	−.13
P: Getting good or bad grades is not going to affect what I want to do in life	*93*	.05	−.02	−.07	−.08	−.05	−.18	−.11	−.02	.08	.13
P: I need pressure to get anything done	*94*	−.04	−.03	−.10	−.09	−.15	−.19	.09	.05	−.08	.04
P: I get uncomfortable when others tell offensive jokes	*95*	−.04	.00	.06	.08	.04	.06	.09	.04	.06	−.16
P: If I help others, they will also help me	*96*	.17	.18	.14	.12	−.08	.09	−.10	−.12	.10	.01
G: Maintain self-control in stressful situations	*97*	.03	.03	.11	.18	.11	.14	−.14	−.17	.03	−.04
P: Others respond well to people who are outgoing	*98*	.15	.15	.08	.09	.00	.10	.00	−.01	.05	.02
P: Nobody really pressures me to work hard	*99*	.10	.01	−.08	−.13	−.06	−.03	.02	.09	.05	.04

N = 505. All |*rs*| > than .09 are significant ($p < .05$). All correlations greater than .20 are additionally shown in bold. Among functionality indicator items, "L" = Liking item, "G" = Goal item, "A" = ability item, "P" = perception items, "Assert" = Assertive, "Social" = Sociable, "Polite" = Polite, "Relia" = Reliable, "Irrit" = Irritable, "Creat" = Creative, "Unconv" = Unconventional. Other words in the complete FI items have been abbreviated for space considerations.

Creativity and unconventionality. Both traits were commonly associated with 5 items. The most highly associated items (#3, #80, #82) concerned enjoying abstract ideas, debating ideas with others, and standing out from others. Somewhat distinctly, individuals reporting greater ease in taking risks (#84) and who disagreed that routines helped make them feel secure (#54) tended to report more creativity and unconventionality.

Question 2: What FIs are commonly associated with correlated behavioral traits in different Big Five domains? We next conducted analyses to explore the FIs that might underlie the covariation of traits typically categorized under different Big Five factors. We first explored FIs associated with both sociability and politeness (r = .24), and sociability and creativity (r = .29), again focusing primarily on items associated above $|r| \geq .20$ with both traits. We then explore FIs that were correlated with traits in several Big Five domains simultaneously.

Sociability and politeness. Both traits were commonly associated with ease of being friendly (#7, #19, #20); expecting comfort and acceptance from others (#9, #69); valuing a positive outlook (#21) and socializing (#16); and greater goals of trying new things (#85), having self-confidence (#26), and making friends (#13).

Sociability and creativity. Both traits were associated with increased enjoyment, effort, and ease of engaging and expressing oneself in social interactions (#1, #3, #4, #6, #7, #8, #11, #10, #14, #18, #82); with ease of putting things in perspective (#74, #75), and of coming up with creative ideas (#78); and with both the desire and ease of trying new things and taking risks (#83, #84, #85).

Question 2B: What FIs are associated with behavioral traits in several Big Five domains simultaneously? Paralleling other studies that have examined the intercorrelations among behavioral traits, we can see in Table 1 that there were almost invariably significant positive correlations between every pairwise combination of sociability, kindness, politeness, reliability, creativity, and assertiveness, and negative correlations between these traits with anxiety, irritability, and unconventionality. Although this is sometimes interpreted as an artifact of the blending of orthogonal factors (Ashton et al., 2009) or the product of higher order factors (DeYoung, 2006), this phenomenon can alternatively be understood as indicating the existence of FIs which influence the functionality of many distinct behavioral traits simultaneously. As can be seen from Table 2, numerous FIs were associated with most traits simultaneously. We list some themes below.

Ease in social situations. Items concerning ease and comfort in social situations (#6, #7, #9, #10, #18) tended to be most associated with sociability and assertiveness, but also related positively to kindness, politeness, and creativity, and negatively to irritability and anxiety.

Negative expectations of social situations. Individuals who expected that others would not accept or help them (#29, #69) especially reported lower kindness and politeness and greater anxiety and irritability, but also reported somewhat lower assertiveness, sociability, reliability, and creativity.

Importance placed on acting positively. Individuals who felt that others depended on them (#60), that they should have a positive outlook (#21) and take part in social situations (#16), and who tried to be successful (#61) and develop self-confidence (#26), tended to be more sociable, kind, polite, assertive, reliable, and creative, and less anxious and irritable.

Interpersonal skills. Individuals who reported greater ease in acting "normal" (#88) and friendly (#19), accepting others (#27), and seeing the positive side of situations (#75), reported greater kindness, politeness, sociability, and reliability, and less anxiety and irritability.

Self-regulatory and task related abilities. Individuals who reported greater ease of regulating their actions (#50, #55, #64), and who liked working hard (#62) tended to report being more reliable, orderly, kind, polite, and sociable, and less anxious, irritable, and unconventional.

Importance and ease of seeing and doing things differently. Individuals who placed greater importance in seeing different perspectives (#36) and trying new things (#85), and who found it easy to come up with creative ideas (#78), tended to report especially higher creativity and unconventionality, but also higher assertiveness, sociability, kindness, and politeness.

Enjoyment of being different. Individuals who enjoyed being different from the crowd (#82) and provoking reactions from others (#87) particularly reported being more creative and unconventional, but also being more assertive, sociable, and less orderly.

Question 3: What FIs are commonly associated with uncorrelated behavioral traits? As we have suggested, even uncorrelated traits should regularly share FIs in an arrangement such that some FIs show same-sign correlations and others opposite-sign correlations in about equal magnitude. We explore this idea by examining two trait pairs that show near-zero correlations in Table 2: orderliness and anxiety ($r = .04$), and assertiveness and politeness ($r = -.09$). In the text, we discuss FIs that were significantly associated ($p < .05$) with both traits simultaneously.

Orderliness and anxiety. Tendencies to be orderly and anxious were commonly associated with 23 FI items. Both were positively associated with believing order was important (#49, #51, #57), and with concern about messing up on tasks (#70) or changing plans (#68). Orderliness and anxiety were both higher among people who liked structure (#53, #54, #65), being a "perfectionist" (#56), and being seen as "right" (#71), and were both lower among people who liked abstract ideas (#80), being different from others (#82), and who strove to try new things (#85). However, ease of managing time (#52), staying on task (#55), self-regulating (#64), and acting "normally" (#88) were associated with increased orderliness but decreased anxiety.

These results thus indicate that *concerns and preferences* for order may serve to increase both orderliness and anxiety, but *abilities* to create or maintain order may serve to increase orderliness but decrease anxiety. These FIs appear to suppress one another and result in the near-zero association between these traits.

Assertiveness and politeness. Tendencies to be assertive and polite were commonly associated with 39 FIs. Both were positively associated with ease and enjoyment of socializing (#7, #9, #10, #11, #12, #13, #16, #18, #69); effort and enjoyment in doing well (#61, #62, #65, #66); and ease of thinking creatively and rationally (#63, #78), putting things in perspective (#74, #75), staying organized (#50) and staying calm in tense situations (#72). Both were negatively associated with perceiving talkative people as annoying (#30) and enjoying silence (#31). However, perceiving more ease and value in confronting or provoking others (#2, #34, #38, #39, #43, #44, #45, #87) was associated with greater assertiveness but

decreased politeness, and ease of managing anger (#77) was associated with higher politeness but lower assertiveness.

Across both examples, we see that behavioral traits regularly share many common FIs even when they are almost perfectly uncorrelated, arrayed such that some showed same-sign associations and others opposite-sign associations with the two traits. This is consistent with our understanding that uncorrelated behavioral traits should generally be expected to be influenced by common FIs that suppress one another, rather than by entirely separate systems of FIs.

Study 2: Relations Between FIs and Big Five-Related Traits Within the IPIP

The IPIP (Goldberg et al., 2006) consists of a set of nearly 2,500 items completed by participants in the ESCS. Most participants have both self- and peer-ratings of Big Five-related traits similar to those examined in Study 1, affording the potential to test whether the major contours of relations between FIs and Big Five-related traits described in Study 1 replicate in a new sample, and across both self- and other-perceptions. Again, we present a summarized description of the Method which is expanded in the Supplementary Materials (S1).

Method

Participants. A total of 700 ESCS participants completed the materials examined here as part of an ongoing study. Participants ranged in age from 18 to 85 (M = 51.4, 56% female), and were of all levels of education (see Goldberg, 2008 for additional details.

Materials: *Saucier Mini-Markers.* In this study, we utilized the Saucier Mini-Markers (SMM; Saucier, 1994) as our measure of personality as it was administered multiple times in the form of both self-ratings and peer-ratings over the course of the multiyear study. There were up to three self-ratings and up to three peer-ratings of the SMM that could be used for each participant.

We used indicators of two distinct traits from each Big Five domain selected to parallel the traits examined in Study 1 to the extent possible, and which were examined separately: the items *bold* and *extraverted* within the domain of extraversion; *kind* and *cooperative* in the domain of agreeableness; *organized* and *practical* in the domain of conscientiousness, *fretful* and *temperamental* in the domain of neuroticism, and *creative* and *philosophical* in the domain of openness. Self-rating estimates of these traits were formed by aggregating the multiple self-ratings of these items over the course of multiple years of the study; peer rating scales were formed by aggregating the 1 to 3 peer ratings.

International Personality Item Pool (IPIP). ESCS participants completed up to 2,492 IPIP items between Spring, 1994 and Spring, 2003, which consisted of short items describing their behavioral traits, feelings, skills, beliefs, and more abstract self-perceptions.

The first and third authors and a research assistant categorized the IPIP items as either an FI item (e.g., *abilities, beliefs, likes/dislikes, goals, values*) or a behavioral trait item. For the 1,351 items classified as FIs, the item's correlation with a self-reported and peer-reported SMM trait was first averaged. We then identified the 100 FI items with the highest absolute correlation with each SMM trait. Across the 10 traits, this resulted in a smaller set of 630 items. These items were then entered into a cluster analysis, which was prespecified to extract 75 clusters. These clusters ranged in size from 24 items, to a one-item cluster which was not considered further. For the remaining 74 clusters, we selected a single item to represent in Table 4 which was most representative of how the cluster was associated with the 10 traits.

Results and Discussion

Question 1: What FIs are associated with behavioral traits in the same Big Five domain? We first examined FIs associated with traits regarded as being within the same trait domain. In the text, we only discuss items that were both (a) correlated at least $|r| = .20$ with either self-ratings or peer-ratings of both traits, and (b) significantly correlated with both self- and peer-ratings of these traits. We entered these items into a cluster analysis to organize redundancies, and in the text identify the resulting groups by their item numbers in Table 4.

Bold and extraverted. We found 11 items associated with both traits, in roughly three clusters. The first (#1, #6, #10, #13, #16, #18) consisted largely of reported ease of influencing others, expressing feelings, and approaching others. The second (#2, #12) consisted of enjoyment of power and attention. The third (#7, #48) consisted of reported ease of making

Table 3. Relations Between Self- and Peer-Rated Big Five-Related Trait Perceptions

# Trait	α_S	α_P	1	2	3	4	5	6	7	8	9	10
1 bold	.76	.43	***.54***	**.49**	–.06	–.10	.07	–.05	–.14	.15	.14	.07
2 extraverted	.85	.53	**.45**	***.54***	.09	.08	.06	–.03	–.10	.00	.14	.07
3 kind	.66	.27	.04	.12	***.23***	**.47**	.09	**.21**	–.09	**–.36**	.07	.10
4 cooperative	.62	.35	–.02	.12	**.52**	***.20***	**.22**	**.30**	**–.21**	**–.45**	.09	.17
5 organized	.86	.57	.09	.07	.10	.16	***.50***	**.38**	–.13	–.09	.05	.04
6 practical	.72	.45	.04	–.04	.17	**.34**	**.38**	***.30***	**–.23**	**–.26**	–.07	.09
7 fretful	.72	.43	–.08	–.06	–.09	–.12	–.13	–.13	***.30***	**.35**	–.04	–.11
8 temperamental	.77	.48	.07	–.01	**–.22**	**–.29**	–.15	–.19	**.44**	***.37***	.05	–.16
9 creative	.85	.52	**.29**	**.20**	.15	.12	.05	.08	–.11	–.07	***.44***	**.25**
10 philosophical	.81	.49	.10	.09	.12	.09	–.01	.05	–.02	–.07	**.31**	***.42***

$N \geq 590$. α_S = Alpha from self-ratings, α_P = Estimated alpha from peer-ratings. All $|rs| \geq .08$ are statistically significant ($p < .05$), all $|rs| \geq .20$ are additionally shown in bold. Correlations between self-ratings are shown below the diagonal, and correlations between peer-ratings are shown above the diagonal. Correlations between the self-rating and peer-rating for the same item are shown on the diagonal and italicized.

