How a Functionalist Understanding of Behavior Can Explain
Trait Variation and Covariation Without the Use of Latent Factors

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We would like to thank the many people who provided comments and suggestions in early drafts of this manuscript. This list includes Jaap Denissen, Grant Edmonds, David Funder, Peter Harms, Ryne Sherman, Jenn Lodi-Smith, Seth Spain, Simine Vazire, and Christian Waugh. We would like to especially thank William Fleeson, Eranda Jayawickreme, Brent Roberts, Mary Jane Skelly, and especially Lara Kammrath for the considerable time and attention they have given to previous drafts of this manuscript, which have resulted in substantial changes and improvements.

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ABSTRACT

Personality psychologists frequently think of latent factors (e.g., extraversion) inferred from the covariance of behavioral traits (e.g., sociability, assertiveness) as basic causes of these traits. Here, we argue that such latent factors serve no role as causes of behavior. Instead, we discuss the merits of approaches which cast motivations, abilities or affordances, and perceptions of the environment – collectively *MAPs* – as the functional antecedents of behavior. Although functionalist explanations of behavior have recently illustrated how a range of basic phenomena in personality psychology can be understood without invoking latent factors (e.g., Fleeson & Jolley, 2007), this work has not clearly described how such frameworks can explain the covariation of behavioral traits. Using qualitative and quantitative data, we show that any particular behavioral trait is almost certainly influenced by many distinct MAPs, and conversely, that any particular MAP almost certainly influences many distinct behavioral traits. This in turn allows for a functionalist understanding of the covariation of behavioral traits which does not necessitate any role for latent factors: covariance increases as traits increasingly share functional antecedents, and even uncorrelated traits will regularly share functional antecedents. We discuss how removing a causal role for latent factors has numerous implications for how personality research is conducted, and for our theoretical understanding of basic issues in personality psychology ranging from the nature of biological and environmental influences on behavior, to personality stability and the potential for personality change.

*Keywords:* personality traits, latent factors, social cognition, functional approach, comorbidity, covariation
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What are the basic units that should be understood as the causes of behavior? To many personality psychologists, the basic units seem to have become broad latent factors, such as the extraversion, agreeableness, conscientiousness, neuroticism, and intellect/openness factors that have been described within the Big Five and Five Factor Model (FFM) frameworks (Goldberg, 1993; McCrae & Costa, 2008), or similar broad factors described in other trait structures (e.g., the HEXACO system, Ashton & Lee, 2007; higher-order alpha/beta or Plasticity/Stability factors, DeYoung, 2006, 2010). We refer to latent factors in the present article specifically as dimensions (e.g. extraversion) that are inferred through the patterns of covariation of distinct self-perceptions or behavioral traits (e.g. assertiveness, sociability, positive affect). Within latent factor approaches, these latent factors are frequently considered as the sources of the covariation among the “narrower” traits that are used to infer them. In turn, these latent factors are enlisted to explain the origins of other phenomena ranging from occupational and academic outcomes (e.g., Barrick & Mount, 1991; Judge, Piccolo, & Kosalka, 2009; Noftle & Robins, 2007), to neurological functioning (e.g., Canli, Zhao, Desmond, Kang, Gross, & Gabrieli, 2001; DeYoung, Hirsh, Shane, Papademetris, Rajeevan, & Gray, 2010), psychopathology and well-being (e.g., Kahn, Jacobson, Gardner, Prescott, & Kendler, 2005; Krueger & Markon, 2006; Kotov, Gamez, Schmidt, & Watson, 2010; Widiger & Smith, 2008), and cultural differences in behavior (e.g., Ashton, Lee, Perugini, Szarota, de Vries, Di Blas, et al., 2004; McCrae, 2009).
Very different explanations of behavior are provided by what we refer to here as *functionalist* approaches, which understand the behaviors as being produced to serve functions for the individual. Functionalist frameworks begin by construing individuals as “actively trying to make the best of their shifting circumstances to improve the quality of their lives” (Fleeson & Jolley, 2006; p. 45), or understanding that “we register [events] as pleasurable or painful. That makes us take steps to have more of the former and less of the latter, now and in the future” (Pinker, 1997; p. 143). In psychology, functionalist approaches are widely represented in a number of social, social cognitive, and evolutionary models of behavior (e.g., Ajzen & Fishbein, 1980; Buss, 2008; Cervone, 2005; Fleeson & Jolley, 2006; Kenrick, Griskevicius, Sundie, Li, Li, & Neuberg, 2009; Kruglanski, Shah, Fishbach, Friedman, Chun, & Sleeth-Keppler, 2002; Mischel & Shoda, 1995; Snyder & Cantor, 1998). Similarly, a number of economic models consider personality as a “strategic response function” (Almlund, Duckworth, Heckman, & Kautz, 2010, p. 46) of individuals who are attempting to maximize their *utility* (pleasure, happiness, benefit) within the constraint of limited resources (Becker, 1976; Bentham, 1789/1948; Manski, 2000). A person’s display of particular behaviors can thus be understood as the result of a complicated, if largely automatic or unconscious, cost-benefit analysis.

Given this conception, functionalist approaches tend to conceptualize units such as expectations, motives, goals, skills, resources, and plans as influences on an individual’s behavior. Notably, most functionalist approaches to behavior provide no causal role for latent factors (again, dimensions inferred from the covariance of distinct behavioral traits). Indeed, several theorists have provided detailed arguments as to why latent factors such as extraversion are unnecessary or inappropriate explanations of behavior, especially when functionalist
alternatives can be offered (e.g., Bandura, 1999; Borsboom, Mellenbergh, & van Heerden, 2003; Cervone, 2005; Cramer, Waldorp, van der Maas, & Borsboom, 2010; Fleeson & Jolley, 2006).

Despite the prevalence of both latent factor and functionalist perspectives in contemporary psychology, the different views these perspectives take concerning the importance of latent factors as causes of behavior have been difficult to square. We believe a large source of this difficulty arises from the fact that the two perspectives have generally been enlisted to explain different phenomena. First, functionalist approaches have been applied to understand fairly specific behavioral patterns such as narcissism (Morf & Rhodewalt, 2001), self-control (Metcalf & Mischel, 1999), and academic performance (Dweck & Leggett, 1988), but generally they have not been applied to understanding the behavioral traits and associated self-perceptions that are most directly associated with latent factors such as the Big Five traits (e.g., tendencies to be sociable, agreeable, responsible, anxious, open). Recently, research by Fleeson and others has begun to demonstrate that this has been an unnecessary division, as the origins of individual differences in Big Five-related behaviors can be usefully illuminated by identifying the specific functions served by such behaviors (Fleeson, 2007; Fleeson & Jolley, 2006; Noftle & Fleeson, 2010; see also Heller, Perunovic, & Reichman, 2009; Wood, Larson, & Brown, 2009). Second, functionalist frameworks have not directly provided an explanation of why tendencies to be assertive, happy, and sociable covary which does not invoke latent traits. This is an important limitation, as the ability for latent factors to explain the covariation of many distinguishable traits represents the most compelling evidence for the existence of latent factors such as the Big Five to many psychologists (McCrae & Costa, 1995). Indeed, it is the central phenomena that latent factors are enlisted to explain (Krueger & Markon, 2006; Tellegen, 1991). We thus continue by describing how the sources of behavior are generally understood in functionalist approaches.
Then, we describe how functionalist approaches provide an alternative to latent factors toward understanding the covariation of behavioral tendencies and associated self-perceptions.

**Functionalist Frameworks for Understanding Variation in Behavior**

We continue by discussing commonalities in functionalist frameworks for understanding the sources of behavior. We begin by providing a definition of terms. Although psychologists employ a range of meanings in their use of the word “trait,” here we adopt something closer to the more lay usage of a trait as “a particular feature of mind or character; a distinguishing quality; a characteristic” (Oxford English Dictionary, 2011). More precisely, we define a *trait* here simply as a relatively enduring characteristic of the individual. Although this is a definition of trait that is similar to that used both by lay persons and by many scientists (e.g., Dawkins, 1989; Funder, 1991; Pinker, 1997; Srull & Wyer, 1993), this is a more inclusive definition of a trait than that used by many personality psychologists. By this definition a person’s traits can range from behavioral regularities, such as tendencies to be talkative and organized; to more cognitive characteristics such as high intelligence, preference for confident mates, and distrust in others; to more physical characteristics such as gender, height, physical attractiveness, ethnicity, amygdala activation levels, the presence of certain genetic alleles, and testosterone levels.

We define *behavior* broadly as an individual’s responses to their environments. Functionalist frameworks typically emphasize behaviors as means to desired ends (e.g., Kruglanski et al., 2002; Snyder & Cantor, 1998). This definition includes outward, observable social behaviors (e.g., assertive or organized behavior), but also more internal feelings or emotions (e.g., anger, anxiety, joy), as these frequently are responses that prompt changes to the environment that are adaptive to a person’s goals (James, 1890; Tamir, 2009). People clearly
differ in their average levels of different behaviors (e.g., Fleeson & Gallagher, 2009), and a person’s characteristic level of behavior can be termed a *behavioral trait*.

Finally, *trait perceptions* are defined here as simply traits ascribed to an individual by oneself or others, and can involve any of the diverse types of traits (e.g., “I am talkative”; “I prefer confident mates”; “She is tall”; “He is well-liked”; “He has high testosterone levels”). Trait perceptions are a subclass of the broader category of traits but are regarded separately for several reasons. The desire to facilitate certain perceptions is frequently a major goal people hope to attain through their behaviors (e.g., create a desirable reputation; Hogan, 1996). Additionally, it is trait perceptions (e.g., self- or peer-ratings of a person’s aggressiveness) rather than more directly measured behaviors (e.g., counts of aggressive word use) which are the usual source of information for measuring individual differences (Roberts & Wood, 2006), and for inferring relations between traits in almost all studies of personality structure (Srivastava, 2010).

As mentioned earlier, there is a very broad range of qualities that are inclusive of a person’s traits. However, the overarching assumption that a person’s behaviors have a functional logic helps to clarify the types of traits that are most important for understanding a person’s behavior. First, it is not necessary that the sources of utility or pleasure for one person are the same as the sources for someone else (e.g., Little, 1999; Murray, 1938). Consequently, it is necessary to identify the outcomes an individual finds desirable. Second, different people may frequently desire the same outcomes, but differ in the extent to which they have resources (e.g., energy, time) that can be enlisted to attain them (e.g., Campbell, 1990; Gibson, 1979). Consequently, it is necessary to understand how easy or difficult it is for individuals to attain desired outcomes. Third, it is clear that apart from the desires and resources that individuals bring to situations, individuals proximally act on their perceptions of situations rather than on the
objective situation (e.g., Kelly, 1963; Reis, 2008). Consequently, it is necessary to understand how an individual expects that their behaviors will modify their environment or experience. We refer to these three classes as concerning the motives, abilities/affordances, or perceptions (or MAPs) underlying behavior, respectively, which we refer to collectively as the functional antecedents of behavior. We elaborate on the role of each of these categories on influencing the functional value of behavior below. Given that similar functional antecedents are discussed by a wide array of frameworks but under different names, we also provide a listing of names given to these functional categories in other frameworks in Table 1. A goal in doing so is to show the ubiquity of these categories in different functionalist frameworks for understanding behavior.

Role of motives in causing behavior. Motivational concepts such as goals, desires, purposes, or attitudes toward objects are posited as explanatory variables which compel behavior in a wide range of psychological models of behavior (Table 1). Similarly, in economic frameworks, preferences concern the extent to which an individual views performing a behavior or attaining an outcome as resulting in the “utility” that people are attempting to maximize (Becker, 1976; Manski, 2000). We can think of motives as influencing behavior in this way: if an individual is afforded and perceives the opportunity to perform a given behavior, motivational constructs can help us to understand whether the individual will subsequently choose to perform or avoid performing the behavior. For instance, two individuals may differ in whether they engage in a conversation due to the fact that the conversation is viewed as interesting to the first person but boring to the other. Motivational sources of behavior are inferred from lay explanations of behavior that begin with phrases like “I dislike…” and “I want to…”

Ultimately there should be an intimate relationship between motives and emotion, in that we can expect that an individual’s behaviors are aimed at increasing the experience of desired
affects (e.g., pleasure, contentment, pride) and decreasing the experience of undesired affects (e.g., stress, pain, irritation). And conversely, emotions are frequently thought of as the product of a person’s evaluation of their success in attaining desired states (e.g., Brandstätter, 1983; Carver, Scheier, & Fulford, 2008). A particularly important task for understanding the functional reasons for an individual’s behavior is thus to identify the outcomes the individual associates with desirable and undesirable affects.

It is also important to remember that the utilitarian calculations that lead to behavior are done in the moment of action among a number of conflicting goals, and may often be arrived at in a very quick manner outside of conscious awareness (Gigerenzer & Goldstein, 1996). Further, an individual may be driven to act in ways that result in utility gains that are short-sighted or otherwise suboptimal in relation to the individual’s larger conscious goals (e.g., eating a cupcake while trying to lose weight). However, functional explanations remain useful even for automatic or maladaptive behaviors, as we may find the processes underlying such behaviors to serve unconscious or evolutionary goals (e.g., Bargh, Gollwitzer, & Oettingen, 2010; Buss, 2008; Kenrick et al., 2009).

**Role of abilities/affordances in causing behavior.** Abilities or affordances refer to any aspect of experience that functions to make behaviors easier or more difficult to perform (Gibson, 1977, 1979), and can be thought of as reflected by the idea of *capabilities or constraints* in economic models of behavior (Almlund et al., 2010; Manski, 2000). The role of abilities in behavior can thus be thought of as almost the converse of the role of motives described above: given an individual who desires to attain a particular outcome, abilities refer to anything that functions to make it more or less difficult to do so. Even among individuals who all desire to perform a behavior or to attain a particular outcome, differences will generally be observed in
how much some individuals experience attaining the outcome as being difficult, draining, or effortful. Individuals can compensate for lower abilities to perform behaviors by expending their own resources (Almlund et al., 2010); however as the resources that can be enlisted are finite and exhaustible, individuals are expected to expend them judiciously and avoid behaving in ways that are particularly draining (Baumeister & Alquist, 2009). The role of abilities in behavior can thus be inferred from lay explanations that begin with phrases like “I find it easy to…” and “I find it tiring to…”

A wide range of constructs can be considered to be abilities or affordances in this manner (Table 1). Intelligence as measured by standard IQ tests might be considered the prototypical ability or affordance, in that individual differences in intelligence predict the ease with which individuals can accomplish a wide range of tasks (Jensen, 1998). However, individuals differ in the extent to which they find it difficult to do other behaviors, ranging from having a conversation with a stranger, to staying organized, confronting others, gaining someone’s trust, attaining a desired mate, or keeping from divulging a friend’s secrets. More generally, habitual behaviors can be thought of as being experienced as abilities by this definition, as they may be so automatized that they require little attention or conscious effort to perform – indeed, they may often require more mental resources to inhibit than to produce (James, 1890).

**Role of perceptions in causing behavior.** Many models of behavior provide a distinct role for perceptions of the environment (Kelly, 1963; Reis, 2008) and of how particular actions will alter the environment (e.g., Manski, 2000; Mischel & Shoda, 1995; Pinker, 1997); a number of categories and constructs serving this functional role in relation to behavior are given in Table 1. As in expectancy-value models (e.g., Rotter, 1954; Vroom, 1964), behavior will be facilitated not just by making associated goals more desirable, but independently by influencing the level of
perceived association between the behavior and the goal. Perceptions of the external environment can be thought of as influencing the strategies that are formed or subgoals that are adopted to help individuals attain their higher order goals (Austin & Vancouver, 1996; Little, 1999). For instance, we can imagine a woman who wants to be liked by the group members she is interacting with, and has just heard someone in the group provide incorrect information. The woman may perceive that correcting this person’s error will be viewed as disruptive and lead to irritation, and consequently stay silent. Alternatively, she may perceive that correcting this person’s error will be viewed as useful and lead to gratitude, and consequently speak up. As this example illustrates, perceptions can influence behavior independently of the person’s motives and abilities by shaping the expected consequences of different behaviors, which then shape the behavioral route the individual will chart (i.e., their plans; strategies) to satisfy their goals (Ames, 2008; Kruglanski et al., 2002). These sorts of expectancies can be inferred from statements of expectancies that being with phrases like “If I do X, then…” and “People here are like…”

The effects of features of reality on behavior come by influencing the functional value of behavior. The suggestion that MAPs are the functional antecedents of a person’s behavior provides a route for understanding how aspects of a person’s physical or social reality influence behavior. In particular, it is useful to think of biological and environmental features as influencing a person’s behavior through modifying the individual’s expected functional value of performing the behavior (e.g. making the behavior seem more adaptive or desirable to perform; Reis, 2008). To illustrate this idea, we briefly describe four aspects of reality that have been linked to variation in standard personality trait measures in past research: regional disease prevalence (Schaller & Murray, 2008), involvement in romantic relationships (e.g., Neyer & Asendorpf, 2001), physical attractiveness (Langlois, Kalakanis, Rubenstein, Larson, Hallam, &
Smoot, 2000); and amygdala responsiveness to positive stimuli (e.g., Canli, Sivers, Whitfield, Gotlib, & Gabrieli, 2002; Canli et al., 2001). These examples are summarized in Figure 1.

Effects of regional disease prevalence on behavior. Regional disease prevalence has recently been associated with national levels of a range of other behaviors, including lower extraversion and openness to experience (Schaller & Murray, 2008), and higher collectivism (Fincher, Thornhill, Murray, & Schaller, 2008). Schaller and Murray’s (2008) preferred explanation for these associations is a functional one: higher regional disease prevalence increases perceptions of threats in the environment in part because interacting with others in such environments does in fact carry a greater likelihood of harm. In turn, increased perception of environmental threats is thought to lead to lessened desire to interact with others, and may additionally lead to environmental changes that it more difficult to do so (e.g., a mandated quarantine). Heightened regional disease prevalence may thus influence a number of motives, abilities, and perceptions which then inhibit the display of extraverted and open behaviors.

Effects of romantic relationships on behavior. Several studies have linked experiences in romantic relationships to changes on personality trait measures. One of the more regular effects observed is an association between involvement in romantic relationships and increases in traits in the domain of conscientiousness (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Roberts & Bogg, 2004; Sampson & Laub, 1992). In social control explanations of these effects, entering romantic relationships causes individuals to operate under new expectations that their former irresponsible behaviors could now lead to rejection from a desired spouse (Sampson & Laub, 1992). In more intrinsically motivated social investment explanations, entering romantic relationships causes individuals to identify with a new goal of providing for and maintaining intimacy with the spouse, which then promotes conscientious behavior (Roberts, Wood, &
In both explanations, romantic relationships ultimately impact conscientiousness by increasing the functional value of conscientious behaviors.

**Effects of physical attractiveness on behavior.** More physically attractive individuals have been found to score higher on measures of extraversion, social confidence, and emotional stability (Langlois et al., 2000). Research indicates that some of the effects of physical attractiveness on several personality traits may be mediated by the increased ability of attractive people to elicit positive reactions from others, which in turn should be reflected in internalized perceptions that interactions with others will be positive and that social interactions are pleasurable (Haas & Gregory, 2005; Langlois et al., 2000; Feingold, 1992).

**Effects of amygdala properties on behavior.** Recent research has indicated that extraversion is associated with heightened amygdala response to happy faces (Canli et al., 2001, 2002), and with greater gray matter concentration in the amygdala (Omura, Constable, & Canli, 2005). These findings have been discussed as indicating the role of the amygdala in processing stimulus reward information (Baxter & Murray, 2002): individuals with higher amygdala activity in response to happy faces may be able to more automatically attend to positive attributes of social stimuli. In turn, the greater ability to attend to positive features such as these may function to motivate the person toward increased social interactions by making them more desirable and rewarding, which then results in extraverted behaviors and associated self-perceptions.

**Additional characteristics of functional explanations of behavior.** We selected these particular examples in order to illustrate various characteristics of functional explanations of behavior. In all of the examples given in Figure 1, the reality antecedent alters the functional value of behavior (e.g., disease prevalence makes social interaction less desirable), which in turn impacts the frequency of behavior (e.g., fewer extraverted behaviors), which consequently
impacts associated perceptions of the individual (e.g., [I am/she is] introverted). We elaborate on other important characteristics of functionalist explanations below.

**Functional explanations can be used to explain behavior at any level of analysis.**

Latent factor models have been criticized as providing little insight into the reasons for intra-individual variability in behavior (Borsboom et al., 2003; Cervone, 2005; Fleeson & Jolley, 2006; Mischel & Shoda, 1995). In contrast, we hoped to illustrate through these examples that functionalist approaches can be applied to understanding behavioral variation at any level of analysis, regardless of whether we are trying to understand behavioral variation within a single person (why does Joe act more extraverted at home than work?), across developmental time (why is Joe less extraverted now than he was in adolescence?), across persons (why is Joe more extraverted than Jane?), or across different regions (why do people in some countries act more extraverted than in others?). We can think of behavior as occurring to serve functions for the person at the moment of action, which when aggregated form the basis of behavioral differences at higher levels (e.g., Fleeson & Gallagher, 2009; Heller et al. 2009; Wood & Roberts, 2006).

The distillation of this view is presented by Fleeson and Jolley (2007) in their description of analogous ‘bottom-up’ approaches to behavior: “Rather than… using broad and abstract personality characteristics as explanatory variables… a bottom-up approach tries to identify processes explaining the level of a personality state at the moment, and then builds up explanations of broader characteristics from these basic processes” (p. 45). Indeed, pairing together the finding that a person’s momentary behavior is highly contingent on situational factors (e.g., Fleeson, 2007; Fleeson, Malanos, & Achille, 2002; Zayas, Whitsett, Lee, Wilson, & Shoda, 2008), with the finding that between-person differences in aggregated rates of momentary behaviors from such studies correlate highly with between-person differences in self-reported
personality (Fleeson & Gallagher, 2009), a base expectation should be that the reality or functional antecedents that increase the likelihood of behavior for most individuals can be used to explain differences in the same behavior at other levels of analysis (Fleeson, 2001; Higgins, 2000). To illustrate: given that most individuals act more extraverted when they perceive the people they are with as friendly (Fleeson, 2007), we should not be surprised that other research shows between-person differences in extraversion to be associated with variation in how much individuals typically perceive others to be friendly (e.g., Wood, Harms, & Vazire, 2010).

*There are many distinct antecedents of a given behavioral trait.* An important characteristic of functional explanations of behavior is that individuals behave in the manner they do on the basis of the push and pull of many functional considerations simultaneously. For instance, social cognitive approaches frequently investigate how variability in a single behavioral pattern such as self-control (Metcalfe & Mischel, 1999), narcissism (Morf & Rhodewalt, 2001), prosocial behaviors (Clary, Snyder, Ridge, Copeland, Stukas, et al., 1998) or extraversion states (Fleeson, 2007) originates from of a large number of distinct expectancies, goals, and competencies. This can be thought of as analogous to the *principle of equifinality* in goal systems theory (Kruglanski et al., 2002) which emphasizes that there are generally multiple routes to the same endpoint (here: producing a given behavior). From the examples given in Figure 1, some of the functional antecedents of extraverted behavior likely include perceptions of other people as non-threatening, abilities to perform effectively in social situations, and the level of pleasure gained from positive social stimuli. Although these functional antecedents are almost certainly positively correlated with one another, they are also distinguishable and most likely have independent effects on a person’s level of extraverted behavior.
There are many distinct antecedents of a given MAP. Although we argue that many MAPs contribute independently to the likelihood of performing a behavior, a person’s level of any particular MAP is itself multiply determined. This can come first in the form of reality antecedents: for instance, the extent to which a person tends to automatically construe others positively – a tendency that seems to facilitate a broad range of behaviors (Wood, Harms, & Vazire, 2010) – might itself be probabilistically increased by being in a satisfying relationship, being physically attractive, being in a region with low disease prevalence, having certain amygdala activation patterns, and numerous other features of a person’s experience. Different MAPs can also be thought of as impacting one another: for instance, deciding that performing a behavior will help with a desired goal (e.g., gaining status) may make the behavior more desirable, which in turn can contribute to making the behavior easier to perform (e.g., by promoting increased rehearsal), which in turn may make the behavior more desirable, and so on (Denissen, Zarrett, & Eccles, 2007).

Despite the multiply determined nature of MAPs, identifying the MAPs that facilitate a given behavior will generally narrow the list of reality antecedents suspected as underlying the behavior. For instance, a particularly sociable person should have some insight that a reason he acts sociably is that he derives a lot of pleasure from being around others, but he almost certainly does not know that an important cause of this is the dramatic responsiveness of his right amygdala to the presence of positive social stimuli. Nonetheless, by understanding enjoyment of others to be an experiential consequence of amygdala functioning but not of, say, testosterone levels or hippocampus functioning, we can narrow the list of reality features suspected of influencing levels of sociability.

Latent Factor and Functionalist Approaches to Understanding Trait Covariation
Although functionalist approaches are widely used across psychology, these differ importantly from how the causes of behavior are understood by investigators employing latent factors. Many theorists advocating functionalist frameworks have explicitly argued that latent factors have no place in explanations of behavior (Bandura, 1999; Borsboom et al., 2003; Cervone, 2005), and recent theory and research has begun to illustrate how functionalist approaches can explain fundamental phenomena in personality psychology without the use of latent factors. For instance, Fleeson and his colleagues have elaborated on how functionalist units can be employed to explain trait variation (e.g., Fleeson, 2001; Fleeson & Gallagher, 2009) and trait development (Fleeson & Jolley, 2006; Noftle & Fleeson, 2010) without invoking a role for latent factors. However, despite the advances, other theorists have continued to provide a prominent and distinct role for latent factors as theoretical explanations of behavior (e.g., Judge et al., 2009; Krueger & Markon, 2006; McCrae & Costa, 1995, 2008; Roberts & Wood, 2006).

We perceive that a central reason functional approaches to behavior have not resonated with many personality psychologists is that these approaches have not yet articulated a clear alternative to latent factor models toward explaining the phenomena of trait covariance. For instance, why are assertive people also likely to be enthusiastic, sociable, and adventurous? Why are intellectual people also likely to be open to new experiences, untraditional, and creative? This is an important issue because the covariation of diverse traits is precisely the phenomena that latent factors are enlisted to address (Ashton & Lee, 2001, 2007; Ashton, Lee, Goldberg, & de Vries, 2009; DeYoung, 2006; Goldberg, 1993; Krueger & Markon, 2006; McCrae & Costa, 1995, 2008; Tellegen, 1991). The discovery of the Big Five is justly regarded as one of the great accomplishments of modern personality psychology precisely because it provides a parsimonious dimensional system that can be used to summarize major patterns of trait covariation (John,
Naumann, & Soto, 2008; Ozer & Reise, 1994). As noted by Tellegen (1991) the argument for the causal role of latent factors follows from “the fact of covariation” (p. 15). However, despite the various critiques of latent factor approaches (e.g., Bandura, 1999; Block, 1995; Cervone, 2005), these critiques have not been coupled with an alternative, functionalist explanation of the phenomenon of trait covariation. Consequently, onlookers to this debate may sensibly ask “so what do you propose we use instead” (Goldberg, 1995, p. 221; John & Naumann 2010)?

We hope to demonstrate here that functionalist approaches of the sort discussed above provide such an alternative. We thus continue by describing two contrasting perspectives of the origins of covariation between behavioral traits. First, we describe the logic of latent factor models for explaining trait covariance, and foreshadow some issues with such explanations. Following this, we outline a functionalist understanding of behavior that can be used to explain the covariation of behavioral traits without invoking causal latent factors.

**Perspective 1: Behavioral trait covariation arises through broad latent factors.**

Latent factor approaches to the covariation of behavioral traits generally proceed by using factor analysis to generate factors (e.g., extraversion) which, in conjunction with factor loadings, can roughly reproduce 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.¹ For instance, as shown in Figure 2, if we were interested in identifying a factor underlying covariation between assertiveness and enthusiasm, and these two traits showed an association of $r = .49$, the factor analysis will extract 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
latent variable; in this example, by multiplying the .70 loadings with the factor together, we can say that assertiveness and enthusiasm have an indirect .49 correlation “through” the common factor, which we might label “Extraversion.” It is worth noting that given these equal factor loadings, the empirical estimate of the factor before rescaling will be a simple averaging of the two variables. That is, the empirical estimate of each individual’s latent “Extraversion” that underlies the association between assertiveness and enthusiasm will be the simple mathematical average of the individual’s assertiveness rating and enthusiasm rating.

When we are looking at the association of two variables, a single factor will always recover the association between variables perfectly. As the number of items in the factor analysis increases – as when individual ratings of hundreds of lexical terms are entered into a factor analysis (e.g., Saucier, 1997) – a small number of factors will no longer be able to reproduce the correlations between items perfectly; however it may nonetheless be generally agreed that the small number of factors can be used to adequately recover the original pattern of covariation observed within the full set of variables. 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 in creating the factor estimate.