Table 4. Relations Between Self- and Peer-Ratings of Big Five-Related Traits and FI/Process IPIP Items

IPIP FI item	#	Bold		Extrav.		Kind		Cooper.		Organized		Practical		Fretful		Temper.		Creative		Philos.	
		S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P
Have a natural talent for influencing people	*1*	**.44**	**.31**	**.40**	**.31**	.08	−.06	.04	−.05	.10	−.01	.01	−.07	−.07	−.05	.03	.05	**.30**	.10	**.23**	.16
Want to be in charge	*2*	**.38**	**.31**	**.31**	**.26**	−.05	−.10	−.03	−.09	.16	.10	−.01	−.03	−.02	−.11	.05	.06	.18	.06	.09	.06
Love a good fight	*3*	**.31**	**.21**	.15	.04	−.13	−.18	−.19	−.14	−.04	.02	−.07	−.08	.03	−.08	.19	.12	.04	−.05	.08	.04
Believe that I am important	*4*	**.29**	**.22**	**.24**	.11	.13	−.01	.11	.02	.14	.05	.15	−.01	−.14	−.14	−.08	−.04	.17	.06	.08	.02
Can handle complex problems	*5*	**.31**	**.20**	.13	.04	.07	−.12	.07	−.02	.19	.06	.16	−.01	**−.26**	−.19	−.14	−.08	**.31**	.10	**.22**	.15
Am good at making impromptu speeches	*6*	**.37**	**.32**	**.38**	**.26**	.01	−.04	.00	.01	.08	−.04	.01	−.03	−.14	−.12	−.07	−.03	**.25**	.09	**.22**	.16
Make decisions easily	*7*	**.35**	**.25**	**.23**	.19	−.01	−.09	.03	−.06	.16	.09	.08	−.03	**−.22**	−.17	−.11	−.02	**.20**	.09	.08	.01
Let myself be pushed around	*8*	**−.23**	−.19	−.12	−.06	−.05	.09	.04	.08	**−.24**	−.17	−.14	−.02	**.21**	.10	.08	−.08	−.17	−.05	−.02	−.01
Try to please everyone	*9*	−.16	**−.20**	−.04	.01	.14	.16	.18	.16	−.01	.02	.02	.02	.15	.02	.04	−.06	−.12	−.05	−.08	−.09
Usually like to talk a lot	*10*	**.26**	**.30**	**.48**	**.37**	.06	.00	.02	−.08	−.01	−.04	−.03	−.11	.08	.12	.10	.17	.04	.01	.00	.01
Love large parties	*11*	.17	.16	**.30**	**.31**	.02	.03	.03	.00	.04	.04	−.05	−.03	−.02	−.01	.00	.04	.02	.01	−.01	−.03
Like to attract attention	*12*	**.31**	.19	**.35**	**.21**	−.08	−.09	−.07	−.08	−.04	−.03	−.07	−.14	.05	−.02	.13	.04	.13	.02	.11	.06
Would make a good actor	*13*	**.26**	.17	**.32**	**.20**	.02	−.04	.03	−.04	−.01	−.05	−.04	−.13	.04	.00	.06	.03	**.20**	.06	**.20**	.11
Usually enjoy being with people	*14*	.09	.17	**.34**	**.28**	**.25**	.11	**.22**	.09	.10	.02	.08	.01	−.14	−.09	−.14	−.12	.03	.04	−.01	−.06
Am considered attractive by others	*15*	**.22**	.13	**.26**	.19	.14	−.04	.13	−.02	.12	.03	.10	−.03	−.09	−.03	−.03	.02	**.21**	.12	.12	.09
Have difficulty expressing my feelings	*16*	**−.25**	**−.26**	**−.37**	**−.34**	−.14	−.04	−.11	−.01	−.17	−.09	−.01	.10	.14	−.04	.08	−.02	−.19	−.15	**−.20**	−.07
Have difficulty showing affection	*17*	−.05	−.13	**−.25**	−.19	**−.28**	−.14	**−.21**	−.07	−.07	.00	−.02	.09	.06	−.05	.06	.00	−.09	−.14	−.08	−.10
Find it difficult to approach others	*18*	**−.27**	**−.26**	**−.40**	**−.27**	−.10	.00	−.10	.01	−.12	.02	−.04	.07	.18	.07	.12	−.01	**−.20**	−.09	−.12	−.15
Like to help others	*19*	−.01	.03	.15	.13	**.34**	**.25**	**.26**	.16	.05	.00	−.01	.01	−.07	.01	−.05	−.08	.04	.05	−.01	−.05
Love to make other people happy	*20*	−.04	.06	.14	.17	**.36**	**.20**	**.26**	.19	.05	.00	.04	−.04	−.01	.03	.00	−.04	.04	.12	.05	.01
Love children	*21*	.00	−.02	.09	.11	**.29**	.17	**.22**	.15	.04	−.01	−.01	−.02	−.07	−.05	−.07	−.13	.09	−.04	.05	−.03
Feel badly if my . . . actions cause someone . . . to feel emotional pain	*22*	−.09	−.06	.01	−.05	**.27**	.15	**.21**	.08	.01	−.01	.04	−.01	−.07	.06	−.15	−.10	.06	.08	.11	.04
Am good at understanding others' feelings	*23*	.10	.11	**.21**	.18	**.31**	.10	.15	.02	.03	−.10	.03	−.17	−.05	.05	−.10	.00	.15	.19	.16	.04
Am concerned about others	*24*	−.05	.01	.04	.08	**.36**	.19	**.23**	.13	.02	−.01	.07	−.04	−.05	.04	−.07	−.06	.08	.05	.09	.07
Believe the poor deserve our sympathy	*25*	−.06	−.01	.00	.01	.19	.16	.15	.10	−.04	−.04	.03	.04	−.04	−.01	−.05	−.07	−.04	.05	.19	.11
Love dangerous situations	*26*	**.22**	.06	.04	.01	−.17	**−.21**	−.19	−.14	−.07	−.13	−.06	−.07	−.02	−.11	.09	.06	.00	−.06	−.01	−.02
Don't care about dressing nicely	*27*	.07	.04	−.14	−.07	**−.22**	−.08	**−.22**	−.10	−.13	−.11	−.06	.03	.00	−.11	.10	.05	−.02	−.03	−.05	−.02
Don't care about the rules	*28*	.13	.12	−.02	.07	−.15	−.14	**−.21**	−.11	−.17	−.11	−.12	−.13	.04	.01	.08	.05	.10	.10	.12	.10
Feel that life has no meaning	*29*	−.10	−.11	−.15	−.13	−.16	−.13	−.18	−.13	−.10	−.06	−.07	−.08	.08	−.01	.14	.09	−.11	−.01	−.05	.01
Pay attention to details	*30*	.09	.07	.05	.01	.10	−.02	.18	−.04	**.37**	.18	**.32**	.10	−.08	.00	−.14	−.01	**.21**	.05	.10	.06
Believe that planning ahead makes things turn out better	*31*	.07	.05	.04	−.03	.09	−.02	.14	.11	**.30**	.13	**.25**	.11	−.05	−.03	−.07	−.07	.00	−.04	.09	.03
Can make myself work on a diff. task even when I don't feel like it	*32*	.14	.04	.02	−.06	.06	−.02	.14	.01	.19	.10	**.21**	.09	−.17	−.06	−.15	−.08	.19	.04	.10	−.04
Want everything to be 'just right'	*33*	−.01	.03	−.02	.10	.08	.04	.04	.04	**.32**	**.22**	.15	.07	.13	.03	.10	.05	−.02	−.04	−.07	−.03
Find it difficult to organize tasks and activities	*34*	−.14	−.12	−.10	−.13	.01	.08	−.08	−.02	**−.45**	**−.30**	**−.22**	−.11	.16	.11	.13	.04	−.10	−.07	−.07	.03
Have difficulty starting tasks	*35*	−.15	−.11	−.15	−.05	−.07	.07	−.10	.05	**−.31**	−.15	−.18	−.06	.17	.12	.12	.01	−.18	−.07	.07	.02
Am easily distracted	*36*	−.06	−.06	−.02	.05	−.04	.07	−.05	.04	**−.28**	−.14	−.13	−.06	**.21**	.09	.18	.04	−.06	.02	−.02	.01
Am not highly motivated to succeed	*37*	−.19	−.14	**−.23**	−.10	−.06	.01	−.09	.02	**−.25**	−.13	−.18	−.08	.10	.09	.09	.06	−.14	−.04	−.11	−.01
Believe in a logical answer for everything	*38*	.02	−.02	−.11	−.07	−.07	−.06	.07	−.02	.17	.13	**.23**	.16	−.02	−.07	−.02	.01	−.05	−.16	−.10	−.16
Can't hold onto money for long	*39*	.01	−.02	.02	−.02	−.05	.04	−.11	−.03	**−.25**	−.15	**−.31**	**−.26**	.13	.10	**.20**	.09	.06	.12	.00	.00
Can't afford to buy things I need	*40*	−.11	.00	−.07	−.05	−.03	−.03	−.10	−.01	−.14	−.09	−.17	**−.20**	.16	.03	.13	.12	.03	.05	−.04	−.06
Feel a sense of worthlessness or hopelessness	*41*	−.15	−.08	−.16	−.17	−.14	−.05	−.16	−.10	**−.20**	−.12	−.19	**−.20**	**.33**	**.27**	**.32**	.17	−.12	−.02	−.08	−.02
Dislike myself	*42*	**−.20**	−.12	−.18	−.11	−.19	.02	−.15	−.07	**−.23**	−.12	**−.21**	−.14	**.37**	**.20**	**.28**	.16	−.12	−.01	−.07	.01
Worry about my health	*43*	−.03	−.05	−.03	−.03	−.08	−.04	−.09	−.05	−.06	−.07	−.10	−.08	**.30**	**.22**	**.27**	.15	.02	.01	−.01	−.11
Often have the feeling that others laugh or talk about me	*44*	−.09	−.04	−.08	−.12	−.15	.01	−.16	−.04	−.17	.00	−.19	.00	**.33**	.13	**.30**	.11	−.10	−.04	−.11	−.08

Table 4 (*continued*)