Although some researchers see the role of factor analysis in studies of trait structure as providing non-causal summaries of the relations between traits (e.g., Saucier & Goldberg, 2001; Ozer & Reise, 1994), others interpret the factors as approximations of the true causes of behavior (Haig, 2005; McCrae & Costa, 1995, 2008). For instance, McCrae and Costa (1995) argue that latent factors identified from studies of personality trait structure are “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) and Kim and Mueller (1978) refer to the postulate of factorial
causation that underlies much work on factor analysis as the assumption that “the covariation between observed variables is solely due to their common sharing of one or more of the common factors” (p. 78) which are approximated from factor analysis. These types of factors have been referred to as “source traits” (Cattell, 1946), “genotypic traits” (Eysenck, 1967), “liabilities” (Krueger & Markon, 2006); and “meta-traits” (DeYoung, 2006). Indeed, many investigators are referring to the latent factors by their use of the term “traits” or “personality traits” (e.g., Krueger & Markon, 2006; McCrae & Costa, 1995; Roberts & Wood, 2006; Tellegen, 1991). Given our more general definition of a trait as any relatively enduring characteristic of an individual (see Table 1), we instead have referred to the dimensions extracted from factor analyses of diverse trait items (e.g., sociability, assertiveness) as latent factors.

The use of latent factors as causal variables. Although some investigators explicitly state their view that latent factors represent basic causes of behavior (e.g., Ashton & Lee, 2001; DeYoung & Gray, 2009; McCrae & Costa, 1995, 2008), many more researchers working with latent factors do not. However, as described by Borsboom and colleagues (2003), it is somewhat difficult to justify the use of latent factors without invoking them as causal influences on behavior. This is because a latent factor is indeed mathematically modeled as an unobserved source of the covariance of the measured traits (John & Soto, 2007; Krueger & Markon, 2006). Consistent with this, a number of conventions can be observed in how latent factors are used in personality research which make sense mainly if latent factors are construed as being causal variables.

Several of these conventions concern how latent factors are understood as relating to more specific traits. Traits such as enthusiasm and assertiveness are often understood as being lower-order “facets” (Soto & John, 2009; McCrae & Costa, 2008) or “aspects” (DeYoung,
Quilty, & Peterson, 2007) of a latent factor, as if these highly correlated traits are different flavors or manifestations of the latent factor, like variations on a theme. Traits that show substantial correlations with multiple latent factors simultaneously are sometimes labeled “blended traits,” implying for instance that tendencies toward leadership or originality are caused by both latent Extraversion and Openness factors, whatever these might be (Ashton et al., 2009; Hofstee, de Raad, & Goldberg, 1992). Others have directed attention to whether such traits should properly be considered as belonging to one latent factor or the other. For instance, some discussion has focused on whether warmth is a facet of Extraversion or Agreeableness (John et al., 2008); or whether conventionality is a facet of Conscientiousness or of Openness to Experience (e.g., Roberts, Bogg, Walton, Chernyshenko, & Stark, 2004). And many investigators control for measures of the broad Big Five traits before examining how more specific traits are associated with variables of interest, which implies that latent factors should be considered first in explanations of how personality traits relate to other variables (e.g., Furnham & Petrides, 2003; Hendricks & Payne, 2007; Judge, Jackson, Shaw, Scott, & Rich, 2007).

The assumption that latent factors are the source of covariation also underlies much of the logic of how personality trait measures should be created. Given the extent that we have contrasted functionalist and latent factor approaches, it may surprise some to discover that most measures of latent personality factors actually include numerous items concerning motives, abilities, and perceptions (Pytlik Zillig, Hemenover, & Dienstbier, 2002; Werner & Pervin, 1986). For instance, the NEO-PI-R Extraversion scale (Costa & McCrae, 1992) contains items pertaining to the person’s tendencies to act assertive, sociable, and happy; but also to enjoy people, attention, and status; to find it easy to lead others, and interact with strangers; and to perceive that events will go well, or that one is expected to ‘take charge’ of a situation. However,
whereas a process understanding of behavior could be informed by seeing how these wide-ranging functional items differentially relate to the behavioral items (e.g., which motives relate to assertive but not sociable behavior?) (McGrath, 2005), scores on all of these disparate items are instead collapsed into a single scale score. This practice is done because all of these items are found to load significantly on a latent factor identified from factor analysis (“Extraversion”), and these latent factors are thought of as the causes of trait covariation that should be the target of measurement (Ashton & Lee, 2001; DeYoung, 2006; Krueger & Markon, 2011; Markon & Krueger, 2006; McCrae, 1995). That is, it isn’t that assertive behavior is a consequence of the desire for power; instead, both assertive behavior and the desire for power are “indicators” (i.e., consequences, effects, projections) of the person’s latent Extraversion level (Tellegen, 1991).

Perhaps most tellingly, many personality investigators do in fact describe motives, abilities, and perceptions as the sources of behavior in much the manner we have described (e.g., the desire for power causes assertive behavior), but then cast latent factors as the source of these MAPs. For instance, DeYoung (2010) describes a functionalist framework very similar to those presented here, where personality is described as an adaptive system in which goals, evaluations of the present state, strategies, plans, and automatized routines are enlisted to explain behavior; and McCrae and Costa (2008) provide a clear role for constructs such as motives and attitudes as causes of behavior (what they term “characteristic adaptations”). However, in such models, MAPs are cast as largely mediating the causal effects of latent factors on behavior. To illustrate with recent examples: Noftle and Robins (2007) hypothesized that “Conscientiousness would be expressed and exert its effects on real-world outcomes by shaping a person's thoughts and feelings” (p. 125); Duckitt & Sibley (2009) construed social dominance orientation (a belief that some groups are superior to others; a source of prejudiced behaviors) “as deriving directly from
the personality dimension of Tough versus Tendermindedness (in Big-Five terms, low Agreeableness)” (p. 102); and Chan and Drasgow (2001) stated their expectation 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 and activities” (p. 481). Many other examples can be readily identified (e.g., Barrick, Mount, & Strauss, 1993; Courneya, Bobick, & Schinke, 1999; Judge et al., 2009; Roisman, 2006).

We hope it is clear from these examples that latent factors are effectively treated as causes of behavior by a wide range of investigators interfacing with personality psychology. This can be seen in how measures of latent factors are used in statistical analyses and how they are created, and how latent factors are conceptualized as relating to more specific behavioral or functional traits.

Explaining latent factors: the search for a “core.” The question remains as to where a person’s level of these latent factors comes from. Despite the fact that some investigators have considered latent factors to be “hypothetical entities that cannot be directly observed” (McCrae & Costa, 1995; p. 238; Allport, 1958; Markon & Krueger, 2006; Tellegen, 1991), many others have attempted to locate the cognitive or biological sources of these latent factors (e.g., Denissen & Penke, 2008; DeYoung, 2010; Eysenck, 1967; Watson & Clark, 1997). Unlike a latent factor, which is estimated as a weighted average of the same items it is purported to explain, the characteristics that are enlisted as potential sources of the factor will typically be a fairly specific and independently measured cognitive variable. For instance, researchers have tried to explain individual differences in extraversion as arising from power motivation (Hogan, 1996), construals of social situations as rewarding (Ashton & Lee, 2001; Denissen & Penke, 20008),
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and a more general sensitivity to reward (Depue & Collins, 1999; Lucas & Diener, 2001; Watson & Clark, 1997).

Interestingly, all of these proposed antecedents of extraversion can be appropriately considered MAPs that modify the functional value of extraverted behavior in the manner discussed earlier. However, a common element of these proposals is their tendency to emphasize a single functional antecedent that underlies variation in the factor, which will usually be labeled a candidate “core” or “central” source of variation in the latent factor. Similar to the way that a single virus or bacteria may be the source of a correlated group of distinguishable symptoms (e.g., sneezing, coughing, fever, headache), psychologists have tried to identify a singular core, or the “shared underlying cause” (notably different from “causes;” DeYoung & Gray, 2009, p. 330) that might be the source of a latent factor and its subordinate facets (see also Cramer et al., 2010). For instance, researchers investigating the relationships between a particular cognitive tendency and the broad extraversion factor often search more specifically for whether the tendency might form “the core of the broad trait of extraversion” (Lucas & Diener, 2001, p. 344; see also Ashton, Lee, & Paunonen, 2002; Denissen & Penke, 2008; Van Egeren, 2009; Watson & Clark, 1997). This language implies that a single functional antecedent should be able to be identified that explains variation in the latent factor, and that the various proposed antecedents to extraversion listed above should be considered as rival candidates competing for this role.

In this literature, a candidate “core” will typically be evaluated along two mathematical goals, which we illustrate graphically in Figure 2. First, the core should correlate highly with all of the facets considered to be in the domain of the factor. For instance, if extraversion is thought of as causing sociability, assertiveness, and positive affectivity, then the core will be evaluated by the extent to which it correlates with all of these traits. Second, the proposed core will usually
be evaluated by the extent to which it correlates highly with standard measures of the factor (e.g., standard extraversion scales). Note that the two mathematical goals are highly interrelated: if a proposed core is very strongly associated with the factor (e.g., \( r > .80 \)), then the proposed core will necessarily parallel the correlates of the factor at a very close order of magnitude. Consequently, a goal of identifying the “core” of a broad personality factor can be thought of as trying to replace a factor which is only estimated from the items it is supposed to explain with a clearer, more concrete, and independently measured biological or cognitive variable.

**Issues with “core” explanations of latent variables.** Although there is a natural appeal to form parsimonious models where a latent factor is caused by a single cognitive antecedent system, there is no mathematical reason why there must be only a single cause that underlies variation in a factor. As noted by Meehl (1993), “a mathematical factor can correspond to a causally efficacious composite whose elements are qualitatively unlike” (p. 4). In other words, in the same way that there are likely multiple antecedents to a specific behavioral trait, there may be multiple distinct antecedents which are independently associated with variation in a broad latent factor. For instance, within the study of intelligence, attempts to identify the single biological core of \( g \) are increasingly being abandoned with the recognition that several distinct neural regions predict variance in \( g \) independently (Toga & Thompson, 2005).

A similar realization that unitary cores are unnecessary to explain latent factors seems to be emerging in personality psychology. For instance, researchers have found that when measures of multiple proposed cores of extraversion are entered together into a simultaneous regression, many of these functional antecedents predict variance in extraversion independently (e.g., Olino, Klein, Durbin, Hayden, & Buckley, 2005). Indeed, it seems very likely that the finding that
distinct cognitive and biological systems predict unique variance in a single Big Five factor would generally be found if more researchers conducted this simple analysis.

**Perspective 2: Covariation of behavioral traits arises through shared functional antecedents.** We have just discussed the first problem with latent factors toward explaining trait covariation, which is that there is likely no “core” functional antecedent to a latent factor, but numerous functional antecedents that contribute independently to its variation. We continue by elaborating on the larger problem with latent factor accounts of behavior, which we pose as a question: If both the origins of latent factors and their effects on behavior need to be explained through the same MAPs that functionalist approaches cast as the basic causes of behavior, then what do latent factors contribute as influences on behavior beyond them? We argue that the answer is nothing. Despite the tempting nature of latent factors as explanations for a broad range of distinct psychological phenomena, they are unnecessary in explanations of the variation and covariation of behavioral traits (see also Borsboom et al., 2003; Cramer et al., 2010).

Instead, we believe that the types of traits that cause the observed covariation between behavioral traits are reality antecedents such as physical attractiveness, amygdala activation patterns, and other features of a person’s biological or social reality of the types listed in Table 1, and the effects that these features have on altering the functional value of behavior (e.g., physical attractiveness may increase the ease or enjoyment of interacting with others). As described earlier, we expect there are many distinct functions that can promote or inhibit a single particular behavioral trait – an idea referred to in goal systems theory as the **principle of equifinality** (Kruglanski et al., 2002). The complement of this idea is that any MAP that influences the likelihood of one behavior will generally influence the likelihood of other distinct behaviors – an idea referred to in goal systems theory as the **principle of multifinality**
Returning to an example given in Figure 1, regional disease prevalence likely increases the perceived risks of interacting with others, which in turn decreases not just rates of behaviors related to extraversion, but also openness to new experiences, individualism, and other traits (Schaller & Murray, 2008; Fincher et al., 2008). It is the variety of behavioral effects of a given functional antecedent that is crucial to understanding the covariation of behavioral effects: covariation between behavioral traits can be understood as occurring when traits share functional antecedents and their more distal reality antecedents.

**Modeling covariation from common functional antecedents.** In the same way that we can multiply factor loadings together to obtain the level of the correlation between two trait perceptions that can be explained “through” the latent factor, we can multiply a particular MAP’s correlation with two behavioral traits together to estimate the expected correlation between the two traits “through” the functional antecedent. This idea is shown graphically in Figure 3. For instance, a tendency to see others positively (e.g., perceive others as interesting and trustworthy) has been found to relate to numerous distinct behavioral tendencies simultaneously (Wood, Harms, & Vazire, 2010). If perceiving others positively has a causal effect of .40 with assertiveness and .50 with enthusiasm, then assertiveness and enthusiasm will be estimated as having a \( .40 \times .50 = .20 \) correlation with one another because more positive perceptions of others promotes both behavioral tendencies simultaneously.\(^2\)

When a particular functional antecedent serves to influence two behaviors in the same direction simultaneously, this will serve to increase the observed correlation between the behavioral traits. In the same manner, antecedents which tend to increase levels of one behavior trait but decrease levels of another will serve to increase the negative correlation between the two traits. In statistical language, functional antecedents that promote or inhibit multiple distinct
behaviors simultaneously would technically be labeled *confounder* variables (Cohen, Cohen, West, & Aiken, 2003; MacKinnon, Krull, & Lockwood, 2000). Note that this is also how latent factors statistically explain covariation, differing only in that in a functionalist framework, the explanatory variable is independently measured (Figure 3) rather than being estimated by exporting the correlations between variables into a new hypothetical variable (Figure 2).

Controlling for a confounder variable will tend to reduce the association of the two variables toward zero, although there may ultimately be multiple distinct confounders necessary to fully explain the correlation (analogous to multiple mediation). For instance, in trying to understand the correlation between assertiveness and enthusiasm, we may find that positive views of others and high social skills may promote both traits independently, and statistically controlling for these and a progressively greater number of additional functional antecedents may further reduce the positive association between assertiveness and enthusiasm toward zero, increasing our confidence that we have properly identified the reasons that the two traits covary. As in this example, whereas latent factor models may explain the covariation of several distinct behavioral traits through a single latent factor, a functionalist explanation of covariation takes the reverse tack, emphasizing that there may generally be several distinct antecedents that must be identified to understand why even a pair of behavior traits covary at the level they do.

**Uncorrelated behavioral traits also share common functional antecedents.** Within investigations to identify the latent factors underlying trait covariation, there is considerable effort taken to find orthogonal factors. This effort is motivated in part by the understanding that correlated factors have common antecedents, and uncorrelated factors may not (e.g., DeYoung, 2006; Ashton et al., 2009). We agree that uncorrelated traits are almost certain to have *fewer* common antecedents than correlated traits. However, given that functional frameworks construe
levels of any behavioral trait as originating from a large number of distinct functional antecedents (e.g., Fleeson & Jolley, 2006; Mischel & Shoda, 1995; Kruglanski et al., 2002), it may actually be more surprising to find that uncorrelated behavioral traits share exactly none in common. Instead, we expect that uncorrelated behavioral tendencies will frequently share some common functional antecedents, but that the antecedents that increase the correlation between the two traits are equal in strength to the antecedents that decrease the correlation, and thus pull for correlations between the two traits in opposite directions which mathematically cancel out.

To illustrate, we might observe that tendencies to be assertive and polite have an observed relationship of $r = 0$. However, if we were to identify the various functional antecedents which underlie assertive and polite behavior, we might find that the two tendencies do in fact share some common functional antecedents. For instance, past research suggests that desire for power and related goals likely increase levels of assertiveness but decrease levels of politeness (Harms, Roberts, & Wood, 2007; Roberts, O’Donnell, & Robins, 2004), while perceiving others positively likely increases both assertiveness and politeness (Wood, Harms, & Vazire, 2010). In statistical terms, these and other antecedents that are shared between these two tendencies may suppress one another (mathematically cancel each other out; Cohen et al., 2003; MacKinnon et al., 2000) ultimately resulting in a negligible correlation between the two traits. In short: an observed correlation of zero between two behavioral traits may regularly mask a number of motives, abilities, and perceptions which are common causes of both traits.

**Contrasting latent factor and functionalist approaches to covariation.** As we have detailed, there are many similarities between latent factor and functionalist explanations of trait variation and covariation. Personality inventories created from both approaches may frequently contain many of the same items, and both approaches explain the covariation of behavioral traits
through common causes. However, the nature of the common causes expected as underlying trait variation and covariation differs dramatically between the two approaches, and a wide number of differences follow from this point of departure.

There are several reasons why explanations of trait covariation through the sharing of functional antecedents should be more compelling than explanations involving latent factors such as the Big Five. In the case of explaining associations between assertiveness and enthusiasm through a latent extraversion factor, controlling for extraversion will come close to completely explaining the positive association between assertiveness and enthusiasm; however, this will only be because the latent extraversion factor has been inferred through the association of the same variables in structural studies. As described earlier, using a latent factor to explain covariation between different behavioral tendencies is mathematically no more than a way of shifting the unexplained correlation between variables into a new variable which is both less specific and equally unexplained. In contrast, when we explain trait covariation as resulting from common functional antecedents, as when the covariation between enthusiasm and assertiveness is explained as arising in part through a perception that others are interesting and trustworthy, we have explained the covariation through constructs that have been measured independently of the behavioral trait. In doing so we tend to provide much more concrete process explanations of the observed trait variation and covariation, which in turn illuminates potential routes for intervention (Borsboom et al., 2003; Cramer et al., 2010; Fleeson, Furr, & Arnold, 2010).

As described earlier, a proponent of latent factors may respond to this argument that motives, abilities, and perceptions are indeed the proximal causes of behavioral traits, but that these mediate the causal effect of the more distal latent factors on behavior (e.g., Duckitt & Sibley, 2009; Judge et al., 2009; McCrae & Costa, 2008). For instance, controlling for MAPs
such as positive perceptions of others and social skills may reduce the association between assertiveness and enthusiasm to zero, but these MAPs may simply be the mediators of the effect of latent extraversion on behavior. In other words, it is possible that latent factors such as the Big Five cause the variation in MAPs, which in turn carry the effect of latent factors to behavior. However, if this is the case, then the effects of aspects of reality such as those discussed in Figure 1 on motives, abilities, and perceptions would presumably have to be mediated through changing the latent factor (i.e., latent factors would be placed between reality factors and MAPs in Figure 1, as they are in diagrams given by Judge et al., 2009, and McCrae & Costa, 2008). For instance, physical attractiveness would have to change latent extraversion, which would in turn change one’s real abilities to influence others and expectations that interactions will go well, which in turn would result in a greater likelihood of assertive and enthusiastic behavior. The only part of this example that seems clearly unnecessary is the role of latent extraversion; it seems more sensible to argue that physical attractiveness influences abilities to influence others and expectations about the positivity of interactions without needing to have these effects mediated by latent extraversion, whatever that may be. These MAP variables may themselves be the ultimate psychological mediators of environmental and biological effects on behavior; there is no need to posit latent factors as influencing behavioral traits behind them, between them, or beyond them.

**Empirical Investigation: What Functions Influence Levels of Big-Five Trait-Related Behaviors?**

The central ideas of the present paper are: (1) a person’s level of a particular behavioral trait is the balance of several distinct functional antecedents or MAPs, and (2) covariation between two behavioral traits occurs as a function of how the two traits share functional
antecedents. As mentioned before, these ideas have been raised at least indirectly in earlier work (e.g., Cramer et al., 2010; Mischel & Shoda, 1995), and investigators such as Fleeson and others have begun to detail theoretical explanations of how even levels of Big Five-related behavioral traits may originate not from unobserved latent variables but from functionalist units (Fleeson, 2007; Fleeson & Jolley, 2007; Nofte & Fleeson, 2009; see also Heller et al., 2009). Here, we hope to extend these efforts in certain ways to more clearly demonstrate how functionalist explanations of trait variation and covariation make providing a distinct role for latent factors unnecessary.

Most importantly, past research on the functional antecedents of trait-related behaviors has been done in a relatively piecemeal fashion, looking at only one or a few potential functions that may promote behaviors or self-perceptions associated with Big Five traits within a single investigation. For instance, different investigators have linked levels of extraversion-related traits to the desire for power (Harms et al., 2007), to relationship, hedonistic, and approach goals (Heller, Komar, & Lee, 2007; Roberts et al., 2004), to abilities to multi-task in social situations (Lieberman & Rosenthal, 2001), and to construals of others in the environment as friendly (Fleeson, 2007; Wood, Harms, & Vazire, 2010). However, although many of the functions underlying common behavioral traits have been indicated in past investigations, many are clearly unidentified (Fleeson, 2007). We thus conducted an exploratory investigation designed to identify a wider range of the distinct functions likely influencing Big Five-related behavioral tendencies. To do this, we adapted a two-part phenomenological approach utilized by Buss and colleagues to identify the various functions served by performing behaviors of interest (Buss, Gomes, Higgins, & Lauterbach, 1987; Kyl-Heku & Buss, 1996; Meston & Buss, 2007), where many reasons for performing behavior is first generated through a qualitative method, which are
then transformed into questionnaire items and related to the behavior of interest in a new sample. This resulted in the generation of an extensive list of motives, abilities, and perceptions that might promote or inhibit Big Five-related behavioral tendencies.

Additionally, given our expectation that the covariation of behavioral traits should be understood as resulting from behavioral tendencies being impacted by and sharing a large number of distinct MAPs, it was then important to explore this by measuring the many MAPs suspected of influencing trait-related behaviors simultaneously. Consequently, the second part of this investigation entailed transforming the functions identified in the first part into questionnaire items and empirically relating these items to levels of Big Five-related behaviors in a new sample. In particular, we attempt to identify the diverse functions that might underlie a single behavioral trait such as sociability or organization, and illustrate how the correlation between two traits can be understood as resulting from the sharing of common MAPs.

As mentioned earlier, we expect many of the MAPs we identify as potential causes of trait-related behaviors will show close resemblance to items already well-represented in existing trait measures. For instance, we expect that people may explain their tendency to act sociably as resulting from their enjoyment of interacting with others, and items about enjoying other’s company can already be found on common extraversion or sociability scales. It is thus important to clarify how items referring to what we consider the functional antecedents of behavior will be treated differently here. Most importantly, we separate items referring to behaviors (e.g., interacting with others) from the items referring to the MAPs that are likely to promote or inhibit them (e.g., finding interacting with others enjoyable, or difficult). An important reason for doing this is because we are interested in documenting the wide range of behaviors that might be influenced by a single functional antecedent. Indeed, the idea that a particular MAP may have
diverse behavioral effects is central to our explanation of the covariation of behavioral traits. There are already published indications of single MAPs having wide-ranging behavioral effects. For instance, Wood, Harms, and Vazire (2010) found evidence that perceiving others as interesting and trustworthy was associated with heightened levels of behaviors related to all Big Five domains simultaneously, and Carver and Connor-Smith (2010) reported similar findings for the ability to restructure (“see the bright side of”) negative events. Analyzing how MAP items that are usually averaged into a single scale with its most highly correlated behaviors are associated with behaviors more generally will reveal that there are regularly diverse effects of a specific MAP on a broad range of behavioral tendencies.

Method

Part 1: Generation of an Inventory of MAPs Underlying Trait Variation

Participants and Procedure

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 were 59% female, and ranged in age from 17 to 23 years ($M = 18.68$). The survey was administered online and took approximately an hour to complete. Participants were informed that they might be invited to participate in an interview on the basis of their answers.

Big Five trait assessments. To assess the Big Five personality dimensions, participants completed the Big Five Inventory (BFI; John & Srivastava, 1999), and the Inventory of Individual Differences in the Lexicon (IIDL; Wood, Nye, & Saucier, 2010). Both inventories were completed with items presented on the screen one at a time in a randomized order on a nine-point scale ranging from “1 = EXTREMELY uncharacteristic of me (I am never like this.)” to “9 = EXTREMELY characteristic of me (I am always like this.)” Big Five estimates were
created using standard scoring of the BFI, and for the IIDL by averaging the five items with the highest correlations with a given Big Five trait as reported in previous research (see Table 1 in Wood, Nye & Saucier, 2010).

Participants also completed a number of items from the International Personality Item Pool (IPIP; Goldberg, 1999) that were found to be highly associated with Big Five trait levels within the Eugene-Springfield Community Sample (ESCS; Goldberg, 1999). These items were rated on a 1 (Strongly Disagree) to 5 (Strongly Agree) scale, and for each dimension, eight to ten items were averaged to create Big Five composites. For extraversion, the item with the highest item-total correlation was “I find it difficult to approach others (R = reversed)” for agreeableness “I insult people (R),” for conscientiousness “I don’t finish the things I start (R),” for neuroticism “I get stressed out easily,” and for openness “I do not like art (R).”

The inter-item reliabilities of the BFI scales ranged from \( \alpha = 0.84 \) to .90, and of the IPIP scales ranged from \( \alpha = 0.79 \) to .90. Consistent with past research (Wood, Nye, & Saucier, 2010), more variable reliabilities were found for the IIDL (\( \alpha \)’s were .82 for extraversion, .90 for agreeableness, .66 for conscientiousness, .80 for neuroticism, and .40 for openness). To create more reliable estimates of how individuals placed along the Big Five dimensions, we standardized their Big Five scores from the BFI, IIDL, and IPIP measures for each dimension and then averaged those together. The reliability of these three-scale composites was .95 for extraversion, .91 for agreeableness, .91 for conscientiousness, .93 for neuroticism, and .85 for openness.

**Generation of Reasons for Trait-Related Behaviors**

**Interviews with participants high and low on Big Five dimensions.** We next interviewed individuals with high or low levels of Big Five traits to generate explanations of the
motives, abilities, and perceptions associated with variation in that trait. Participants with the highest and lowest scores from the three-measure composites were invited to participate in one-on-one interviews for additional credit toward the class research requirement. Individuals who agreed to participate met with an experimenter to do an interview lasting approximately 15-20 minutes. Five individuals completed interviews for each end of the Big Five, except for low conscientiousness and low openness which had six individuals due to over-scheduling, resulting in a total of 52 interviews.

To elicit functional explanations of behavior within these interviews, participants were asked to describe the extent to which they performed specific trait-related behaviors and why. The behaviors participants were asked to respond to were adapted from IPIP items that were found to be highly related to Big Five trait scores previously within both the ESCS sample and within the current sample. The eight to ten items found to be highly correlated with each Big Five trait were rephrased as questions to the participants. For instance, the items “I start conversations” and “I don’t talk a lot” were thus rephrased as interview questions “Are you typically someone who starts conversations?” and “Would you say that you talk a lot?” The set of questions participants were asked is given in Appendix A.

Participants generally responded that they performed the behaviors at a level consistent with the trait they were selected to represent (e.g., participants selected for low extraversion said they did not talk a lot, and for high extraversion said they did). Interviewers were instructed to then probe for reasons interviewees performed the behaviors at that level. In particular, interviewers were instructed to ask participants if there were aspects that they liked or disliked about the behavior or that made them seek or avoid performing the behavior to elicit motives, aspects that made it easy or hard for them to perform the behavior to elicit abilities/affordances,
and about any other aspects of the situation that influenced their decision to act the way they did to elicit other situational perceptions. These probes continued for a given question until the participants provided no more explanations for why they engaged in certain behaviors, and then the experimenter moved on to the next question. This process continued until either participants had described reasons for performing all the behaviors listed, 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 MAPs that may not have been provided by participants in explaining their own behavior, due to self-presentational concerns, lack of self-insight, or other reasons.

Each participant was randomly assigned to describe someone they knew that 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 that were found to be very highly associated with the Big Five dimension within the ESCS sample. For instance, in the high extraversion condition, participants were asked to “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.” Instructions that participants received for high and low levels of the Big Five traits are presented in Appendix A. Between 21 and 26 individuals were assigned to each of the 10 total conditions (two ends of each Big Five trait).

All participants were then instructed to respond to the following instructions: “First, list some instances in which you recall this person acting in the ways just described.” This was done in order to encourage participants to think about more specific, concrete instances of the person
acting in trait typical ways. To elicit descriptions of motivational, ability, and perceptual explanations of the person’s behavior, participants were then asked: “What do you think are some of the reasons that he or she tends to act in this way?” then, “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?” Participants were given space to respond to each of these questions.

**Generation of the MAP Inventory**

**Extraction of reasons for trait-related behavior from interviews and reports.**

Research assistants then extracted reasons for trait-related behavior from the participant interviews and reports. Assistants were given instructions describing what constituted an appropriate “reason” for trait-related behavior, which consisted mainly of motives, abilities, and perceptions of the type described earlier. Self-perceptions solely involving trait adjectives or type-nouns were not considered appropriate explanations of behavior (e.g., “I did this because I’m a sociable person / an extravert”). This was done because our current goal was to explain patterns of behavior and associated self-perceptions through motives, abilities, and perceptions rather than use these trait descriptors as active explanatory constructs.