IPIP FI item	#	Bold		Extrav.		Kind		Cooper.		Organized		Practical		Fretful		Temper.		Creative		Philos.	
		S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P
Remember my failures more easily than my successes	*45*	−.17	−.07	−.18	−.13	−.15	−.06	−.17	−.15	−.13	−.07	−.13	−.13	**.27**	.18	.19	.08	−.16	.00	−.04	.00
Expect things to fail	*46*	−.06	−.07	−.12	−.09	−.14	−.04	−.13	−.07	−.10	−.08	−.07	−.07	**.24**	.14	.18	.12	−.08	−.03	.01	−.02
Feel crushed by setbacks	*47*	−.12	−.04	−.06	.04	.00	.04	−.07	−.04	−.09	−.01	−.08	−.03	**.33**	.17	**.26**	.08	−.14	.02	−.05	−.01
Worry about being embarrassed	*48*	**−.23**	−.15	**−.22**	**−.21**	−.08	.04	−.05	.02	−.07	.02	−.04	.03	**.31**	.18	**.21**	.07	−.17	−.07	−.07	−.06
Adapt easily to new situations	*49*	**.20**	.11	.19	.10	.10	.01	.18	.04	.07	−.01	.09	−.05	**−.28**	−.16	**−.22**	−.10	.17	.09	.05	.02
Find it easy to stay healthy	*50*	.08	.04	.08	.08	.08	.00	.12	.08	.19	.09	.17	.14	**−.21**	−.18	**−.24**	−.12	−.01	−.02	.01	.03
Can stand a great deal of stress	*51*	**.23**	.17	.08	.09	.07	−.04	.11	.04	.12	.09	.17	.09	**−.23**	**−.23**	−.18	−.09	.10	−.01	.06	.05
Experience very few emotional highs and lows	*52*	−.09	−.06	−.04	−.02	−.04	.00	.01	.06	.06	.02	.07	.19	−.16	**−.23**	**−.27**	−.11	−.10	−.18	−.11	−.07
Feel that friendly people are actually trying to manipulate me	*53*	.00	−.07	−.12	−.13	**−.21**	−.11	−.17	−.11	−.13	−.07	−.10	−.08	**.21**	.08	**.26**	.16	−.03	−.04	.01	−.07
Tend to become agitated when I have to sit and wait for something	*54*	.06	.04	.01	.04	−.14	−.06	**−.21**	−.11	.03	.07	−.08	−.02	**.21**	.08	**.28**	.13	−.02	−.06	−.04	−.04
Suspect hidden motives in others	*55*	.07	.07	−.11	−.09	−.18	−.12	−.18	−.13	−.13	−.05	−.08	−.06	**.25**	.07	**.25**	.14	−.03	.02	.06	−.04
Get upset if others change the way that I have arranged things	*56*	.05	.02	−.07	−.05	−.14	−.01	−.16	−.09	.17	.14	.05	.05	**.22**	.09	**.24**	.18	−.02	−.03	−.04	.01
Look on the bright side	*57*	.08	.03	.16	.11	**.23**	.13	**.23**	.11	.11	−.03	.12	.02	**−.24**	−.16	**−.24**	−.19	.07	.03	.03	−.03
Am not easily annoyed	*58*	−.05	−.05	.03	.01	.19	.13	.17	.16	−.02	−.09	−.02	.02	**−.30**	−.15	**−.41**	**−.24**	.06	.02	.04	.01
Easily resist temptations	*59*	−.05	.01	−.02	−.04	.11	−.01	.10	.09	**.24**	.11	.14	.16	**−.21**	−.14	**−.29**	−.15	.05	−.03	−.03	.00
Don't try to get even	*60*	−.11	−.06	−.04	−.03	**.22**	.11	**.20**	.09	.04	.00	.07	.06	−.15	−.05	**−.23**	−.19	−.02	.02	.01	.10
Love to think up new ways of doing things	*61*	**.24**	.10	.10	.06	.08	−.01	.02	−.06	.03	−.05	.00	−.08	−.06	−.05	−.01	.04	**.38**	**.25**	**.22**	.13
Am usually aware of the emotions that are portrayed in various types of art (for ex., painting, photography, music, dance)	*62*	.10	.11	.14	.08	.14	.05	.11	−.03	−.08	−.17	−.03	−.17	−.03	.02	−.05	.00	**.30**	**.25**	**.35**	.17
Enjoy feeling "close to the earth"	*63*	.07	.04	.01	−.02	.11	−.03	−.03	−.02	−.03	−.08	.01	−.01	.04	.00	.04	.05	.19	**.22**	**.22**	.06
See beauty in things that others might not notice	*64*	.01	.07	.06	.03	**.20**	.07	.09	−.03	.02	−.15	.01	−.15	−.04	.08	−.01	.10	**.29**	**.23**	**.25**	.04
Prefer variety to routine	*65*	.19	.11	.18	.08	.01	−.05	−.02	−.11	−.15	−.19	−.06	−.17	−.10	−.02	.03	.03	**.27**	**.21**	.16	.15
Have difficulty imagining things	*66*	−.15	−.12	−.10	−.03	−.09	−.02	−.02	.00	−.04	.04	.01	.10	.15	.08	.07	−.01	**−.37**	**−.25**	**−.23**	−.15
Try to understand myself	*67*	.12	.18	.14	.07	.14	.04	.09	−.04	.00	−.11	.05	−.09	.01	.04	.01	.02	**.22**	.15	**.34**	.17
Enjoy wild flights of fantasy	*68*	.17	.01	.04	.01	−.10	−.03	−.13	−.02	−.14	−.19	**−.21**	−.16	.11	−.05	.17	.05	.18	.15	**.27**	**.20**
Look forward to the opportunity to learn and grow	*69*	.18	**.21**	**.21**	.13	.17	.05	.11	−.03	.06	−.04	.02	−.10	−.10	−.11	−.08	−.08	**.22**	.14	**.24**	.18
Enjoy discussing movies and books with others	*70*	.02	.03	.14	.05	.09	.00	.11	−.04	−.03	−.03	−.01	−.13	.01	.09	−.06	.01	.12	.13	**.29**	.18
Believe that we should be tough on crime	*71*	.00	−.04	.00	−.01	.06	.01	.09	.06	.13	.17	.17	.12	.01	.03	.01	.01	−.01	−.02	**−.21**	**−.24**
Am not interested in theoretical discussions	*72*	−.15	−.07	−.05	−.05	.02	.04	.07	.04	.03	.05	.03	.07	.07	.07	.00	−.02	**−.22**	−.12	**−.42**	**−.28**
Don't try to figure myself out	*73*	−.14	**−.20**	−.07	−.09	.04	−.02	.02	.07	.05	.05	.05	.09	−.16	−.05	−.16	−.08	−.13	−.18	**−.29**	**−.20**
Would hate to be considered odd or strange	*74*	**−.20**	−.12	−.07	−.03	.11	.10	.17	.07	.14	.12	.11	.10	.02	.06	−.03	−.05	−.19	−.15	**−.24**	**−.22**

For self-reports, all $N \geq 659$, and all $|rs| \geq .08$ are significant ($p < .05$). For peer reports, all $N \geq 472$, and all $|rs| \geq .09$ are significant ($p < .05$). All significant correlations are underlined; all correlations greater than $|r| = .20$ are shown in bold.

"S" = self-perception, "P" = peer perception, "Extrav." = extraverted, "Cooper." = cooperative, "Temper." = Temperamental, "Philos." = Philosophical. Other words in the complete Functional IPIP items have been abbreviated for space considerations.

decisions without concern of embarrassment. Somewhat independently, individuals who believed they were important (#4) and attractive (#15), and who looked forward to opportunities to learn and grow (#69) tended to be both more bold and extraverted.

Kind and cooperative. We identified five items associated with both traits. Four (#19, #20, #21, #24) pertained to feeling it was important and enjoyable to help others, and the latter concerned a tendency to see the positive side of situations (#57).

Organized and practical. We identified five items associated with both traits. Three (#30, #34, #39) pertained to ease of staying organized and maintain resources. Somewhat distinctly, individuals who disliked themselves (#42) and who did not think planning was important (#31) tended to be both less organized and practical.

Fretful and temperamental. We identified 10 items associated with both traits, in roughly two clusters. The first (#41, #42, #44, #57, #49) concerned disliking oneself and feeling disliked by others. The second (#43, #50) pertained to concerns about health. Somewhat distinctly, both were associated with ease of being annoyed (#58) and of resisting temptations (#59).

Creative and philosophical. We identified eight items associated with both traits, in roughly two clusters. The first (#1, #5, #61, #66, #72) largely concerned interest in and ease of solving complex, theoretical, or novel problems. The second (#62, #67, #69) largely concerned desires to learn about oneself and to grow and develop.

Question 2: What FIs are associated with traits in diverse trait domains? Similar to Study 1, we next identified FI items that were correlated at a $|r| \geq .10$ level with traits in several Big Five domains simultaneously.

Negative beliefs about oneself, others, and the future. Tendencies to dislike oneself and feel unimportant (#4, #41, #42, #45) were most associated with neurotic tendencies, but were also associated with lower levels of nearly every other trait examined. Items indicating negative expectations about others (#44, #53, #55) and the future (#29, #46, #57) showed similar associations.

Self-regulatory skills. Similar to Study 1, individuals who reported greater ease of organizing and completing tasks (#7, #32, #34, #35) were particularly more organized, but were also more practical, bold, extraverted, and less fretful, both in self- and peer-reports, and described themselves as more cooperative, creative, and philosophical, and less temperamental.

Interpersonal skills. Similar to Study 1, individuals who reported skills at expressing and understanding themselves and others (#16, #17, #18, #23, #49) were more extraverted, bold, kind, and creative in both self- and peer-reports, and also described themselves as less fretful and temperamental and more philosophical.

Valuation of traditions. Similar to Study 1, people who disliked rules and routines (#28, #65) and were unconcerned with being considered "strange" (#74), were more bold, creative, philosophical, and less kind, cooperative, organized, or practical, in both self- and peer-reports.

Question 3: What FIs are associated with uncorrelated or weakly correlated traits? As in Study 1, we were interested in illustrating how negligibly correlated traits can share common FIs in a suppressive manner. We returned to roughly the same trait-pairs examined in Study 1, and only discuss FIs that were significantly associated with either self-ratings or peer-ratings of both traits.

Organized and fretful. As in Study 1, there were several FIs with same-sign correlations with both traits. Tendencies to want order (#33) and to be upset with disorder (#56) were associated with being both more orderly and fretful, while enjoying danger (#26), variety (#65), and being unconcerned with dressing nicely (#27) were associated with both being less orderly and less fretful. However, other FIs showed opposite-sign correlations. Individuals who disliked themselves and were suspicious of others (#41, #42, #44, #45, #55), who had difficulties handling interpersonal and complex situations (#5, #16, #18), and who found it difficult to start and stay focused on tasks (#32, #34, #35, #36) tended to be less organized and more fretful.

Bold and cooperative. As in Study 1, reported abilities to do difficult or novel tasks (#18, #32, #35, #49, #51) and to express and understand emotions (#16, #17, #23, #62) were positively associated with both traits; and feelings that life, others, or oneself were dislikable or without value (#4, #15, #29, #41, #42, #45) were negatively associated. However, enjoying danger (#3, #26) and disliking conformity, rules, and routine (#9, #28, #65, #68, #74) was associated with increased boldness but decreased cooperativeness.

Summary of the Empirical Illustrations

As noted at the onset, a major goal of the empirical illustrations was to yield a more empirically grounded specification of Figure 1B, that is: of the FIs that may be involved with shaping levels of many distinct behavioral traits simultaneously. Consequently, we conclude these illustrations by identifying 22 specific FIs which appeared to both (a) be relatively similar across the two studies, and (b) relate to trait perceptions in a relatively similar manner in Tables 2 and 4. These are presented in Figure 2. For instance, "ability to imagine things" was positively associated with assertiveness, sociability, warmth, politeness, and negatively associated with anxiety in both studies (#78 in Table 2, #66 in Table 4). These items were cluster analyzed using the relevant items from Study 1 in order to place more highly covarying items closer together in the figure; this suggested these 22 FIs could be organized in roughly five clusters.

This diagram illustrates some important overarching themes from the two empirical illustrations. First, traits in a common trait domain seemed to covary due to the sharing of numerous distinct FIs. For instance, the present results suggest that assertiveness and sociability covary in part because both traits are similarly facilitated by FIs such as liking attention, and social situations; by the ease of opening up to others, and of adapting to new situations; and by expectations that interactions with others will go well. Many of these FIs are relatively distinct from one another and thus should explain independent aspects of the covariation between assertiveness and sociability. Second, we found that associations between a particular FI and trait perceptions were rarely localized to a single Big Five domain. Rather, FIs regularly had associations across multiple trait domains simultaneously. Third, even those FIs that had higher semantic and statistical similarity to one another (as indicated here by being on the same cluster) had distinguishable associations with trait perceptions that were relatively consistent across the two studies. For instance, "liking to attract attention" and "liking being considered odd/strange" might be considered as being

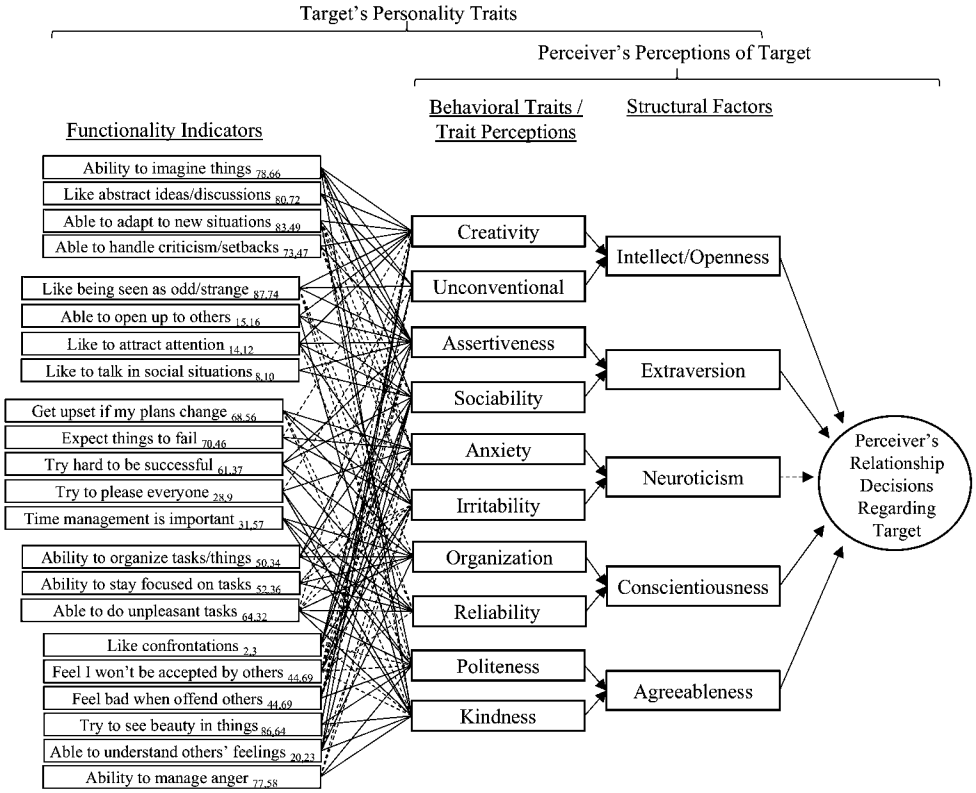

Figure 2. The left half of the diagram depicts some of the FIs found to relate to Big Five-related traits in a similar fashion in both Studies 1 and 2. Subscripts indicate where the corresponding FIs are listed in Tables 2 and 4, respectively. Solid lines indicate positive effects, and dashed lines indicate negative effects. The right-half of the diagram, adapted from **Wood** (in press), depicts a conception of the Big Five structural factors as "useful summaries" of ways in which an individual's traits impact relationship decisions regarding the individual made by others (e.g., whether to befriend or begin a romantic relationship with the individual). See Footnote 1 regarding how to interpret relations between behavioral traits and trait perceptions (e.g., assertiveness, sociability) and broader structural factors (e.g., extraversion).

fairly similar, but the former had positive associations with sociability not found with the latter, and the latter had negative associations with orderliness not found with the former.

It is also reassuring to find that the relationships between particular FIs and Big Five-related traits seemed to generally be similar to relationships identified previously in the literature. For instance, Connor-Smith and Flachsbart (2007) reported that the ability to cognitively restructure negative events was associated with more positive levels of all Big Five traits, a finding paralleled here (#74, #75, #20 in Table 2; #23, #57 in Table 4). Similarly, **Wood**, **Harms**, and Vazire (2010) found tendencies to see others positively to be associated with more positive levels of traits in all Big Five domains, a finding paralleled here (#24, #29, #96 in Table 2; #44, #53, #55 in Table 4).

An important caveat of these empirical illustrations is that the documented relationships between FIs and behavioral traits have to indicate *causal* relationships—with FIs causally impacting behavioral trait levels—in order for FIs to explain trait variation and covariation in the manner conceptually described here (Figure 1B). The cross-sectional nature of the two explorations makes it impossible to definitively establish the directionality of these relationships. However, it would be very surprising if the associations documented in Tables 2 and 4 represented mainly noncausal effects of FIs on behavioral traits for several reasons.

First, a diverse range of theoretical models posit FIs as the proximal causes of an individual's behavior (e.g., Ajzen, 1991; Feather, 1982; Gintis, 2007; Mischel & Shoda, 1995). These associations appear to be generally consistent with the overarching functionality assumption that FIs relate to behavioral tendencies by how they alter the behavior's association to desired ends. For instance, it is easy to imagine how a "belief that rudeness is socially acceptable" would decrease the perceived costs of behaving in an assertive, unkind, and irritable manner, and shape levels of these behavioral tendencies accordingly. Second, it is increasingly clear that cross-sectional relationships between FIs and behavioral traits frequently replicate in within-person studies, or when the associated FIs are directly manipulated (Dweck & Leggett, 1988; Fleeson, Malanos, & Achille, 2002; Higgins, 2000; McCabe & Fleeson, 2012; Metcalfe & Mischel, 1999). Third, behaviors, abilities, expectancies, motives, and associated life experiences appear to generally reinforce and show "corresponsive" causal relationships with one another (Denissen, Zarrett, & Eccles, 2007; Roberts & **Wood**, 2006). On the basis of these numerous considerations, we believe that our base expectation should be that the correlational relationships identified here generally indicate causal effects of FIs on the behavioral traits they are associated with. At the very least, these represent a myriad of sensible "empirically informed hypotheses" regarding the various FIs that

may be further explored as sources of Big Five-related behavioral traits and trait perceptions.

Broader Implications of a Functionalist Understanding of Trait Covariation

The framework we have illustrated is a fairly different approach to the issue of trait covariation than is typically seen in personality psychology, where covariation is sometimes considered to be "explained" by a small number of factors identified in structural investigations (e.g., the Big Five or HEXACO factors). We will thus continue by first discussing how structural factors such as the Big Five might be considered as linking with the current functionalist understanding of trait covariation. Then, we will discuss some implications of this manner of understanding the sources of behavioral trait levels for additional topics within personality psychology, such as trait stability and trait measurement.

Locating Structural Factors in the Personality System

Within the empirical illustrations, our goal was to argue that functionalist or process units such as expectancies, self-efficacies, values and goals can be enlisted to explain the covariation of traits such as assertiveness and sociability. We did not directly address the issue of how structural factors such as the Big Five might link to this understanding of trait covariation. We consider four different perspectives which may be compatible with the empirical illustrations.

Structural factors as approximating "distal causes" of process variables. A first manner in which we might try to locate structural factors in a functionalist framework is as major causes of FIs and process variables. This view understands structural factors as approximating more distal causes of FIs or process variables, which in turn mediate the effects of structural factors on behavior.

This appears to be a fairly common understanding of structural factors, as evidenced by how relations between structural factors and behavior are often described in the literature. To illustrate with recent examples: Duckitt and Sibley (2009) considered the belief that some groups are superior to others as " *deriving directly from* the personality dimension of Tough versus Tendermindedness (in Big-Five terms, low Agreeableness)" (p. 102); Chan and Drasgow (2001) argued that Big Five traits "relate to leader behaviors *through* the individual's motivation to lead, which in turn affects the individual's participation in leadership roles " (p. 481; also Judge, Piccolo, & Kosalka, 2009). Most directly, Terracciano and McCrae (2012) argued that "it is perfectly reasonable to say that party going is caused (proximally) by liking people and that it is *caused (distally) by extraversion*" (p. 449; italics added in examples above). This view is particularly reflected within Five Factor Theory, where process variables are considered "characteristic adaptations" shaped largely by the five factors measured by the NEO-PI, which are considered "basic tendencies" (see McCrae & Costa, 2008, Figure 5.1).

An appealing aspect of this conception of structural factors is that it provides some suggestions regarding how levels of FIs or process variables are themselves shaped. However, there are considerable questions as to the specific nature of these more distal causes. One possibility is that structural factors might approximate set-points or sources of equilibrium within the personality system. As suggested by DeYoung (2014) structural factors such as the Big Five may approximate "persistent attractor states . . . [which] indicate states toward which the person will tend to gravitate" (p. 3; McCrae, 2009). Like an individual's center of gravity, this may not be a property of the individual we can hope to directly observe, but which helps to understand the individual's behavior. As more distal sources of behavior, we may however suspect structural factors as having stronger associations with particular biological systems than FIs. For instance, DeYoung (2006) has suggested that the plasticity and stability "metatraits" that may exist above the Big Five may have substantial correspondence to the dopaminergic or serotonergic systems, respectively.

Structural factors as "causally efficacious composites." A second perspective is suggested by Meehl's (1993) understanding that "a mathematical factor can correspond to a causally efficacious composite whose elements are qualitatively unlike" (p. 4). In other words, a structural factor may not correspond to a particularly unitary thing, but rather be better interpreted as something like "the sum of the diverse things which cause the measured traits to covary."

For instance, a "plasticity" or "Beta" dimension is sometimes thought to underlie the covariation between the extraversion and openness/intellect factors (DeYoung, 2006; Digman, 1997; Markon, Krueger, & Watson, 2005; but see Ashton et al., 2009). However, if we examine the specific content of IPIP items that have the highest loadings on this broader Plasticity factor, as reported in DeYoung, 2010, Table 1, we see that many of these are FIs of the sort considered here. (Indeed, because both our list of FIs in Study 2 and DeYoung's, 2010 list of plasticity and stability indicators are IPIP items, some of these are exactly the same items.) For instance, some items concern descriptions of social skills (e.g., "have a natural talent for influencing people;" "express myself easily"), others concern the desire for attention (e.g., "don't mind being the center of attention") and others an interest in self-development (e.g., "look forward to the opportunity to learn and grow"). From this perspective, the diverse FIs found to load most on this factor may not be indicators of some deeper plasticity, but may instead indicate some of the more important, relatively *distinct* processes that cause the associated traits to covary. In fact, it may be in part the fact that qualitatively different processes such as these explain *independent* parts of the covariation of the associated traits which causes these processes to receive high factor loadings, analogous to how variables retain nonzero weights in a simultaneous regression. More generally, any FI or process variable that is strongly associated with a structural factor should usually be expected to be important for understanding why the narrower behavioral traits and trait perceptions associated with the factor covary.

From this perspective, we could consider structural analyses as guiding us to the locations of some of the specific FIs or process variables that are most important to explaining the observed covariation between traits. A functionalist approach such as that illustrated here might then be considered as decomposing these "causally efficacious composites" into their more specific constituent elements (Johnson, 1999; Roberts, 2009). A couple advantages should follow from this, which we can see in our empirical illustrations. First, we may see more clearly that FIs such as these and others contribute to the

covariation of traits within a given domain relatively independently of one another. Additionally, by measuring these FIs separately rather than aggregating them into such a composite, we can see more clearly that they have distinct effects on traits in *other* domains. To use two of the characteristics just listed, we see that people who "look forward to the opportunity to learn and grow" (#69 in Table 4) and "like to attract attention" (#12) tend to be higher on both extraversion and openness-related traits, as we should expect given that these IPIP items have among the highest loadings on a broader plasticity factor (DeYoung, 2010; Table 1). However, these two FIs have slightly different effects outside of these trait domains—specifically, "looking forward to learning/growth opportunities" showed positive associations with emotional stability, kindness, and practicality, whereas "liking attention" showed negative associations with the same traits. These secondary relationships are both sensible and valuable to know, but are also largely masked when aggregated with many other items to measure a broader plasticity factor.

Structural factors as useful summaries. Another interpretation of structural factors is detailed by Ashton and Lee (2005), who argue that:

> We can *explain* decisiveness, cautiousness, studiousness, and practicality as manifestations of a more general construct of 'Conscientiousness' . . . [but this] should not be misconstrued as a claim that these factors are causes of those characteristics. That is, although we explain these characteristics as *examples* of the broader constructs represented by the factors, we do not explain the characteristics as *consequences* of those broader constructs" (p. 15; authors' italics).

Structural factors are understood more explicitly as descriptive from this perspective than those described previously. Consequently, the explanatory power of invoking structural factors to explain specific traits is understood as roughly analogous to Funder's (1991) understanding of the explanatory power of using trait attributions of specific behaviors, who notes "such an explanation relates a specific behavioral observation to a complex and general pattern of behavior" and in this manner serve as useful "stopping places in the explanatory regress" (p. 36). For instance, if we say "Ramona is organized because she is high on conscientiousness," we are in effect saying "Ramona is organized because she is also cautious, studious, and practical," and we are thus learning that whatever processes commonly facilitate traits in the conscientiousness domain may be driving her organized behavior (Ashton & Lee, 2005; McCrae & Costa, 1995). Traits covary in part because they share environmental, biological, and functional pathways, and as structural factors are effective summaries of covariation, it may be prudent to consider the traits at the level of structural factors rather than the narrower traits in order to increase parsimony (Krueger, DeYoung, & Markon, 2010; Krueger & Markon, 2006). This resembles the most recent position of McCrae (2014), who suggests that viewing a structural factor as the sum (rather than the cause) of the narrower facets, much as shown in Figures 1B and 2, "is most certainly not meaningless; it should allow inferences about other, extratest manifestations and correlates," and elaborates that if the various facets relate to other outcomes in similar ways, the "facets may be legitimately combined because they are functionally equivalent" (p. 12).