For the participant interviews, two coders listened separately to each recorded interview and copied verbatim any reasons that the interviewees provided to explain their own behavior. The two coders reconciled discrepancies while listening to the tape a second time to combine their extracted reasons into a single list. Finally, each reason was summarized into a short phrase or sentence. For the free-response survey answers, one coder extracted reasons from the
responses provided, making each reason into a one-sentence item. Ultimately, 1,985 reasons for trait-related behavior were initially extracted across all Big Five traits.

**Reduction of reasons for trait-related behavior.** Coders were then provided with instructions to sort all these items into smaller groups of motives, abilities, and perceptions. For instance, perhaps half a dozen of the items consisted of similar beliefs that acting talkative could lead to saying something embarrassing, and thus could be considered redundancies that could be distilled into a single group.

Between three and six coders were used to sort the items into a smaller number of item clusters separately for each Big Five trait. To aid with this task, coders were told to first classify each item into one of nine more specific categories: motive-related categories of (1) likes and dislikes (e.g., “I like other people”), (2) preferences (e.g., “I prefer being with people over being alone”), and (3) goals (e.g., “I want to be a leader”); a category of (4) abilities (tasks or behaviors the participant reported being good/bad at, or finding easy/difficult to do; e.g., “I am good at leading other people”); and perception-related categories of (5) contingencies concerning the perceived consequences of behavior (e.g., “If I speak my mind in social situations, more good will happen than bad”), (6) situation construals (e.g., “Other people are basically good-natured”), (7) felt external pressures and needs (e.g., “I feel that I am expected by others to take charge in social situations”), (8) values about how people should act (e.g., “I think it is important for people to speak their mind”), and (9) concerns and worries (e.g., “I am worried about whether others like me”). Following this, coders were told to group items on the basis of how similar the items were, 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 first separately for reasons for each Big Five trait, resulting in a list of 633 reasons.
Following this, a group of four coders read through this list and met again to discuss reasons generated for all Big Five traits simultaneously to further reduce redundancies. For instance, the item “I like helping others” had been coded as a reason promoting behaviors related to extraversion, agreeableness, and conscientiousness, and thus the analogous groups created for these different traits were combined. Additionally, the “preference” category of items was eliminated at this stage. As preference items implicitly or explicitly contrast degree of liking for two different objects (e.g., “I prefer to be with myself rather than with other people”), the preference items were split apart to make separate items involving how much the person liked each object indicated in the preference statement separately (e.g., a “I like being by myself” item, and a separate “I like being with other people” item). As we intended to make items referring to the extent of liking certain objects or ease of doing certain tasks, items referring to liking and disliking the same object (e.g., “I like having plans” and “I dislike having plans”) were combined into a single group, as were items referring to finding the same task easy or difficult. These steps ultimately served to further reduce the list of reasons for Big Five trait-related behavior into a smaller list of 463 distinct reasons.

**Part 2: Relationships between MAPs and Perceptions of Behavioral Traits**

Following the generation of a list of potential functional antecedents of behavior, we continued by exploring how the MAPs generated were associated with variation in measures of core vectors and narrower traits associated with the Big Five.

**Participants**

Participants were 537 students from two semesters of an introductory psychology course who completed a survey online for two hours of credit toward a research participation requirement. From this total, two participants’ responses were deleted for failing to fill out major
sections of the survey, and eight participants’ responses were deleted for having no variability in their responses for major sections of the survey (e.g., answering “2” to every question). These removals resulted in a final complete sample size of 527 participants. This final sample was composed of 57% females and had a mean age of 18.7 years, ranging from 17-37 years.

Materials and Procedure

MAP Inventory. The 463 reasons generated from the earlier qualitative survey were adapted into questionnaire statements to be rated through self-report, which we refer to as the Motive, Ability, and Perception (MAP) Inventory. We used four different questionnaire formats to assess the items. The 96 items pertaining to likes and dislikes were rated under the instruction “How much do you like or dislike the following things?” with a response scale ranging from 1 (strongly dislike this) to 5 (strongly like this). The 65 items pertaining to goals were rated under the instruction “How much do you try or want to do the following behaviors?” with a response scale ranging from 1 (I try very hard to avoid doing this) to 5 (I try very hard to do this). The 77 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 response scale ranging from 1 (I find it very difficult to do this) to 5 (I find it very easy to do this). The remaining 225 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). Items were phrased in a manner to be compatible with these instructions and response scales. A number of these items are shown throughout the results that follow; the 463-item MAP Inventory used here is available from the first author. For each participant, the items were randomized within category, and the order in which participants completed the four categories (likes/dislikes, goals, abilities, and perceptions) was also randomized.
Big Five Inventory. Participants completed the BFI (John & Srivastava, 1999), a widely used measure of the Big Five personality traits. Participants completed the survey on the same 1 to 9 scale used in Part 1. Alpha reliabilities ranged from .79 for Agreeableness to .88 for Extraversion. As in previous research, the BFI scales showed modest inter-correlations (John et al., 2008), with the positive ends of the scales being correlated with one another; when reverse-scoring Neuroticism as Emotional Stability, all pair-wise correlations between BFI subscales ranged from a low of .13 (between Agreeableness and Openness) to a high of .37 (between Agreeableness and Emotional Stability).

For some analyses we used scales of narrower traits that are measured with the BFI as reported by Soto and John (2009); we have changed some of the labels to more directly parallel the scale content. As reported by Soto and John (2009), BFI Extraversion can be subdivided into narrower scales of assertiveness (e.g., has an assertive personality) and enthusiasm (e.g., generates a lot of enthusiasm); BFI Agreeableness into narrower scales of kindness (e.g., is helpful and unselfish with others) and forgiveness (e.g., has a forgiving nature vs. finds fault with others); BFI Conscientiousness into narrower scales of order (e.g., tends to be disorganized; reverse-scored) and self-discipline (e.g., makes plans and follows through with them); BFI Neuroticism into narrower scales of anxiety (e.g., worries a lot) and depression (is depressed, blue); BFI Openness into narrower scales of openness to art (e.g., values artistic, aesthetic experiences) and openness to ideas (e.g., is curious about many different things).

Results

Our central goals of this empirical analysis were to illustrate (1) the diversity of functions that might influence a specific behavioral trait (i.e., serve as various equifinal means to the same end), and (2) which specific functions might influence a diversity of behavioral traits (i.e., serve
as a *multifinal* means to various ends; Kruglanski et al., 2002), in order to illustrate many of the specific functions likely influencing variation and covariation of behavioral traits highly related to the Big Five.

**What Functions are Associated with Variation in Big Five Trait Dimensions?**

To identify the various functions associated with the Big Five dimensions, we first correlated all 463 MAP Inventory items with the measures of Big Five traits, and noted the number of MAP Inventory items with correlations of $|r| \geq .20$ with a given scale. A total of 114 items were associated at this magnitude for BFI Extraversion, 180 for BFI Agreeableness, 106 for BFI Conscientiousness, 86 for BFI Neuroticism, and 71 for BFI Openness to Experiences.

To get a clearer sense of the distinct functions that were associated with variation in a single trait measure scale (e.g., BFI Extraversion), and also to organize MAP items that were most related to one another, we then took all items that were correlated with the trait above the .20 magnitude and factor analyzed them by extracting ten factors through principal component analysis with direct oblimin rotation. It should be noted that factor analysis was used here to serve a purely organizational role: given the very large number of items found to relate to each trait, factor analysis to help illustrate some of the larger distinct functions associated with trait variation among the larger set of MAP items. Ten oblique factors were initially extracted for each trait in order to standardize the number of factors. In some cases, particular factors showed few high loading items; if an extracted factor had two or fewer items with loadings greater than .40 in the pattern matrix, we considered the factor to represent a minor function related to trait variation and did not consider it further.

The results of this analysis are given in Tables 2 through 6. For each trait, we provide a summary label for the functional content commonly represented by the items grouped by the
factor analysis, and give several representative items. We then list the zero-order correlations between the factors and the traits, and the partial correlations controlling for the other remaining factors. As we were interested in discussing the diverse functions served by a single dimension of behavior, we focus our discussion of the results on MAP item groups that remained significantly associated with variation in the trait after controlling for all other item groups.

**Functions associated with variation in extraversion.** Higher levels of BFI Extraversion were associated with greater reported desires and abilities to initiate conversations, to be the center of attention, to confront others with their problems, and to express emotions. Higher extraversion was also associated with reports of greater enjoyment of others, and of less fear of social situations. Although these different MAPs were moderately inter-correlated, they also were all uniquely associated with variation in Extraversion in a simultaneous regression. Additionally, Extraversion levels were associated with preference and ability for risk-taking and exploration, preference for opinionated discussions, and ability to read social situations, although these additional MAPs were not uniquely associated with Extraversion in the simultaneous regression.

**Functions associated with variation in agreeableness.** Levels of BFI Agreeableness were lower among individuals with greater reported perception of social situations as being intimidating and difficult, perception of oneself as more important than other people, desire for confrontation with others, and sense of value in being rude to others, and were higher among individuals reporting greater ability to control anger and see others’ perspectives. These various characteristics appeared to offer unique contributions to predicting levels of Agreeableness. Additionally, Agreeableness levels were associated with greater preference and ability for
engaging in social interactions, and heightened concern with having a good reputation, although these were not uniquely associated with Agreeableness in the simultaneous regression.

**Functions associated with variation in conscientiousness.** Level of BFI

Conscientiousness was associated with reports of greater preference and ability to keep things organized, heightened ability to manage time, lower attention to people’s negative attributes, heightened concern about the consequences of one’s actions for oneself and others, more positive expectations of being accepted by others, and a sense that getting work done and doing quality work is important. These various characteristics offered unique contributions to predicting levels of Conscientiousness. Additionally, Conscientiousness levels were associated with a heightened perspective that it was important to follow through with commitments, heightened achievement and performance goals, and heightened desire to lead, although these were not uniquely associated with Conscientiousness in the simultaneous regression.

**Functions associated with variation in neuroticism.** Levels of BFI Neuroticism were associated with reports of greater discomfort in the presence of disorder, and in unplanned situations, more concern about interpersonal interactions, the quality of work, and with gaining others’ approval, greater perception that worrying had benefits, and lower abilities to see the positive sides of situations, to understand abstract ideas, and to stay on task. All of these characteristics appeared to offer unique contributions to predicting levels of Neuroticism. Additionally, higher Neuroticism was associated with less reported ability and desire to take risks and do new things, and to gossip about others, although these characteristics were not uniquely associated with Neuroticism in the simultaneous regression.

**Functions associated with variation in openness to experience.** Levels of BFI Openness to Experience were associated with reports of greater desire and ability to appreciate
art, to talk to strangers and start conversations, and to understand abstract ideas, greater ability to read people and take perspectives of others, lower need for routines, and greater desire to stand out from other people. These various characteristics appeared to offer unique contributions to predicting a person’s level of Openness. In addition, Openness was associated with greater desire to learn new things and about other perspectives, desire and ability to take risks, and lessened belief that there was a single answer to problems, although these additional characteristics were not uniquely associated with Openness in the simultaneous regression.

**What Functions May Produce Covariation in Big Five-Related Traits?**

From a functionalist framework, behavioral covariation arises when a given function influences many distinct behaviors simultaneously. The fact that specific MAPs were associated with multiple behaviors simultaneously can be seen through a close examination of Tables 2 through 6. For instance, although various items indicating a person’s expectation that interactions with others will go badly were associated with decreased agreeableness (A3 in Table 3), many of the same items were associated with decreased extraversion (E4; Table 2), conscientiousness (C8; Table 4), and openness (O2; Table 6), and with increased neuroticism (N2; Table 5).

To more clearly illustrate the MAPs that might be associated with several behavioral traits simultaneously, we created a standard set of MAPs which eliminated redundancies across the 45 scales reported in Tables 2 through 6. To do this, we correlated the 45 scales together and combining scales that correlated above $|r| = .70$ into single scales; this resulted in a smaller set of 24 MAP scales. The full content of these scales is given in more detail in Appendix B and are simply given a short summary label in Table 7. Additionally, the final scale that the preliminary scales were placed onto is indicated in subscripts in Tables 2 through 6. The intercorrelations between these 24 scales are given in Appendix C.
We use results from Table 7 to illustrate how trait covariation can be understood as arising from shared functional antecedents. We continue by examining the functional antecedents of (1) highly correlated traits within the same factor domain, then (2) highly correlated traits in different factor domains, and finally (3) relatively uncorrelated traits. In order to examine how highly correlated traits in the same or different latent factor domain could covary due to sharing common functional antecedents, we shifted to considering patterns of covariation between the 10 narrower traits contained within the BFI as described by Soto and John (2009). Given the very large number of combinations of traits that could be considered in each group, we limit this discussion to one to three examples per category.

**Shared antecedents of traits in the same factor domain.** First, we examined the MAPs associated with two traits considered to be within the same factor domain. Assertiveness and enthusiasm are commonly considered major facets of extraversion (DeYoung et al., 2007; Soto & John, 2009), and were highly correlated in this dataset \((r = .57)\). As noted earlier, the high correlation is understood here as indicating that the traits are facilitated by highly similar functional antecedents. Indeed, both assertiveness and enthusiasm seemed to be facilitated by greater desires for social engagement, and to have debates or discussions; by desires and abilities to get attention from others, to take risks, and to express emotions; and to be inhibited by fears and difficulties in social situations \((|rs| \geq .31)\).

At the same time, the \(.57\) correlation between assertiveness and enthusiasm is far from unity, indicating that although the functional antecedents for these two behavioral tendencies are highly similar, they are not redundant, and each trait should have some distinct antecedents. Consistent with this, the desire and ability to confront other people showed a considerable relationship with assertiveness \((r = .26)\), but a negligible relationship with enthusiasm \((r = .09)\).
And conversely, viewing social negativity as unhelpful and distasteful, being able to see others’ perspectives and manage one’s anger, not viewing one’s own interests as more important than other’s interests, and disliking gossip all seemed to increase levels of enthusiasm (|r| between .11 and .23), but were essentially unrelated to assertiveness (|r| between .00 and .07).

**Shared antecedents of traits in different factor domains.** Given the perspective that factors such as extraversion serve no role in the actual causes of trait covariation, there is no reason to limit our discussion of MAPs as causes of trait covariation to traits considered to be within the same factor domain. For instance, enthusiasm showed a moderate association with self-discipline (r = .31). We can interpret this as indicating that variation in the two traits is caused by some similar functional antecedents. Consistent with this, we found that levels of both enthusiasm and self-discipline appear to be facilitated by greater desire and ability to lead others, having greater planning and social interaction skills, greater perceptions that respecting others is important, and that social situations are unintimidating (|r| ≥ .26).