Structural factors as particularly socially consequential traits. Finally, structural factors might be regarded as pieces of information which are *particularly useful or important for perceivers to know* about someone (Buss, 1996; Goldberg, 1981; McAdams & Pals, 2006; Srivastava, 2010). Interestingly, this perspective understands structural factors as summaries rather than as approximating sources of the individual's behavior, but emphasizes that they may also be among the most important sources of *others'* behavior toward the individual. This view is depicted graphically in Figure 2.

This understanding of the Big Five and HEXACO factors rests on the fact that lexical studies involve the analysis of the most frequently used person descriptors in a given culture. From this perspective, the reason communal structural factors (e.g., agreeableness, conscientiousness) emerge prominently in lexical studies around the world (Ashton & Lee, 2007; Saucier & Goldberg, 2001) is because these correlated tendencies are extremely consequential to a range of relationships in any human society, and members of a culture thus develop and use many words to describe them. Estimates of communal factors more generally indicate the extent to which individuals will prioritize their interests over the interests of others (Ashton & Lee, 2007; **Wood**, Tov, & Costello, in press), and this is extremely useful information to know about someone, regardless of the myriad processes which may cause the person to do so (Buss, 2008; Cottrell, Neuberg, & Li, 2007; Fiske, Cuddy, & Glick, 2007). In contrast, we have few words to describe tendencies to do activities left-handed versus right-handed (e.g., open doors, write, hold mugs, throw balls), and thus don't have a "handedness" factor in our trait structures. This is not because there is any more or less covariation between these behavioral tendencies, but because they are much less socially consequential, and thus less represented in lexical trait structures (Goldberg & Saucier, 1995).

As support for this interpretation, **Wood** (in press) found that trait terms with higher loadings on the Big Five dimensions had a larger impact on others' relationship decisions (e.g., whether to date or befriend someone) than terms with negligible loadings. Similarly, conscientiousness-related traits influence whether employers will hire, fire, or promote you, which is decidedly appropriate, as these behavioral traits impact the overall productivity of their company (Barrick & Mount, 1991; Dudley, Orvis, Lebiecki, & Cortina, 2006). Moreover, conscientiousness-related traits impact relationship satisfaction and longevity (Bogg & Roberts, 2004; Ozer & Benet-Martínez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). These are also fairly clearly causal effects: if an individual's rate of conscientious behavior were to become higher, his or her spouse's satisfaction, organization's earnings, job standing, and own life expectancy would be expected to increase. Levels of conscientiousness-related traits could increase by impacting a range of distinct FIs—one individual by becoming more concerned with making coworkers happy; a second by enjoying work more; a third by becoming more able to filter out distractions—and we might expect largely the same salutary effects. Their employers may in essence say "I don't care *why* this employee behaves more conscientiously now, but this employee should receive a promotion." As depicted in Figure 2, it will often be an individual's behavioral tendencies which are the proximal causes of others' responses to the individual, not the processes that shaped them. The value of structural factors such as the Big Five or HEXACO factors as a level of analysis may principally be their ability to summarize similarities

in how an individual's traits tend to impact his or her interpersonal environment.

Jointly considering these perspectives. The four perspectives discussed above represent an incomplete survey of views regarding how structural factor and functional explanations of behavior might be connected. However, there is little reason to think they need to be mutually exclusive. For instance, the axes of factors such as the Big Five will gravitate toward items that have the most correlations with other items. However, there are many reasons that a particular item will covary with many items in the set. It may do so because it closely indicates a variable which influences many conceptually different variables in the set. For instance, being secure in one's self-worth (as indicated by adjectives like *well-adjusted* and *secure*, and related to #4, #41, and #42 in Table 4) likely commonly facilitates extraverted, agreeable, conscientious, emotionally stable, and open behaviors. Alternatively, an item may covary with many other items by being influenced by a qualitatively distinct variable that influences many others in the set but is not itself closely indicated in the analysis (e.g., functioning of the dopamine system, current mood, a response set). Alternatively, a particular item will correlate with more items in a lexical set if many other conceptually similar items have been frontloaded into the set (e.g., many terms about *warmth* were entered into the analysis and few about *handedness*; Saucier & Goldberg, 1996).

We have already described our preferred understanding of structural factors, which understands structural factors first and foremost as indicating the most socially valuable and consequential information about an individual's behavioral tendencies, as depicted in Figure 2. However, even without shifting from this conception of structural factors, we can note that the most valuable traits for perceivers to learn about a person should not simply be the person's most consequential behavioral tendencies, but the FIs or processes that lead the person to perform them. For instance, knowing whether an individual typically completes obligations and works hard (i.e., acts conscientiously) may be of great value to perceivers, but knowing whether the individual possesses self-regulatory skills and feels it is important to honor commitments should be particularly useful toward predicting such behaviors. For these and other reasons, structural analyses should simultaneously help to identify both the behavioral tendencies that are of particular interest to perceivers and the FIs that are particularly important in shaping them.

More generally, structural factors such as the Big Five may simultaneously indicate *both* the most important sources and outputs of the individual's personality system (Fleeson, 2012; McCabe & Fleeson, 2012). This could occur if the words individuals use most frequently to describe one another follow a folk wisdom of encapsulating particularly important stages of an individual's goal-directed action patterns, such as how they plan or initiate behaviors (DeYoung, 2014; Van Egeren, 2009). This is an interesting possibility to be evaluated more fully in future research.

The Value of Greater Disaggregation in Personality Measurement

Despite a general understanding that suppression effects are rare and difficult to find (e.g., Paulhus, Robins, Trzesniewski, & Tracy, 2004), our results suggest that suppression effects are likely quite common: behavioral traits and abstract trait perceptions are regularly uncorrelated in part due to having some processes which increase their correlation and others that decrease their correlation in roughly equal magnitude. Additionally, the model described here and illustrated in Figure 2 indicates that FIs or behavioral traits should not be considered manifestations of more basic factors such as extraversion. If structural factors do not approximate the most important common causes of trait covariation, the rationale for aggregating narrower traits to estimate them becomes somewhat weaker. The common practice of aggregating FIs and process variables with the behaviors they are most associated with makes it much more difficult to see the diverse effects a single FI regularly has on other behavioral traits. For instance, the common practice of aggregating items indicating orderliness concerns, orderliness skills, and orderly behavior to estimate an individual's broader orderliness or conscientiousness, would have made it more difficult to document the opposing effects of orderliness concerns and orderliness skills on anxiety and irritability levels that we found in both studies.

More generally, although factors such as the Big Five represent useful ways of summarizing an individual's traits which impact other outcomes in similar ways, it should be a rare circumstance when all the traits used to identify a structural factor are equally related with any particular outcome of interest. Consequently, the practice of aggregating a large number of correlated traits into an estimate of a single structural factor prior to explore their correlations with other variables of interest will generally result in a considerable loss of information that is reliable and theoretically meaningful (McCrae, 2014). For instance, although extraversion measures are sometimes regarded as having negligible or inconsistent relationships with gender (Feingold, 1994; Lynn & Martin, 1997), narrower traits in the domain of extraversion have stronger and more consistent relationships: measures related to assertiveness tends to be higher among men, whereas measures related to warmth and positive affectivity tend to be higher among women (Costa, Terracciano, & McCrae, 2001; **Wood**, Nye, & Saucier, 2010).

Given the frequency with which structural factors have been the preferred level of analysis in personality psychology, it is still surprisingly easy to make important contributions to the field by simply showing how very basic variables (e.g., gender, age, political orientation, health, popularity, intelligence, attractiveness) are associated with personality traits measured at a more fine-grained level of analysis. For instance, Soto, John, Gosling, and Potter (2011) recently demonstrated that simply shifting the level of analysis from the broader Big Five factors to 10 narrower dimensions considerably refined the picture of how personality changes with age as reported elsewhere (Roberts, Walton, & Viechtbauer, 2006; Srivastava, John, Gosling, & Potter, 2003). Although levels of the broad structural factor conscientiousness increase considerably in adulthood, these increases seem to be largely localized to traits related to self-discipline, whereas traits related to orderliness seem to increase negligibly (see also Jackson et al., 2009).

How Are Levels of Functionality Indicators Shaped?

As we have argued, FIs should be expected to be true causes of behavioral trait levels, in that individuals should gravitate toward behavioral trait levels that they experience as

having greater functionality. Consequently, much of the value of identifying important FIs is in giving us a list of variables we should target to influence behavioral trait levels. However, we have mostly not discussed the issue of how these FIs might be influenced. Additionally, we have focused principally on explaining covariation of behavioral traits, but it is clear that conceptually distinct FIs or process variables show considerable correlations with one another (e.g., positive social expectations, positive social skills, and liking social interactions).

In the same way that a single behavioral trait should be understood as being shaped by several distinct FIs, a single FI should be understood as being shaped by a large number of distinct forces. Some of these will include predictable influences of FIs on one another; for instance, if an individual increases in their desire to attain a particular goal, the individual can be expected to increase in their ability to do so, and vice versa (Bandura, 1986; Denissen et al., 2007; Lent, Brown, & Hackett, 1994). The causal effects of the ability, expectancy, and valuation trait classes on one another can be understood through the same overarching functionality assumption that links these three trait classes to behavioral traits (**Wood** & Denissen, in press). There should be pressure for *any* trait to increase—whether it is a behavioral trait or an FI—when the actor experiences a higher level of this trait to be functional. For instance, it is generally functional to decrease one's valuation of tasks you are unable to perform (Baltes, 2003; Heckhausen, Wrosch, & Schulz, 2010), and to find it more difficult or taxing to perform actions that you find unrewarding (Kurzban, Duckworth, Kable, & Myers, 2013). Such functional dynamics will frequently lead conceptually distinct FIs to be correlated with one another and consequently can help to explain some of the syndromal qualities found in personality networks.

Additionally, an individual's levels of FIs should be shaped by features of the individual's biology and culture (Mischel & Shoda, 1995), or of the objective situation more generally (Reis, 2008). For instance, an individual's general tendency to see other people positively, which is likely involved in influencing levels of many distinct behavioral traits, might itself be influenced in predictable ways by environmental and biological factors ranging from physical attractiveness (Langlois et al., 2000), to the level of amygdala activation to happy faces (Omura, Todd Constable, & Canli, 2005), the number of recent positive or negative events (Vaidya, Gray, Haig, & Watson, 2002), and the degree of parental affection (Collins & Read, 1994), among many other things. As with the effects of FIs on one another, the effects of biological and experiential variables on FIs can be understood as being mediated by altering the functionality of the FI itself. For instance, it is somewhat more functional to perceive others negatively if local rates of infectious disease are high (Schaller & Murray, 2010), and children are more likely to develop intellectual abilities when in familial or cultural environments that place greater value on such skills (Nisbett et al., 2012).

Implications for Understanding Trait Change and Stability

Sometimes the considerable heritability estimates and rank-order stability estimates of structural factors (e.g., Bouchard, 2004; Roberts & DelVecchio, 2000), and indications of relatively small environmental effects on the development of broad personality factors (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Specht, Egloff, & Schmukle, 2011) are offered as evidence that such factors are basic tendencies that are relatively impervious to change (Eysenck, 1970; McCrae & Costa, 2008). However, there is actually surprisingly little evidence that structural factors are either more heritable or more stable than the narrower traits they summarize. Once a trait measure's instability over very short periods of time (e.g., 1 or 2 weeks) is accounted for, narrow traits appear to show heritability and stability estimates that may be comparable with broader structural factors (McCrae, Kurtz, Yamagata, & Terracciano, 2011, Table 2; **Wood** & Wortman, 2012). Nor is it clear that higher levels of these characteristics necessarily indicate that they are more "basic." For instance, Johnson, McGue, Krueger, and Bouchard (2004) reported the heritability of marital status to be on par with the heritabilities of personality traits, despite the fact that one's likelihood of marrying is undoubtedly influenced by a variety of distinct traits.