However, the lower correlation observed between enthusiasm and self-discipline than observed between enthusiasm and assertiveness indicates that enthusiasm and self-discipline likely have a greater number of distinct antecedents, and this indeed appeared to be the case. Reported desires and abilities associated with having debates, expressing emotions, getting attention; and abilities to manage anger and see things from other perspectives seemed to facilitate enthusiasm (rs between .45 and .31), while having negligible relations with self-discipline. Indeed, heightened desires and abilities to get attention from others seemed to increase enthusiasm (r = .45), but to decrease self-discipline (r = -.09). Meanwhile, heightened need for order, concern about letting people down, and concern about putting quality effort into
one’s work seemed to facilitate self-discipline (|rs| ≥ .31) but to have negligible influences on enthusiasm (|rs| between .06 and .12).

The specific MAPs shown in Table 7 also provide some possibilities for understanding the tendency for the positive ends of Big Five-related traits to all show modest positive correlations with one another. Although this tendency is frequently understood as a method artifact due to a socially desirable response set (Holden & Passey, 2010) or acquiescence (Soto, John, Gosling, & Potter, 2008), this can additionally be understood as resulting from specific MAPs promoting a wide range of behaviors simultaneously. As can be seen in Table 7, some MAPs were associated with nearly all 10 narrow traits examined simultaneously. For instance, although tendencies to perceive social situations as threatening and difficult (“Social Fears/Difficulties”) appeared to relate most to traits in the domain of extraversion, this particular perceptual tendency also appeared to relate to kind, forgiving, and self-disciplined behavior, openness to ideas and aesthetics, and to anxiety and depression. Similarly, planning and organizational skills appeared to facilitate more positive levels of nearly all 10 of the narrower traits examined, as did feeling it was important to respect others, and having abilities to manage anger and see others’ perspectives.

**Shared antecedents of uncorrelated traits.** As suggested earlier, from a functionalist perspective, finding two traits to be uncorrelated should not be taken as indicating that they share no common functional antecedents. Uncorrelated traits may instead share functional antecedents that increase the correlation and others that decrease the correlation between the two traits in equal magnitude.

Perhaps the best example of this among the traits examined in Table 7 concerns tendencies to be orderly and anxious. Although these two behavioral tendencies were essentially
uncorrelated \( r = -0.06 \), they nonetheless appeared to share numerous MAP antecedents. Individuals who reported a greater need for order, greater difficulty in taking risks, lower appreciation of abstract ideas, and lower desire to stand out reported higher levels of order and also higher levels of anxiety. However, individuals who reported that they had greater planning and organization skills, greater desire to lead, less desire to gossip, and fewer social anxieties and difficulties reported higher levels of order but lower levels of anxiety. In other words, it appears that certain motives, abilities, and perceptions served to make the correlation between order and anxiety more positive (e.g., a need for order), whereas others served to make the correlation between these two traits more negative (e.g., organization skills), ultimately producing a near-zero correlation between the two behavioral tendencies.

Several other examples of near-zero trait relationships that mask sensible common MAPs of both traits can be seen in Table 7; we discuss two more here. First: assertiveness and forgiveness showed a correlation of -.02; however there were various functional antecedents associated with both tendencies. Perceiving social situations as threatening and difficult and social engagement as undesirable seemed to decrease assertiveness and also decrease forgiveness; however, perceiving attention and confrontation as desirable seemed to increase assertiveness but decrease forgiveness. Second: forgiveness and openness to ideas showed a small positive correlation \( r = .12 \). As would be expected by the small positive correlation, forgiveness and openness to new ideas shared MAPs positively associated with both traits: abilities to interact with others and to manage anger, feeling that negativity and gossip were undesirable, and that it was important to respect others. However, desires to get attention, to confront others, and to be different from others tended to increase openness to ideas but decrease forgiving behavior, which likely served to lower the correlation between these behavioral traits.
Overall explanation of trait covariation by the 24 MAP scales. Finally, we conducted a simple analysis of the extent to which the inter-correlations between the ten narrow traits could be explained by the 24 MAP scales when considered as a set by reporting the part correlations between the ten narrow traits after controlling for the 24 MAP scales simultaneously; these are shown above the diagonal in Table 7. The part correlations were reported rather than partial correlations as part correlations indicate the correlations that cannot be explained by the MAP scales in the original metric of the variables rather than correlating the residual variance (Cohen et al., 2003). As seen here, the inter-correlations between the ten scales were substantially reduced, but in some cases were still moderately strong. For instance, self-reported levels of kindness and forgiveness continued to show moderate correlations after controlling for the 24 MAP scales (part $r = .24$), as did self-reported levels of order and self-discipline (part $r = .25$). These and other significant residual correlations indicate that linear combinations of the set of 24 MAP scales created here cannot fully explain the observed trait correlations. We discuss some reasons why these residual correlations may exist in the discussion.

Discussion

Differences in how phenomena central to personality psychology are explained by functionalist frameworks (e.g., Fleeson & Jolley, 2006; Mischel & Shoda, 1995) and latent factor frameworks (e.g., DeYoung, 2010; Krueger & Markon, 2006; McCrae & Costa, 1995, 2008; Tellegen, 1991) have been difficult to resolve. Although functionalist frameworks have been increasingly successful in explaining trait variation and development (Fleeson & Jolley, 2006; Nofl & Fleeson, 2010; Heller et al., 2009; Wood et al., 2009), they have not yet provided a clear explanation of trait covariation which does not involve latent factors. This is important, as the assumption that latent factors are necessary to explain covariation is a central reason for their
prominent role in personality psychology. As Tellegen (1991) notes, latent factors can be thought of as “families of covarying responses,” and consequently “covariation is the one essential justification for claiming the existence of trait entities [i.e., latent factors]” (p. 10). Here, we have shown trait covariation can be explained through observed functional variables rather than unobserved latent factors. By extension, we have challenged the one essential justification for claiming the existence of latent factors.

Given the prominent role of latent factors in personality psychology, there are certainly alternatives to the argument we have presented here which may be consistent with the empirical demonstration just presented, and which would preserve a causal role for latent factors; we briefly consider two of these below. Following this, we detail some of the broader implications that should follow from understanding latent factors such as Extraversion as non-causal summaries of the relations between observed variables rather than distal influences on behavior.

First, as noted earlier, an alternative interpretation of our functionalist explanation of trait covariation is that latent factors such as the Big Five do in fact cause behavior, but that their effects are mediated by motives, abilities, and perceptions of the sort we have identified (e.g., McCrae & Costa, 2008). In applications like this, latent extraversion is seen to cause certain people to have heightened enjoyment of social interactions, which in turn mediates the effect of latent extraversion on sociable and enthusiastic behavior (e.g., Barrick et al., 1993; Chan & Drasgow, 2001; Courneya et al., 1999; Duckitt & Sibley 2009; Noftle & Robins, 2007). Unfortunately, the argument that latent factors are basic influences on a person’s motives, abilities, and perceptions is likely mathematically unfalsifiable without measures of latent factors that consist of something more than simply a weighted average of the correlated motive, ability, perception, and behavior indicators they are supposed to explain. We would be interested in
seeing such a measure, but are pessimistic that such measures will ever be identified, as it is not clear what such a measure would look like.

Second, in replacing latent factors with a myriad of functional antecedents as causes of behavior, it may be argued that we are advancing an approach to understanding individual differences in behavior that is not as parsimonious as explanations involving latent factors (e.g., Krueger & Markon, 2006; Krueger, Markon, & DeYoung, 2010). To illustrate: whereas our findings suggest that the covariation of assertiveness and enthusiasm likely arises from half a dozen relatively distinct functional antecedents or more, the Five Factor Model (McCrae & Costa, 2008) purports to explain the covariation of assertiveness, enthusiasm, and several other traits (warmth, sociability, excitement-seeking, activity) as arising from a single latent factor (“Extraversion”).

At first glance, the latent factor explanation looks much more parsimonious. But is it? As we have detailed, in order to describe the processes linking latent factors to behavior, most investigators ultimately describe the causal impact of latent factors on behavior as being mediated by their impact on functional units (Barrick et al., 1993; Chan & Drasgow, 2001; Courneya et al., 1999; Duckitt & Sibley 2009; McCrae & Costa, 2008; Noftle & Robins, 2007). Moreover, explanations of the origins of these latent factors also generally rely on functionalist units (e.g., latent extraversion arises through biological factors that increase a person’s level of enjoyment of social stimuli; Ashton & Lee, 2001; Denissen & Penke, 2008; DeYoung, 2010; Watson & Clark, 1997). If both the origins and impact of latent factors must be explained by functional units, the main difference between functionalist and latent factor approaches isn’t actually the addition of numerous motives, abilities, and perceptions as explanatory variables,
but the addition of latent factors. Given the unclear role that latent factors need to serve beyond functional units, it is probably functional approaches that are actually more parsimonious.

Instead of attempting to explain the origins of latent factors through functionalist units, some theorists instead explain the latent factors supposedly underlying trait variation and covariation as “hypothetical entities that cannot be directly observed” and that are nearly impervious to influence (McCrae & Costa, 1995, 2008). Such explanations are parsimonious in the same sense that explanations of strange natural phenomena as arising from an unobservable God who works in unknowable ways are parsimonious. That is, explanations of a broad range of phenomena through a small number of unobservable factors are cognitively tempting, in large part because the explanatory factor seems to explain so much and is itself unexplained. At the same time, such explanations have the tendency to provide next to nothing toward process explanations of the phenomena, and consequently provide little toward the scientific goals of prediction and control (Borsboom et al., 2003; Cramer et al., 2010; Preston & Epley, 2005).

Implications for Research and Theory

A more circumscribed role for factor analysis and latent factors. If factor analysis is not actually able to form close approximations of the latent causes of behavior, and have no corresponding “core” in reality, this seriously reduces the importance of various topics regularly discussed in personality psychology. For instance, debates about the correct number of basic personality dimensions (e.g., are there five latent factors, or six?) and of the correct placement of facets to factors (e.g., is warmth a facet of Extraversion or Agreeableness?) (e.g., Ashton & Lee, 2007; John et al., 2008; McCrae & Costa, 2008) are much more important if there is an actual accuracy criterion to such answers (e.g., there really are five latent factors rather than six).
However, even if factor analysis does not identify latent causes of behavior, it remains a useful tool for numerous applications. First, factor analysis is useful for identifying and organizing traits which are most related to one another. Indeed, we used factor analysis in the present investigation for this purpose. When there are literally hundreds of items in an analysis, as in the present investigation and as in many studies of personality trait structure (Saucier, 1997), factor analysis can quickly organize the densest regions of covarying items. This use of factor analysis can illuminate important themes in the data that would have been much harder to detect from simply examining an unordered list. For instance, in the present study, factor analysis revealed that motives and abilities for the same object (e.g., the desire for attention, and the ability to get attention) regularly covary highly (Tables 2 through 6). This in turn is suggestive of a general process whereby motives and abilities for a given object likely become “coupled” over time (e.g., enjoying attention begets greater ability to get attention, which begets more enjoyment of attention; Denissen et al., 2007). Similarly, in studies of personality structure, recognizing that positive affect, sociability, sensation-seeking, and assertiveness all have high loadings on a common factor can serve as a heuristic tool for identifying sets of traits that are likely to share more similar functional antecedents. Dimensional systems created from factor analysis also provide a common language for personality psychologists, by providing a taxonomy and cartography for mapping and describing personality traits (Goldberg, 1993; John et al., 2008). These are all important uses of factor analysis in personality research that can be employed without assuming that the factors extracted are actually causes the measured trait items (Ozer & Reise, 1994; Saucier & Goldberg, 2001).

Secondly, the non-existence of latent factors has no bearing on the validity or invalidity of the lexical assumption that more important or consequential evaluations are reflected by more
terms in language (Saucier & Goldberg, 2001). Consequently, to the extent that we trust this assumption, the factors extracted by factor analysis can be used to set the agenda for which domains of individual differences personality psychologists should be most interested in measuring. For instance, the greater size ease of identifying factors resembling openness or intellect factors in lexical studies of modern individualistic cultures than other cultures (Saucier & Goldberg, 2001) may suggest the greater importance of these evaluations in these cultures, and the consistent identification of honesty-related factors in six-factor structures in many cultures (Ashton & Lee, 2007) should strengthen the argument that traits related to honesty and humility are socially consequential dimensions that should be assessed by personality psychologists with greater frequency. Further, if investigators only have time to assess five or six items per unit of analysis – a situation encountered frequently in research contexts such as social network, person perception, and experience sampling studies (e.g., Denissen, Geenen, Selfhout, & Van Aken, 2007; Kenny, 1994) – items representing the principle axes of the Big Five or HEXACO factors would be a very good choice to maximize content coverage of important personality traits and minimize redundancy.

**Disentangling the heterogeneous content of a personality trait scale.** As described earlier, many investigators interfacing with personality psychology do not explicitly espouse a view that latent factors are causal. However, such investigators are nonetheless likely to use scales constructed to measure latent factors to assess personality characteristics. In this section we address this question: If latent factors are not actual causal influences on behavior, then why use scale construction techniques designed to measure them? The assumption that latent factors are the sources of covariation and the appropriate unit of analysis underlies the common practice of treating a broad range of heterogeneous items as “indicators” of a latent factor, and
aggregating them into a single scale (John & Soto, 2007; Tellegen, 1991). However, there are important reasons why we should consider separating conceptually distinct types of items from one another in the scales we create, even when these items correlate highly with one another.

Two of our most concrete suggestions for future personality researchers are to (1) avoid aggregating functional items with the behavioral items they are most associated with, and (2) to avoid aggregating inter-correlated but distinguishable behavioral traits such as sociability, assertiveness, and enthusiasm into estimates of latent factors like extraversion. We elaborate on these suggestions below.

*The importance of separating functional traits from behavioral traits.* As we have illustrated, correlated behavioral traits are expected to be driven by more common MAPs, but nonetheless should have somewhat distinct relationships with common MAPs even when highly inter-correlated. And 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 ubiquitous, in that uncorrelated behavioral tendencies will regularly share MAPs that increase the correlation between the two behaviors and others that decrease the correlation simultaneously. For instance, concern about the quality of one’s work tends to increase both orderliness and anxiety, but organization and planning skills tend to increase orderliness but decrease anxiety. The common practice of aggregating together indicators of the MAPs influencing behavior with the behaviors they are most associated with makes it much more difficult to see the diverse effects a single MAP may have on other behavioral tendencies. In this example, the common practice of aggregating items indicating orderliness concerns, orderliness abilities, and orderly behavior to estimate latent “Orderliness” or
“Conscientiousness,” would have made it much more difficult to document the likely opposing effects of orderliness concerns and orderliness skills on anxiety levels suggested here (Table 7).

*The importance of separating behavioral traits from one another.* Similarly, we are encouraged by the increasing efforts undertaken to separate the measurement of highly correlated behavioral tendencies from one another. Numerous measures have been constructed to measure narrower personality trait dimensions than the broad Big Five (e.g., DeYoung, et al., 2007; Roberts et al., 2004; Wood, Nye, & Saucier, 2010). As with this investigation (Table 7), these investigations show that narrower traits show reliable and meaningful differences in how they relate to other variables, even when they are highly correlated with one another and considered to be part of the same trait domain.

Given the widespread use of measures of broad latent factors such as the Big Five in personality psychology, it is still surprisingly easy to make useful basic contributions to personality research by simply showing how traits measured more narrowly than the Big Five relate to extremely basic variables such as gender (Wood Nye & Saucier, 2010), well-being (Schimmack, Oishi, Furr, & Funder, 2004), political orientation (Block & Block, 2006), or behavioral consistency (Sherman, Nave, & Funder, 2010). Indeed, useful contributions can be made by simply reanalyzing the same data previously analyzed at the level of latent factors at a lower level of analysis. For instance, Soto, John, Gosling, and Potter (2011) recently replicated analyses originally reported by Srivastava, John, Gosling, and Potter (2003) linking age to the BFI, but analyzed the data at the level of the ten narrower scales used here rather than at the level of the broader Big Five traits (Soto & John, 2009). This simple shift to a more fine-grained measurement of personality traits considerably refined the picture of how personality likely changes with age; for instance, although levels of Conscientiousness was found to increased
considerably in adulthood as in other investigations (Roberts et al., 2008), large age increases in this domain seemed to be localized largely to traits related to self-discipline, while traits related to orderliness were found to increase negligibly with age (see also Jackson, Bogg, Walton, Wood, Harms, Lodi-Smith, et al., 2009).

**Further understanding the sources of trait variation and covariation.** The empirical study carried out in this investigation endeavored to identify as many of the diverse functions that may be served by performing trait-related behavior as possible. The qualitative-to-quantitative approach used here to identify the various potential functions served by behavior has been demonstrably useful for generating a large list of the candidate psychological antecedents of other behaviors (e.g., Buss et al., 1987; Kyl-Heku & Buss, 1996; Meston & Buss, 2007). Nonetheless, it is clear that the list of MAPs we identified could not completely explain the covariation among traits, as moderate correlations remained between some traits even after controlling for the full set of 24 MAPs measured simultaneously (Table 7). There are many reasons why the behavioral traits may have continued to covary; below we consider three.

**Identification of missing MAPs.** First, our method of identifying the functional antecedents of behavior likely left some important functions promoting or inhibiting behavior unidentified. Our method of generating MAPs underlying Big-Five related behaviors was intended to cast a wide net, but nonetheless focused most directly on identifying antecedents of behaviors most related to the core vectors of the Big Five (e.g., sociability in the domain of Extraversion; see items listed in Appendix A). This procedure thus likely missed some of the important functional antecedents of behavioral traits less directly related to the core vectors of the Big Five (e.g., assertiveness and positive affectivity in the domain of extraversion).
Additionally, our sample used to generate MAPs consisted of college students; a broader range of participants would have likely resulted in additional distinct MAPs.

*Improved measurement of identified MAPs.* We are reassured that the self-report methodology used here found many MAPs to relate to behavioral traits in a manner similar to indications found in previous investigations using more indirect methods. For instance, Wood, Harms, & Vazire (2010) found an indirect assessment of positive perceptions of others to relate to heightened levels of all Big Five traits, and this finding was paralleled here, as the “Enjoyment of Social Involvement” item group was formed of similar items such as “[I like] other people” and “I think other people are usually entertaining” (Appendix B), and was significantly associated with nearly all behavioral traits examined here (Table 7). Similarly, Carver and Connor-Smith (2010) reported that the tendency to cognitively restructure negative events (i.e., see other perspectives) was associated with significantly more positive levels of all Big Five traits, and the similar item group “Ability to Manage Anger/See Perspectives” showed similarly broad associations with behavioral traits in the current study (Table 7).

Although we are encouraged that many of the MAPs indicated in previous research were identified and operated in a similar manner here, we are also aware that many of the identified MAPs were likely not measured in the manner necessary to show how strongly they relate to behavioral traits, as many of the motives, abilities, or perceptions that guide behavior are not directly accessible through self-reports and introspection (e.g., Bargh et al., 2010; McClelland, Koestner, & Weinberger, 1989). For instance, a desire for power may be a more important common antecedent of tendencies to be assertive, self-disciplined, and (less) kind and forgiving than was observed in Table 7. Consequently, even if most of the important antecedents of behavioral traits were reflected by items in this inventory, they may nonetheless not be measured
in the manner necessary to account for the covariation of behavioral traits. It is thus important to explore additional methods of identifying and assessing the MAPs that underlie social behaviors that avoid the pitfalls associated with direct self-report.

In this vein, one of the more interesting avenues of future research could be identifying ways to more objectively measure abilities relevant to behavior, given that self-reported abilities to plan and organize, interact with others successfully, express emotions, manage anger, or appreciate art showed substantial relationships with behavioral traits. As abilities were construed here largely in terms of the ease of producing successful performances, it would be valuable to consider how tests of such capacities could be constructed which measure the amount of psychological resources that must be expended to attain a successful performance (e.g., Baumeister & Alquist, 2009), or that measure individual differences in performance under conditions of maximal effort (Sackett, 2007). For instance, there are indications that individuals with introverted tendencies have difficulties performing as well as extraverts in certain social and cognitive tasks (e.g., Lieberman & Rosenthal, 2001). Studies of more rigorously assessed abilities will afford the potential to more critically evaluate the numerous suggestions found here behavioral trait levels are driven in large part by real abilities to create successful performances.

**Common behavioral cues may underlie covariation in trait judgments.** The third important reason we believe distinct trait judgments continued to covary is also the least explored in the present study. Although we illustrated how the covariance of trait perceptions can arise through common MAPs, the most proximal source of trait judgments is likely an individual’s recollection or impression of past behaviors in particular trait-relevant situations rather than the MAPs that facilitated those behaviors (Figure 1). People likely use some of the same specific behaviors they have recalled to infer multiple traits (Srull & Wyer, 1993). For
instance, a student who raises a critical comment in class to correct a teacher’s error may later use this episode as relevant information to infer that she is talkative, assertive, argumentative, and helpful. The residual correlations between trait perceptions shown in Table 6 could thus represent in part redundancies in the cues participants have brought to mind in making different trait judgments. As people infer their own personality traits in part by trying to identify such exemplars (e.g., Bem, 1967; Kammrath, Mendoza-Denton, & Mischel, 2005; Wood, 2007), it may be difficult to fully account for covariation among trait judgments until we have identified the types of behaviors individuals have brought to mind in making these trait judgments.

**The causal importance of behavioral traits.** We hope to be clear that our argument that broad latent factors are not causal variables should not be viewed as indicating that behavioral traits (e.g., tendencies to act sociable) are similarly non-causal. Although we have considered behaviors here mainly as dependent variables, a central assumption of functionalist frameworks is that behaviors are performed to alter the environment in ways that advance the actor’s interests (e.g., Bandura, 1999; Becker, 1976; Dawkins, 1989; Fleeson & Jolley, 2006; Kenrick et al., 2009; Kruglanski et al, 2002). This is represented by the causal paths leading from behavior to trait perceptions and to reality factors in Figure 1. A person’s behaviors are thus the mechanisms for mediating the effects of a person’s motives, abilities, and perceptions on their environment. For instance, a man may deeply long to be in a romantic relationship with the neighbor across the street, but these desires will not be realized if he doesn’t transform them into behaviors that cause the neighbor to know he exists, and then to think favorably of him.

The importance of behaviors should also not be viewed as limited to their impact on external reality. Here we have emphasized the possibility that MAPs are the causal antecedents of behavior. However, given the regular finding that personality effects on environments and
environmental effects on personality are correlative (Roberts & Wood, 2006), we are certain that the relationships reported in Tables 2 through 7 regularly represent bidirectional influences between MAPs and behavioral traits. For instance, certain social skills likely make it easier to enter social situations, but frequent entrance into social situations should be expected to hone these social skills. In the same way that regular piano practice results in improved musical skills, the regular performance of a class of behaviors should progressively make performing the same behaviors easier in the future (Denissen et al., 2007; James, 1890). This can occur through the development of routines and habits that decrease the level of cognitive resources necessary to perform the behavior successfully, and through incorporation of new techniques that improve the behavioral performances, both of which should be represented neurologically through improved connectivity of neural areas involved in the behavior (Kandel, Schwartz, & Jessell, 2000). In short, we suspect that the performance of behaviors will generally serve to deepen many of the same cognitive, biological, and environmental features that initiated them.

**Pulling the levers of personality: Identifying the reality antecedents of MAPs.** The value in identifying a more complete list of the functions related to trait-related behaviors lies in large part in outlining the agenda of the specific motives, abilities, and perceptions that need to be targeted to impact a person’s behavior (Fleeson, 2007; Mischel & Shoda, 1995). To borrow examples from Table 2, if we were interested in changing an individual’s level of behaviors related to extraversion, our findings suggest that we might do this by identifying ways to increase the extent to which the person finds other people’s company rewarding, their sense of having something valuable to contribute to conversations, their desire for status, developing relevant skills, lowering their concern with being negatively evaluated in social interactions, or targeting a number of other functional antecedents.
Of course, changing something like an individual’s desire for status or social skills is easier said than done. Although we have identified a large number of the MAPs that likely influence variation in behavioral traits, here we did not identify the reality antecedents that might impact these MAPs. Although we have likely located many of the levers influencing trait levels, it is not immediately clear how we can pull them.

This is a formidable question. It is clear that there are many different ways that any single function underlying behavior may be impacted by features of reality. For instance, paralleling past research (Wood, Harms, & Vazire, 2010), generalized expectations that interactions with others will go well seems to be a major determinant of behaviors ranging from sociability, to kindness, self-discipline, openness to ideas, low anxiety and depression (see correlates of “Social Fears/Difficulties” in Table 7). However, a person’s level of this single perceptual tendency is almost certainly impacted by reality factors ranging from local disease prevalence, to physical attractiveness, the extent to which the amygdala activates in response to happy faces, the number of recent positive events, and the degree of parental affection experienced in childhood, in addition to various other features of a person’s experience. Accordingly, we may be able to increase a person’s tendency to see others positively by moving the person away from a disease-ridden environment; giving the person a makeover; providing cognitive training to improve attention to positive events; using biofeedback training to increase amygdala response to positive events; or using psychotherapy to help the person cope with a history of parental neglect.

It is nonetheless important to emphasize that reality antecedents are expected to impact behavioral tendencies through MAPs, and consequently, reality antecedents are expected to be somewhat more highly associated with MAPs than with behavioral traits. If this is true, it has interesting implications for interpreting the well-known difficulty in locating replicable specific
genes associated with variation in individual differences (Zeggini & Ioannidis, 2009). We suspect that MAPs should frequently be expected to show stronger associations than behavioral traits with particular genes or with physical biological structures (e.g., blood sugar levels, hormone levels, dendrite density, hippocampus volume), as the nature of these biological structures may frequently be largely to impact relatively specific functions, such as the processing of different external stimuli (e.g., “is this person a threat?”; Gottesman & Gould, 2003; Raine, 2008). The difficulty of finding particular genes or other biological traits that correlate with variation in personality traits may occur precisely because we have been looking for them in the place where their effects are weakest – i.e., behavioral traits, and worse yet: latent factors (Canli, 2008; van der Sluis, Kan, & Dolan, 2010).

Implications for understanding trait stability and change. The high stability of personality trait measures (Roberts & DelVecchio, 2000), and the general tendency to identify small environmental effects on trait development (e.g., Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007) is sometimes interpreted as suggesting that personality traits are largely impervious to environmental changes, except in the case of gross biological insults (McCrae & Costa, 2008). A functionalist understanding of trait variation 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 latent factors. For instance, a particular assertiveness training program could indeed result in increased levels of assertiveness, but have negligible effects on positive affect and even negative effects on sociability. If researchers only search for effects of the intervention on personality traits at the level of latent factors such as the Big Five, 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 effects of the intervention on specific behavioral traits and MAPs. As a single Big Five scale will aggregate across a broad range of distinct traits, the entire scale score should not shift much from environmental experiences unless the experience impacts the functional antecedents that are common to all narrower traits contained within the scale, and impacts them in the same direction. Measuring distinct behavioral traits separately should thus be expected to result in more frequent observation of environmental effects and biological correlates.

At the same time, the current findings also suggest some reasons to be more pessimistic about the possibility of large-scale changes in behavioral traits. Although these findings illuminate the levers that might be pulled to result in changes in behavioral traits, the problem is that there are so many of them. In Tables 2 to 6, we showed how at least half a dozen distinct MAPs can contribute independently to variation in any particular Big Five trait domain. As demonstrated by Ahadi and Diener (1989), when there are multiple distinct determinants of a single behavior, the magnitude of the effect expected to occur by changing any single one of them should be expected to be small. For instance, we might expect that a person who has suddenly inculcated a new goal of becoming more sociable might observe little change in displayed sociability if this change is not also accompanied additionally by some combination of greater expectations of having positive social interactions, newfound social skills, enjoyment of attention and social interactions, or interest in other’s perspectives. To give another example shifting from functional antecedents to the level of reality antecedents, we may increase a person’s attractiveness in the aims of promoting extraverted behavior. However, it is likely that the person’s level of extraversion is impacted by numerous other factors of their biological and
social reality, ranging from their physical health and strength, height, ethnicity, gender, brain size, amygdala activation in presence of positive stimuli, blood glucose levels, presence/absence of supportive parents, wealth, occupational status, among many others. Although changing a person’s attractiveness or any other feature of their reality should be expected to result in certain behavioral changes, it should not make this person a stranger to their past self. Instead, the person should be expected to show some change, but not massive change, because the person’s levels of a wide number of other features influencing their behavior have not changed.