A functionalist understanding of trait variation and covariation suggests some reasons to be both more and less optimistic about the possibility of large-scale personality change. First, the apparent resistance of personality traits to environmental influence has likely been artificially inflated by the aggregation of behavioral traits with distinct etiologies into estimates of structural factors. For instance, a particular assertiveness training program could indeed result in increased levels of assertiveness, but have negligible effects on other traits in the extraversion domain, such as positive affect or activity level, and even negative effects on others such as sociability. If evaluators of this program were to search for effects of the intervention on "personality traits" at the level of structural factors, this effect will be diluted if not washed out entirely, and the researchers may be misled to the conclusion that the intervention "does not impact personality traits" when there are in fact several reliable effects of the intervention on specific behavioral traits and FIs. As a single Big Five scale is a summary of a broad range of distinct traits, the entire scale score should not shift much from some experience unless the experience impacts most of the narrower traits contained within the scale and in the same direction. Measuring distinct behavioral traits separately should thus be expected to result in more frequent observation of environmental effects on trait development.

However, the current findings also suggest at least two reasons to be more pessimistic about the possibility of large-scale changes in behavioral traits. First, although the current findings suggest some of the FIs or process variables we may target to increase levels of the behavioral trait, levels of these FIs will not be infinitely malleable. Rather, each is certain to be highly influenced by numerous biological or environmental variables, which will often themselves be very stable over time. As one example, many of the FIs shown in Tables 2 and 4 show considerable associations with self-reported sex. Females reported greater skill at understanding others' feelings (#23 in Table 4, Cohen's d = .72) than males, and lower tendency to "love a good fight" (#26, d = −.49). As an individual's biological sex impacts a number of FIs and doesn't

2. This adjustment is necessary to adjust for the fact that heritability and longitudinal stability estimates will be higher for scales with more items, all other things being equal. Further, as reviewed by McCrae et al. (2011), short test–retest stability (or "dependability") estimates are likely more conceptually appropriate corrections for unreliability than interitem reliabilities.

change, it will effectively function as a consistent force on the associated FIs over time (mediated more proximally by its effects on testosterone, gender role expectations, and so on). Although this is an extreme case, many other biological and environmental variables (e.g., weight, brain integrity, physical attractiveness, regional culture, social class) will be sufficiently stable over time to serve similar anchoring functions for the FIs that influence behavioral traits.

Second, although these findings illuminate many of the functional levers that might be pushed or pulled to influence behavioral trait levels, a second reason to be pessimistic about the possibility of large-scale changes is that there are so many of them. In Tables 2 and 4 and the surrounding discussion, we describe many of the distinct FIs that likely contribute relatively independently to behavioral trait levels. And as we have noted, there will be numerous distinct biological and environmental features involved in calibrating levels of any particular FI. When there are many distinct determinants of a single behavior, the magnitude of the effect expected to occur by changing any one of them should be small (Ahadi & Diener, 1989). For instance, we might expect that an individual who has suddenly inculcated a desire to become more sociable might observe little change in his or her levels of sociability if this change is not also accompanied by some combination of greater expectations of having positive social interactions, newfound social skills, enjoyment of attention and social interactions, or interest in others' perspectives.

The Issue of Parsimony

The functional conception of the sources of trait covariation and the exploratory goals of our present empirical illustrations together resulted in our unusual decision to aggregate items as minimally as possible (see also Cramer et al., 2012, 2010). We believe this to be a logical extension of functionalist frameworks, in that these understand trait levels to be shaped by the value of their expected effects (Feather, 1982; Thorndike, 1913), and understand any given trait to have a wide range of effects on the environment (e.g., Kruglanski et al., 2002). Additionally, we believe it has been valuable in providing within Tables 2 and 4 a much elaborated understanding of how levels of Big Five-related traits tend to relate to standard process variables such as self-efficacies, expectancies, goals, and contingencies of liking and anxiety. This in turn should help deepen the continuing integration of prominent trait and process approaches to personality (Fleeson, 2012; Funder, 2001; Mischel, 2009).

However, it may be argued that this approach to covariation is not as parsimonious as explanations involving structural factors. To illustrate: Whereas our findings suggest that the covariation of assertiveness and sociability is explained by at least half a dozen relatively distinct FIs or more, the Five Factor Model purports to explain the covariation of assertiveness, sociability, and at least four other distinct traits (activity, excitement-seeking, positive emotionality, and warmth) largely via the single variable of extraversion (McCrae & Costa, 2008). This type of reasoning is described by Krueger, DeYoung, and Markon (2010) in their critique of a network model recently proposed by Cramer et al. (2012), which is similar in terms of its item-level analysis strategy and very large number of distinct components:

> With regard to model fit, the network models proposed by Cramer et al. are unlikely to emerge as optimal models when compared to latent variable [that is, structural factor] models. This is because the network models fit by Cramer et al. contain a multitude of parameters; they are lacking in parsimony when compared with latent variable models. Models lacking in parsimony often provide a poor relative fit to data and are thereby lower in scientific utility because they amount to little more than re-expressions of observed data (p. 164).

We might agree with Krueger et al. that structural factor explanations of trait covariation *look* much more parsimonious than network or functional explanations. For instance, compare Figure 2 of Krueger and Markon (2006) with our Figure 2, or with Cramer et al.'s Figure 2. As Krueger and colleagues note, standard psychometric tools for judging relative parsimony (e.g., goodness-of-fit statistics) will almost undoubtedly judge most structural models to be more parsimonious than models such as what we have described here. But are they? As noted by Dawkins (2005) "parsimony is always in the forefront of a scientist's mind when choosing between theories, but it isn't always obvious how to judge it" (p. 118).

How parsimonious are structural explanations? As we have reviewed, the level of parsimony associated with structural factor explanations depends in large part in how we should regard the nature of the relationship between structural factors and behavior. If structural factors such as extraversion truly approximate the most important distal sources of FIs or process variables, then explanations of covariation by structural factors might be considered very parsimonious indeed. However, as we have discussed, there are many perspectives regarding what structural factors actually correspond to.

Interestingly, theorists sometimes suggest that structural factors correspond roughly to important FIs or process variables. For instance, an individual's level of extraversion may correspond highly to his or her valuation of reward stimuli (Ashton, Lee, & Paunonen, 2002; Denissen & Penke, 2008; Watson & Clark, 1997), which in turn might be associated with the dopaminergic system (e.g., DeYoung, 2010). Alternatively, such factors might be best viewed as "causally efficacious composites" in which several fairly distinct FIs contribute independently to the explanation of covariation. In both of these scenarios, it is ultimately FIs which are explaining trait covariation (e.g., the extravert is going to parties because she more highly values social experiences). In this sense, structural analyses may point the way to FIs that is particularly important to explaining trait covariation, rather than point to a distinct sort of explanatory variable.

The level of parsimony afforded by structural factor explanations of covariation is of course even more dubious if we consider an individual's level of a structural factor to be primarily a summary of the indicated traits. As noted by Borsboom and colleagues (Borsboom, Kievit, Cervone, & Hood, 2009; Cramer et al., 2012), if considered in this fashion an individual's level of some structural factor like Extraversion should be regarded as *caused* by levels of more specific tendencies to be assertive, sociable, and so on—in the sense of being a mathematical summary—and it is simply a category error to "explain" covariation by the structural factor.

Given the ambiguity of what structural factors are, and what they contribute to understanding behavior beyond functional or process variables, we would argue that it may

be functionalist approaches which eschew any distinct role to structural factors as sources of an individual's more specific traits that are actually more parsimonious. Granted, this is a *conceptual* parsimony rather than a methodological one; there will undoubtedly be considerable growing pains as personality psychologists and methodologists work to develop better methods for representing the complex and massively interacting networks of FIs or process variables that underlie an individual's behaviors. However, this is work worth doing, as understanding behavioral traits as being shaped by a large number of FIs rather than by a small number of structural factors could reflect a more accurate of the causal dynamics that underlie variation and covariation (Borsboom et al., 2009; Buss, 2008; Fleeson, 2012; Kurzban & Aktipis, 2007; Mischel & Shoda, 1995). Consequently, the upshot of learning to deal with this complexity will be a better understanding of what traits are, and how trait levels are shaped. As noted by Minsky (2007):

> It might appear to make everything worse, to change some things that looked simple at first into problems that now seem more difficult. However, on a larger scale, this increase in complexity will actually make our job easier. For, once we split each old mystery into parts, we will have replaced each old, big problem with several new and smaller ones—each of which may still be hard but no longer seem unsolvable. (p. 2)

We believe that the large role structural factors have played in explanations of trait covariation may have in some ways served to slow our understanding of this phenomenon. We may need to become more comfortable using a wide number of narrower process variables to explain trait covariation. Decreasing the role of structural factors could help to remove a large cognitive and theoretical impediment to a more accurate understanding of trait covariation, similar to eliminating consideration of a singular homunculus as a source of our experience of consciousness in favor of models favoring a much larger network of narrower processes (Dennett, 1993; Kurzban & Aktipis, 2007; Minsky, 1988).

Placing some limits on explanatory complexity. Functionalist frameworks to covariation are consistent with network approaches to understanding personality functioning that accommodate hundreds of interacting components (Cramer et al., 2012; Mischel & Shoda, 1995). Each distinct effect that might result from behavior, and separate valuation of each effect, can be represented as a separate node in a personality network, and many of these should be expected to explain independent variance in a given behavioral trait. As we have shown (e.g., Figure 2), this can result in a considerably more complex account of the sources of trait covariation than those found in a standard structural approaches.

At the same time, recommending that a small number of structural factors be replaced with hundreds or even thousands of items or variables to understand trait covariation can be meaningfully compared with recommending we aspire for the "great blooming, buzzing confusion" that James (1890, p. 488) described as an infant's phenomenological experience before developing useful concepts for representing the world. This is not ultimately what we are recommending. Rather, as in the development of expertise (Ericsson & Lehmann, 1996), achieving a mature and useful understanding of a phenomenon involves reducing many molecular pieces of information into more molar "chunks," and drawing out more general principles (Funder, 1991).

It is thus useful to briefly review some of the various steps that were taken here to reduce explanatory complexity at the level of FIs (see also S1 in the Supplementary Materials). We began with initial sets of 463 and 1,351 items in Studies 1 and 2, respectively, which were correlated with measures of Big Five-related trait perceptions. However, cluster analysis was then used to group items that (a) related similarly to one another, and (b) related similarly to trait perceptions, and reduce these to a single row in Tables 2 and 4. For instance, "concern for order" and "organization skills" are highly correlated with one another, but these distinctions were teased apart in both studies by relating differently to anxiety-related traits. However, distinctions such as "feeling uncomfortable around disorder" and "feeling stressed when there is not a plan" were initially measured as separate items, but were collapsed by the same considerations. Interestingly, these steps paralleled some of those that were used in the development of Block's diverse Q-sort instruments (see Block, 1961). As in that context, these steps lend themselves to a greater number of scales or components than reduction techniques like factor analysis which mainly prioritize interitem correlations, but also provide an effective limit to the level of explanatory complexity that will be tolerated in the analysis.

At a more theoretical level, a functionalist framework further reduces explanatory complexity in a couple ways. First, it provides a classification scheme for different aspects of a personality system. Rather than considering each item separately (Cramer et al., 2012), these can be conceptually classified into the three classes of FIs—abilities/efficacies, expectancies, and valuations—or as behavioral traits and more abstract trait perceptions. These trait classes can be used to reliably classify items in personality scales (e.g., "I like . . ." statements are valuation indicators; "I easily . . ." statements are ability indicators). More importantly, the way in which FIs should relate to behavioral patterns are articulated in a range of expectancy-value, rational actor, and economic models (e.g., Almlund et al., 2011; Feather, 1982; Gintis, 2007; Vroom, 1964). Specifically, FIs should influence behavioral trait levels principally by influencing their functionality. This overarching idea, which we have referred to as the *functionally assumption*, serves as a parsimonious theoretical guide as to when we should expect to observe associations between FIs and behavioral traits (or between nodes in a personality network) and when we should not.

We believe this assumption holds up extremely well in our empirical illustrations. Specifically, it is difficult to identify clear cases within the hundreds of correlations listed in Tables 2 and 4 where behavioral traits were higher among individuals who found it more effortful or difficult to perform trait-identifying behaviors, or among those who had a greater expectation of negative outcomes of such behaviors. Rather, we suspect the specific positive, negative, and nonsignificant associations observed between FIs and behavioral traits generally appear sensible and nonsurprising to most readers, due mainly to their own fairly intuitive application of this functionalist assumption. For instance, to predict sociable behavioral tendencies to be positively correlated with the expectation that others are unkind would likely strike most people as absurd, principally because it

typically becomes less (rather than more) functional to socialize if one has such expectations. More generally, whereas both network and structural approaches to covariation are at their heart mathematical modeling techniques, functionalist approaches at their heart suggest how the content of such networks should be organized. As more work is done to detail how this functionality assumption can be more explicitly formalized, we expect that it will serve as a powerful guide for understanding the structure of complex personality networks.

Conclusion

The fact that distinct personality traits covary with one another has been suggested as a major rationale for casting structural factors such as the Big Five or HEXACO factors as "underlying" or "explaining" trait covariation (Cattell, 1950; McCrae & Costa, 1995; Tellegen, 1991). However, such explanations are sometimes considered problematic by proponents of process approaches, due in part to concerns of circularity and the question of how structural factors should be operationalized outside of their indicators (Bandura, 1999; Cervone, 1999; Cramer et al., 2012; Mischel, 1968). We illustrate here how the ability/efficacy, expectancy, and valuation trait classes common to a range of functionalist and process approaches—which we have considered here primarily as functionality indicators or FIs—can be enlisted to explain trait covariation without necessarily positing a distinct role for structural factors.

As we have detailed here, explanations of behavioral trait covariation through process variables or FIs may offer a particularly valuable method for understanding trait covariation. Relative to explanations of covariation that enlist structural factors, such explanations more directly provide a specific process understanding of where behavioral trait levels come from, and of how (and perhaps how much) they might be altered. Such a framework should thus help us shed new light not just on the specific sources of trait covariation, but on many other issues concerning the nature of personality traits.

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Appendix A: Measures of Big Five-Related Traits Used in Study 1

Assertive: BFI: Has an Assertive personality; IIDL: Bold/assertive

Sociable: BFI: Is Outgoing, sociable; IIDL: Outgoing/sociable

Warm: BFI: can be cold and aloof R, IIDL: kind-hearted/caring; unfriendly/cold R; affectionate/loving)

Polite: BFI: is sometimes rude to others R; IIDL: rude/inconsiderate R, courteous/polite, pleasant/agreeable

Reliable: BFI: Is a reliable worker; IIDL: Dependable/reliable, undependable/unreliable R

Orderly: BFI: Tends to be disorganized; disorganized/messy

Nervous: BFI: Worries a lot; Remains calm in tense situations R; can Be tense; IIDL: Tense/anxious

Irritable: BFI: Can be moody; IIDL: Crabby/grouchy; angry/hostile; touchy/temperamental

Creative: BFI: Is original, comes up with new ideas; Is inventive; IIDL: Creative/imaginative

Unconventional: IIDL: Radical/rebellious; traditional/conventional R

Note: Subscript "R" indicates item was reverse-scored.

Supplemental Materials

How Functionalist and Process Approaches to Behavior Can Explain Trait Covariation

by D. Wood et al., 2014, *Psychological Review*

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Supplementary Materials 1 (S1)

Extended Study 1 and Study 2 Methods

Study 1 Method

Part 1: Generating Potential FIs Underlying Big Five-Related Behaviors

A total of 529 Wake Forest University undergraduates over two semesters completed an online survey in order to earn credit towards a course research participation requirement. Participants ranged in age from 17 to 23 (M = 18.68; 59% female). Participants were informed that they might be invited to participate in an interview on the basis of their answers.

Big Five trait assessments. Participants completed the Big Five Inventory (BFI; John & Srivastava, 1999), Inventory of Individual Differences in the Lexicon (IIDL; Wood, Nye, & Saucier, 2010), and items from the International Personality Item Pool (Goldberg, 1999) identified as highly associated with Big Five trait levels; many of the IPIP items are provided in Supplementary Materials 2 (S2). Big Five estimates for the IIDL were created by averaging the five items with the highest correlations with a given Big Five trait reported in Wood, Nye, and Saucier (2010). Big Five scores from the BFI, IIDL, and IPIP measures for each dimension were then standardized and averaged. The reliability of these three-scale composites was .95 for Extraversion, .91 for Agreeableness, .91 for Conscientiousness, .93 for Neuroticism, and .85 for Openness.

Interviews with participants high and low on Big Five dimensions. Participants with the highest and lowest scores from the three-measure Big Five composites were invited to participate in one-on-one interviews for additional class credit. Each interview lasted approximately 15 to 20 minutes. Five

to six individuals from each end of each Big Five trait were interviewed, resulting in a total of 52 interviews.

Interviewed participants were asked to describe the extent to which they performed eight to ten behaviors related to the trait they were selected for, and why. These behaviors were adapted from IPIP items found to be highly related to Big Five trait scores. For instance, the IPIP items "I start conversations" and "I don't talk a lot" were rephrased as questions "Are you typically someone who starts conversations?" and "Would you say that you talk a lot?" A full listing of the items asked in these interviews is provided in the Supplementary Materials 2 (S2).

Interviewers were instructed to probe for reasons interviewees performed the behaviors at that level. In particular, interviewers were instructed to ask participants if there were things (a) that they liked/disliked about doing the behavior, or that made them seek/avoid doing the behavior, (b) that made it easy/hard for them to perform the behavior, and (c) about any other aspects of the situation that influenced their decision to act the way they did. This process continued until either all questions were asked or 20 minutes had passed.

Reports of others' high and low Big Five trait levels. All participants who completed the initial survey in the second semester of data collection (N=229) were asked at the conclusion of the survey to think of someone they knew who acted in an extremely trait-typical way, and to describe reasons for their behavior. This was done to elicit additional functions that may not have been provided by participants in explaining their own behavior.

Each participant was randomly assigned to describe someone they knew who was high or low on one of the Big Five traits. Descriptions of the desired target were created by using three synonymous adjectives and a pair of behaviors highly associated with the Big Five dimension. For instance, in the high extraversion condition, participants were asked "Think of someone you know who is very sociable, extraverted and outgoing. This is someone who regularly starts conversations with others and who regularly talks to lots of different people at parties." Between 21 and 26 individuals were assigned to each of the 10 conditions (two ends of each Big Five trait); instructions for the remaining traits are in the

Supplementary Materials 2 (S2).

Participants were then instructed to respond to the following questions: "First, list some instances in which you recall this person acting in the ways just described." To elicit reasons for these behaviors, participants were then asked: "What do you think are some of the reasons that he or she tends to act in this way?"; "What are some of the things that make it easy for the person to act this way? What are some of the reasons that make it hard for the person to act in a different way?"; and finally "Put yourself in this person's shoes. Why do you think this person wants to act in this way? Why do you think this person does not want to act in a different way?"

Extraction of reasons for trait-related behavior from interviews and reports. Research assistants then extracted reasons for trait-related behaviors from the participant interviews and reports of others' behavior. Coders were given instructions describing what constituted an appropriate "reason" for trait-related behavior, which consisted of statements of different types of valuations and goals, abilities, and effects/expectancies. Two coders listened separately to each recorded interview and copied verbatim any reasons that the interviewees provided to explain their behavior. Coders then reconciled discrepancies while listening to the interview a second time together. Finally, each reason was summarized into a short phrase or sentence. For the free-response survey answers of others' behaviors, the second author extracted reasons from the responses provided, making each reason into a one-sentence item. Ultimately, 1,985 reasons were initially extracted across all Big Five traits.

Reduction of reasons for trait-related behavior. Three coders (the second author and two research assistants) were then provided with instructions to sort this larger set of 1,985 items into a smaller set of item groups to eliminate redundancies within each Big Five trait. To aid with this task, they were instructed to first classify each item into one of nine more specific categories: (1) abilities; (2) behavior-outcome expectancies; (3) situation construals; (4) felt pressures and needs; (5) likes and dislikes; (6) preferences; (7) values and standards; (8) concerns and worries, and (9) goals. Coders were then instructed to group similar items while maintaining as many distinctions as possible. After doing this separately, coders met to form a unified set of distinct reasons for high or low levels of each Big Five

trait. This was done separately for each Big Five trait, resulting in a list of 633 item groups.

Following this, a group of four coders (the first and second authors and two research assistants) met again to further reduce redundancies across all Big Five traits. Also at this stage, preference items were split apart to make separate items involving how much the person liked each object implied in the preference item (e.g., "I prefer being alone" was separated to "I like being alone" and "I like being with people"). Following this stage, the list of reasons for Big Five trait-related behavior was further reduced into a smaller list of 463 distinct reasons.

Part 2: Linking Functionality indicators to Big-Five Related Traits

We continued by exploring how these FIs were empirically associated with variation in behavioral traits associated with the Big Five.

Participants. A total of 537 Wake Forest University students from an introductory psychology course completed the items described above via an online survey. Participants were removed if they left over 20 of the items blank, or if they had no variability in their responses for major sections of the survey (e.g., answering "2" to every question within a particular subsection). These removals resulted in a final sample size of 511 participants ranging in age from 17 to 37 years (M = 18.7, 57% female).

Measures of Big-Five Related Behavioral Traits. Participants completed self-ratings of the BFI (John & Srivastava, 1999) and the IIDL (Wood, Nye, & Saucier, 2010). Using items across these two inventories, we estimated two distinct behavioral traits within each Big Five trait domain. In constructing these measures, we excluded any items that concerned self-perceptions of valuations or goals, abilities, or expectancies (e.g., the BFI Agreeableness item "likes to cooperate with others"), to focus on more clearly behavioral trait items and self-perceptions. We also attempted to measure traits close to the two major "subfacets" within each Big Five domain recently described by DeYoung, Quilty, and Peterson (2007) and Soto and John (2009). Following these considerations, the items used to construct these 10 scales are given in Appendix A, and alpha values are provided in Table 1.

FIs associated with Big Five-related behaviors. The 463 FIs ultimately generated from Part 1 were adapted into questionnaire statements using four different question-response formats. Items

pertaining to likes and dislikes were rated under the instruction "How much do you *like or dislike* the following things?" with a scale ranging from 1 (Strongly dislike this) to 5 (Strongly like this). Items pertaining to goals were rated under the instruction "How much do you *try or want to do* the following behaviors?" with a scale ranging from 1 (I try very hard to avoid doing this) to 5 (I try very hard to do this). Items pertaining to abilities were rated under the instruction "How easy or hard do you find doing the following things when you try to (or feel that you should)?" with a scale ranging from 1 (I find it very difficult to do this) to 5 (I find it very easy to do this). All remaining items were rated under the general instruction "How much do you agree with each statement?" with a response scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The complete inventory is available from the first author.

We then reduced the complete set of 463 items to a more manageable set of approximately 100 items. To identify content most frequently reflected in the inventory and to organize content similarities, we conducted a hierarchical cluster analysis, using procedures similar to those described by Wood, Nye and Saucier (2010). We first constructed a dendrogram using the within-group linkage algorithm; in order to allow antonymous content to be placed on the same cluster, we included all 463 items in their original form as well as reverse-scored variables of all items, resulting in a cluster analysis of 926 items. We considered items as forming a cluster if at least two items clustered together in the dendrogram by showing intercorrelations of a magnitude of .35 or higher. Many of the larger clusters were then broken into smaller subclusters when there was clear evidence that the subsets of the items reflected different gradients of meaning. This was indicated more formally by entering the items from the larger clusters into a factor analysis using principle axis factoring and oblimin rotations, and identifying if there were two or more groups of items (each consisting of at least two items) which had fairly distinct factor loadings from one another, generally by having at least two items on each factor with at least .60 loadings and minor cross-loadings. These procedures resulted in the extraction of 87 clusters.

Finally, we correlated all 463 items with the 61 items of the IIDL. We used this to aid in selecting one item to represent each of the 87 clusters; items with greater correlations with the IIDL items (either by having a large maximum correlation, or by having many IIDL items correlated at a level of $|r| \geq .10$)

were given preference. We also examined this matrix to identify additional single items that were not located on multi-item clusters but that showed large correlations with an IIDL item, or that showed correlations above an absolute magnitude of .20 with 10 or more IIDL items. These additional considerations resulted in the identification of an additional 12 items, resulting in a total of 99 FI items.

Study 2 Method

Participants

A total of 700 ESCS participants completed the materials examined here as part of an ongoing study. Participants ranged in age from 18 to 85 (M = 51.4, 56% female), and were of all levels of education. See Goldberg (2008) for additional details.

Materials

Saucier Mini-Markers. In this study, we utilized the Saucier Mini-Markers (SMM; Saucier, 1994) as our measure of personality due to its unique advantage among resources collected within the ESCS sample of being administered multiple times in the form of both self-ratings and peer-ratings. In the fall of 1998, participants both completed the SMM themselves, and were asked to recruit up to three people they knew well to describe them on the SMM. Additionally, the participants rated themselves on the SMM earlier in the summer of 1993, and in the spring of 1995. Consequently, there were up to three self-ratings and up to three peer-ratings of the SMM that could be used for each participant.

Similar to Study 1, we selected two indicators from each Big Five domain, which were examined separately. The two trait indicators were selected (1) to measure distinct behavioral traits within the Big Five domain, and (2) to the extent possible parallel the traits examined in Study 1 (i.e., the traits listed within Table 1). We also only included items that were positive indicators of the dimension (e.g., for kindness, the item "kind" would be a positive indicator and "harsh" a negative indicator). This resulted in the selection of the items *bold* and *extraverted* within the domain of Extraversion; *kind* and *cooperative* in the domain of Agreeableness; *organized* and *practical* in the domain of Conscientiousness, *fretful* and *temperamental* in the domain of Neuroticism, and *creative* and *philosophical* in the domain of Openness.

Scales were formed by aggregating the self-ratings of these traits made in the three different

administrations; the reliabilities are shown in Table 3 and ranged from .62 to .86. Peer rating scales were formed by aggregating the 1 to 3 peer ratings obtained in Fall 1998. The intraclass correlations for peer ratings of the same participant, shown in Table 3, ranged from .13 to .35. Since participants were rated by an average of 2.5 peers, using the Spearman-Brown prophecy formula we estimated the approximate reliabilities of the average peer-rated scales as ranging from .27 to .57.

International Personality Item Pool (IPIP). ESCS participants completed up to 2492 distinct items between Spring 1994 and Spring 2003. These items consisted of relatively short items in which people described a wide range of behavioral traits, feelings, skills, beliefs, and more abstract self-perceptions. Participants rated about 50 of these items both in Spring 1994 and again in Fall 1995, allowing for estimation of the test-retest reliability over about a year. For these items, the test-retest correlations averaged .52, which we use as an approximation of the one-year test-retest reliability or dependability of the IPIP items.

Identification of functionality indicators (FIs) within the IPIP items. Given the heterogeneity of content within the IPIP, the first and third authors and a research assistant categorized the IPIP items into 1 of 7 categories. The first six collectively consist of the IPIP items we considered FIs; we list the categories and some common IPIP item stems: (1) *likes/dislikes* (e.g., "[Like/dislike]…", "[Prefer/prefer not] to…" "Feel [happy/bad] when…"; (2) *goals* (e.g., "[Want/seek/avoid]…" "[Try/try not] to…"), (3) *values* (e.g., "People [should/shouldn't]…" "Expect others [to/not to]…" "[Allow/let]…" "It is important [to/not to]…"), (4) *contingencies of emotion/attention* (e.g., "Am [concerned/not concerned] about…" "[Pay/don't pay] attention to…", "When in [situation], I feel [emotion]"); (5) *abilities* (e.g., "[Can/can't]…" "Am [easily/not easily]…" "[Know/Don't know] how to…" "Am [good/bad] at…"); (6) *beliefs/situation perceptions* (e.g., "[Believe/do not believe] that…" "[Experience/feel that]…""[Know/don't know] that…").

Finally, outside of these categories, items could be categorized as concerning (7) *behaviors/identities/reputations*, which especially concerned rates of behavior (e.g., "Tend to…", "When in [situation], do [response]"), expected rates of behavior (e.g., "Would [probably/never]" and abstract

trait perceptions. We also placed items in this category that had functional content that was vague or non-specific (e.g., "Worry about minor things").

There was relatively consistent categorization of these items into these categories: 1451 of the total 2413 IPIP items (60%) were placed in the same category by all raters; 785 (33%) were placed into the same category by two of the three raters, and only 177 (7%) were placed into a different category by each rater; although frequently all raters categorized such items into one of the first six FI categories. Any discrepancy beyond universal placement was discussed by the three raters. Of the 2492 items contained within the IPIP, 1351 (54%) were categorized as perceptions of FIs; these categorizations are available from the first author upon request.

Identifying functions associated with Big Five-related trait perceptions. We conducted a multi-step process to identify FIs related to the ten traits examined, and to reduce these to a smaller set that could be used to represent the diverse functions within the body of the text. Although this procedure was similar to that used in Study 1, some differences were necessary given the presence of both self- and peer-ratings of these participants and the much larger item pool used in this sample.

First, as the pattern of correlations between IPIP items and trait perceptions tended to be similar across both self-ratings and peer-ratings of traits (across the 1351 functional IPIP items, the vector correlation for how items were associated with self- and peer-ratings ranged from .94 for "extraverted" to .57 for "practical"), we averaged the item's correlation with the self-reported trait and with the peer-reported trait together. Second, for each of the 10 traits, we found the 100 items that had the highest absolute correlation with the trait. This resulted in reducing the 1351 functional IPIP items to a smaller set of the 630 items that were most highly associated with the 10 trait perceptions across self- and peer-reports. These items and their reversals were then entered into a cluster analysis, where we pre-specified the extraction of 75 clusters, again using the within-group average linkage algorithm, and using correlations as the similarity coefficient. These clusters ranged in size from 24 items, to one cluster with one item which was not considered further.

For the remaining 74 clusters, we selected a single item to indicate how the cluster was associated

with trait perceptions. We chose to use single items in order to make the number of items used to represent the cluster uniform, and so the cluster could be represented by providing the complete item within Table 4. To help in the selection of an item that indicated how the cluster as a whole related to Big Five-related trait perceptions, we conducting an inverse factor analysis, where the items within the cluster were entered as variables and the rows depicted the item's correlations with the 20 trait perceptions, considering self- and peer-ratings separately. The items with the highest factor loading within the associated covariance matrix provided an indication of which items were most representative of the cluster. We then selected an item from among the highest loading items which seemed to refer semantically to the content of the cluster and to a specific valuation, ability, and or perceived effect or situation construal. For instance, the items "Suspect hidden motives in others" and "Don't care about the rules" were selected over the items "Distrust others" and "Resist society's rules," respectively, due to the former items referring less ambiguously to FIs rather than to behavioral tendencies.

Supplementary Materials 2 (S2)

Materials for Generating Reasons for Trait-Related Behavior

1. Interview Questions for Generating Explanations of Big Five Related Behaviors

Original IPIP Item	**Interview Item**
Extraversion	
I start conversations.	Are you typically someone that starts conversations?
I don't talk a lot.	Would you say that you talk a lot?
I am skilled in handling social situations.	How skilled would you say that you are in handling social situations?
I keep in the background.	Do you feel that you keep to the background in social situations, or that you make yourself prominent?
I talk to lots of different people at parties.	Would you say that you talk to lots of different people at parties?
I find it difficult to approach others.	How easy do you feel that it is to approach other people?
I make friends easily.	Would you say that you make friends easily?
I often feel uncomfortable around others.	How comfortable are you around other people?
I warm up quickly to others.	Would you say that you are someone who warms up quickly to others?
I seem to derive less enjoyment from interacting with other people than others do.	Do you feel that you get more or less enjoyment from interacting with people than others do?
Agreeableness	
I sympathize with others' feelings.	Would you say that you tend to sympathize with other peoples' feelings?
I insult people.	Would you say that you are someone who insults people?
I respect others.	How much would you say that you respect other people?
I look down on others.	Do you feel that you look down on other people?
I accept people as they are.	Would you say that you tend to accept people as they are?
I get back at others.	If someone does you wrong, will you tend to try to get back at them?
I find that it takes a lot to make me feel angry at someone.	Would you say that it takes a lot to make you angry at someone?
I point out others' mistakes.	Would you say that you are someone who points out mistakes that other people make?
I listen to people's problems.	Are you someone who will listen to people's problems?
I tell offensive jokes.	Do you tell offensive jokes?
Conscientiousness	
I follow through with my plans.	Would you say that you typically follow through with plans you make?
I don't finish the things that you start.	Would you say that you finish the things that you start?
I usually take care of my responsibilities as soon as possible.	When you have responsibilities, would you say that you are someone who takes care of them as soon as you can?

I find it difficult to organize tasks and activities.	Do you have difficulty organizing tasks and activities?
I complete tasks successfully.	Are you someone who completes tasks successfully?
I have difficulty keeping my attention on a task.	Do you have difficulty keeping your attention on tasks?
I like to organize things.	Are you someone who likes to organize things?
I hardly ever finish things on time.	Are you someone who finishes things on time?

Emotional Stability

I am relaxed most of the time.	Are you usually a relaxed person?
I get stressed out easily.	Are you someone who gets stressed out easily?
I remain calm under pressure.	Are you someone who remains calm under pressure?
I panic easily.	Would you say you are someone who panics easily?
I rarely worry.	Would you say that you are someone who worries a lot?
I am moody.	Are you a moody person?
I am not easily bothered by things.	Are you easily bothered by things?
I am afraid of many things.	Would you say that you are afraid of many things?

Openness

I believe in the importance of art.	Do you believe in the importance of art?
I seldom notice the emotional aspects of paintings and pictures.	Are you someone who notices the emotional aspects of paintings and pictures?
I have a vivid imagination.	Do you have a vivid imagination?
I am not interested in abstract ideas.	Are you someone who is interested in abstract ideas?
I see beauty in things that others might not notice.	Do you think that you see beauty in things that others might not notice?
I do not like art.	Do you like art?
I enjoy hearing new things.	Are you someone who enjoys hearing new things?
I have difficulty understanding abstract ideas.	Do you have an easy or difficulty time understanding abstract ideas?

2. Materials for Generating Explanations of Big Five-Related Behaviors in Others

High Extraversion: Think of someone you know who is very sociable, extraverted, and outgoing. This is someone who regularly starts conversations with others and who regularly talks to lots of different people at parties. [26]

Low Extraversion: Think of someone you know who is very reserved, introverted, and shy. This is someone who regularly keeps in the background in social situations and who regularly has a difficult time approaching others. [22]

High Agreeableness: Think of someone you know who is very compassionate, agreeable, and kind-hearted. This is someone who regularly sympathizes with other people's feelings and who regularly listens to other people's problems.[21]

Low Agreeableness: Think of someone you know who is very inconsiderate, disagreeable, and rude. This is someone who regularly insults other people and who often offends others. [23]

High Conscientiousness: Think of someone you know who is very dependable, conscientious, and organized. This is someone who regularly follows through with the plans they make and who regularly completes task on time. [22]

Low Conscientiousness: Think of someone you know who is very disorganized, unconscientious, and unreliable. This is someone who regularly starts tasks but doesn't finish them and who regularly has trouble keeping his or her attention on a task. [25]

High Emotional Stability: Think of someone you know who is very relaxed, calm, and emotionally stable. This is someone who regularly remains calm under pressure and who generally is not bothered by things that could easily upset other people. [22]

Low Emotional Stability: Think of someone you know who is very tense, anxious, and nervous. This is someone who regularly gets stressed out easily and who gets worried over small things. [23]

High Openness to Experience: Think of someone you know who is very curious, open to new experiences, and imaginative. This is someone who believes in the importance of art and who frequently sees beauty in things other people might not notice. [24]

Low Openness to Experience: Think of someone you know who is uninterested in new experiences, unimaginative, and has fairly narrow interests. This is someone who does not tend to notice the emotional aspects of art and who regularly has a difficult time understanding abstract ideas. [21]

Note. Number in parentheses provides the number of participants who provided a report for this instruction set.