**Conclusion**

Although functionalist approaches have increasingly demonstrated how central phenomena in personality psychology can be understood without the use of latent factors (e.g., Fleeson & Jolley, 2007), there has been little attention to how functional approaches can explain the phenomena of the covariation of behavior. Here, we show that identifying the numerous motives, abilities, and perceptions that promote and inhibit trait-related behaviors affords the opportunity of understanding trait covariation without positing any causal role to latent factors. In turn, removing the need to posit latent factors as explanations of trait covariation removes a critical argument for their use (Tellegen, 1991). Accordingly, understanding motives, abilities, and perceptions underlying behavior as the functional levers that environmental and biological factors must impact to influence behavior serves to clarify numerous topics central to personality and social psychology, including how different individual differences in traits should be measured, the role of biological and environmental sources of behavior and the nature of their effects, and our understanding of the reasons for personality stability and change.
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FUNCTIONALIST EXPLANATIONS OF TRAIT COVARIATION


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Ostendorf (Eds.), *Personality Psychology in Europe, Vol. 7* (pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.


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Footnote

1. Note that factor loadings will better reproduce the correlation matrix when using principle axis factoring (PAF) rather than principle component analysis (PCA). This is because factor analysis by PAF will summarize only the item inter-correlations, whereas PCA will additionally base factor loadings on item variances, or the diagonals of the correlation matrix.

2. Note that the indirect relationships produced by a single particular MAP variable are usually expected to be lower than the indirect relationships produced through latent factors. This is because when a behavioral trait has many distinct causes, as suggested by functionalist approaches, the magnitude of the extent to which any particular cause is expected to relate to the behavioral trait is expected to be lower (Ahadi & Diener, 1989).

3. The term “confound” is somewhat unfortunate as it has the negative connotation that some of zero-order relationship between the two behavioral traits is “spurious” (Cohen et al., 2003; p. 78) or that the confounder “falsely obscures or accentuates” (MacKinnon et al., 2000; p. 174) the relationship between the behavioral traits. We instead intend for such functional antecedents to be interpreted as a potential common cause of two or more behavioral traits.

4. Soto and colleagues (2011) note that their observations are non-overlapping with the previous investigation by Srivastava et al. (2003), as their investigation only included observations collected after this earlier investigation. More generally however, if the goal of the investigation is largely to demonstrate heterogeneity of effects within a given latent factor domain, there is no reason why precisely the same data should not simply be reexamined by decomposing the content in scale of a latent factor into narrower scales or even single items. At this point in the field, there remains considerable value in simply documenting how a broad range of personality traits are associated with basic variables of interest (Funder, 2009; Wood, Nye, & Saucier, 2010).
Examples:

**Disease prevalence**
- “Strangers are dangerous”
- Lower enjoyment of social gatherings
- Lower entrance in social situations
- Less interaction with strangers
- “I’m reserved/wary”
- “I’m not open to new experiences”

**Involvement in romantic relationships**
- I want to provide for my spouse
- There is someone I care about
- I don’t want to do anything that will cause me to lose my spouse
- More execution of responsibilities
- Less delinquent activity
- More caring behavior
- “I’m responsible”
- “I’m caring/sensitive”

**Physical attractiveness**
- “People find me attractive”
- Ease at attaining desired mates, affecting situations
- Higher enjoyment of social situations
- Increased entrance, poise in social situations
- Increased dating/sexual experience
- “I’m sociable/outgoing”
- “I’m confident”
- “I’m well-adjusted”

**Amygdala gray matter concentration and activation patterns**
- Higher attention to positive information
- Higher enjoyment/desire of social rewards
- Greater entrance into social situations
- “I’m extraverted”
- “I’m sympathetic”

**Figure 1.** Conceptual relationship between features of reality, MAPs, behaviors, and perceptions of behaviors
2A: General latent factor conception of behavioral trait antecedents

\[
l_A \quad \text{Trait A} \quad u_A
\]
\[
l_B \quad \text{Trait B} \quad u_B
\]
\[
l_C \quad \text{Trait C} \quad u_C
\]
\[
l_D \quad \text{Trait D} \quad u_D
\]

2B: Example for extraversion- and neuroticism-related behaviors

<table>
<thead>
<tr>
<th>Reward Sensitivity</th>
<th>.8</th>
<th>Extraversion</th>
<th>.7</th>
<th>Assertiveness</th>
<th>.5</th>
<th>Desire for power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punishment Sensitivity</td>
<td>.8</td>
<td>Neuroticism</td>
<td>.7</td>
<td>Anxiety</td>
<td>.5</td>
<td>Concern w/ neg. evaluation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Depression</td>
<td>.5</td>
<td>Sense of self-worth</td>
</tr>
</tbody>
</table>

\[
\text{Factor}_1 \quad l_1 \quad \text{Core}_1
\]
\[
\text{Factor}_2 \quad l_2 \quad \text{Core}_2
\]

\[
l_{AB} \approx l_A \times l_B
\]
\[
l_{CD} \approx l_C \times l_D
\]

**Figure 2.** Conceptualization of trait antecedents consistent with latent factor models, which conceptualize variation and covariation of behavioral traits as arising primarily through latent factors, which may have a cognitive “core” (such as reward sensitivity for extraversion). Circles represent indirectly inferred latent factors, boxes represent measured variables.
**Figure 3.** Conceptualization of trait antecedents consistent with functionalist frameworks. Variation in behavioral traits is assumed to arise from multiple distinguishable MAPs, and covariation between behavioral traits as arising through the sharing of these MAPs.
Table 1. *Major trait categories relevant to behavior.*

<table>
<thead>
<tr>
<th>Type of Trait</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reality / Environment:</strong> Features of physical and social reality</td>
<td>Biological: Gender / weight / height / ethnicity / genes / testosterone levels / amygdala activation patterns / visual acuity / physical attractiveness</td>
</tr>
<tr>
<td>Alpha press, Culture, Ecology, Endophenotypes, Objective situation</td>
<td>Social/environmental: socio-economic status / regional disease prevalence / income / relationship status / organizational power or status / collectivist culture</td>
</tr>
<tr>
<td><strong>Abilities/Affordances:</strong> Ease of performing behaviors or attaining outcomes</td>
<td>[Ease of] making people comfortable / entering relationships with desired mates / solving calculus problems / lifting 100 lbs / keeping secrets / keeping living space clean / buying nice clothes</td>
</tr>
<tr>
<td>Abilities, Affordances, Capabilities, Competencies, Constraints, Intelligences, Resources, Skills</td>
<td>“Other people like me” / “If I go to this party, I will meet interesting new people” / “Small talk is worthless” / “People can’t be trusted” / Libertarianism / Christianity / Atheism / Belief in a just world</td>
</tr>
<tr>
<td><strong>Perceptions:</strong> Construals of objects and environment; especially how objects relate to one another</td>
<td>[Desire to] talk with others / attain power / get an ‘A’ / avoid embarrassment / exercise / have an clean house / create art / have a traditional spouse / be accepted / show competence / be autonomous / avoid harm</td>
</tr>
<tr>
<td>Beliefs, Beta press, Construals, Expectancies, Expectations, Interpretations of situations, Lay theories, Perceived situation, Perceiver effects, Personal constructs, Schemas, Subjective norms</td>
<td>[Tendencies to] talk with strangers / act in aggressive fashion / display good posture / wear nice clothes / be happy</td>
</tr>
<tr>
<td><strong>Motives:</strong> Desire to perform behaviors or attain outcomes</td>
<td>I am sociable, nice, responsible, neurotic, intelligent, attractive, interesting, trustworthy</td>
</tr>
<tr>
<td>Attitudes, Desires, Experienced/subjective utility, Goals, Intentions, Interests, Motives, Needs, Personal action constructs, Preferences, Purposes, Valence, Values</td>
<td></td>
</tr>
</tbody>
</table>
Table 1 (continued). *Major trait categories relevant to behavior.*

<table>
<thead>
<tr>
<th><strong>Type of Trait</strong></th>
<th><strong>Examples</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other-perceptions:</strong> Characteristic ways of being seen by other observers</td>
<td>Reputation\textsubscript{25,42}, Target and relationship effects\textsubscript{29}</td>
</tr>
<tr>
<td><strong>Latent factors:</strong> Factors extracted in factor analyses of indicators of distinct behavioral traits</td>
<td>Genotypic trait\textsubscript{19}, Liability\textsubscript{30}, Meta-trait\textsubscript{16}, Source trait\textsubscript{14}, Trait\textsubscript{35,42,46}</td>
</tr>
</tbody>
</table>

Table 2. MAPs Associated with Variation in BFI Extraversion

<table>
<thead>
<tr>
<th>MAP item group and representative items</th>
<th>( r ) (( \text{partial} \ r ))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E1: Preference/Ability for Initiating Conversations(_{1})</strong></td>
<td>(.64*(.25*))</td>
</tr>
<tr>
<td>Goal: Talk to people I don’t know, start conversations with others. Like: making “small talk,” talking to strangers, meeting people on my own. Ability: approaching other people to start conversations, meeting new people.</td>
<td></td>
</tr>
<tr>
<td><strong>E2: Preference/Ability for Risk-Taking &amp; Exploration(_{7})</strong></td>
<td>(.42* (.00))</td>
</tr>
<tr>
<td>Ability: Taking substantial risks, trying new things, doing things that are out of my comfort zone. Likes: Taking substantial risks, playing it safe(_{(R)}). Goal: Try new things, explore the world around me.</td>
<td></td>
</tr>
<tr>
<td><strong>E3: Preference/Ability for Attention(_{3})</strong></td>
<td>(.55* (.33*))</td>
</tr>
<tr>
<td>Like: Being the center of attention, doing strange things to get a reaction out of others. Ability: Making myself the center of attention. Goal: Get attention from others, be dominant in social situations. Perception: People expect me to be the “life of the party”</td>
<td></td>
</tr>
<tr>
<td><strong>E4: Fear/Negative Expectations of Social Situations(_{2})</strong></td>
<td>(-.52* (-.37*))</td>
</tr>
<tr>
<td>Perception: I am scared to speak up in social situations, if I were to be talkative in a situation, I feel that others would criticize what I say, I often feel that I will sound foolish in social situations, I am intimidated by new situations, I feel that I won’t be accepted by others.</td>
<td></td>
</tr>
<tr>
<td><strong>E5: Social Awareness Abilities(_{4})</strong></td>
<td>(.46* (.00))</td>
</tr>
<tr>
<td>Ability: Getting attention from others in positive ways, realizing how I come across to other people, reading people, knowing how to act in social situations, putting things into perspective</td>
<td></td>
</tr>
<tr>
<td><strong>E6: Preference for Opinionated Discussion(_{6})</strong></td>
<td>(.42* (.00))</td>
</tr>
<tr>
<td>Like: Forming my own opinions, debating ideas with other people, speaking for myself in social situations, standing out by being different from the crowd. Goal: have others value my opinion</td>
<td></td>
</tr>
<tr>
<td><strong>E7: Preference/Ability for Expressing Emotions(_{8})</strong></td>
<td>(.39* (.13*))</td>
</tr>
<tr>
<td>Like: Expressing my emotions, keeping my opinions to myself(<em>{(R)}). Ability: Telling others about my problems, opening up to other people, keeping my problems to myself(</em>{(R)}). Goal: Express my emotions when I have problems</td>
<td></td>
</tr>
<tr>
<td><strong>E8: Preference/Ability for Confrontation(_{12})</strong></td>
<td>(.34* (.14*))</td>
</tr>
<tr>
<td>Like: confronting others. Goal: confront others, let others know when they have upset me. Ability: Saying something that is bothering me to the person’s face, brushing off what other people think of me.</td>
<td></td>
</tr>
<tr>
<td><strong>E9: Preference for Social Situations and Engagement(_{1})</strong></td>
<td>(.50* (.15*))</td>
</tr>
<tr>
<td>Like: Surrounding myself with other people, meeting people through mutual friends, other people, making new friends, having a large group of friends, silence in social situations(_{(R)}). Perception: It’s important to take part in conversations in social situations, talkative people are interesting, I tend to think that starting conversations with others will benefit me.</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Several representative items with loadings above .40 are given, in descending order of their loadings within rating category (likes, goals, abilities, perceptions). Rating categories are listed roughly in order of which categories tend to have the highest loading items for the dimension. In the second column, the first value \( r \) indicates the correlation between the MAP item group and the BFI scale, and the second value (partial \( r \)) indicates the partial correlation controlling for the other item groups listed. Subscript \(_{(R)}\) indicates that the item loads negatively on the factor. The number in subscripts following the scale label indicates the corresponding scale that the items were considered as part of in Table 7.
Table 3. MAPs Associated with Variation in BFI Agreeableness

**MAP item group and representative items**

**A1: Importance of Ideas/Other Perspectives**

*Perception:* Everyone makes mistakes, it’s important to learn a lot of things, it’s important to be exposed to a lot of different ideas, it’s important to be myself, it’s important to be able to view things from multiple perspectives, it would be boring if everyone was the same

*Partial correlation:* $r = .43^* (-.10^*)$

**A2: Desire/Ability for Social Engagement**

*Like:* Other people, making new friends, being around upbeat people, making other people comfortable in social situations, getting to know other people. *Goal:* Start conversations with others. *Ability:* Spending time in large group of people, opening up to other people. *Perception:* It’s important to take part in conversations in social situations.

*Partial correlation:* $r = .41^* (.07)$

**A3: Fear/Difficulty for Social Participation**

*Perception:* I am intimidated by new situations, if I were to be talkative in a situation I feel that others would criticize what I say, If I keep to the background in a social situation I’ll minimize the chances that I’ll embarrass myself. *Ability:* Making friends, meeting new people, knowing how to act in social situations.

*Partial correlation:* $r = -.40^* (-.22^*)$

**A4: Unimportance/Displeasure of Rude Behaviors**

*Perception:* There is no point in being rude to other people, I would feel bad if I insulted someone, it’s not fair to insult other people, it’s not worth it to get revenge on others, you shouldn’t judge other people. *Ability:* Talking behind somebody’s back, thinking of good insults. *Like:* Offensive jokes.

*Partial correlation:* $r = .53^* (.24^*)$

**A5: Abilities for Perspective-Taking/Controlling Anger**

*Ability:* Letting things go that could make me angry, seeing things from others’ perspectives, managing my anger, seeing the positive side of bad situations, adjusting when plans change

*Partial correlation:* $r = .44^* (.24^*)$

**A6: Goal of Being Respected**

*Goal:* be respected by others in all situations, have the reputation of being a “good person”, do my absolute best work, be successful in everything I pursue, appear approachable to others, have confidence in myself, come across as being an “angry” person.

*Partial correlation:* $r = .44^* (.04)$

**A7: Desire/Ability to Be Angry**

*Goal:* Confront others, get angry at other people, come across to others as a moody person. *Like:* confronting others, arguing with other people, disappointing or angering other people, upsetting other people. *Ability:* Getting angry at other people. *Perception:* It’s just not worth it to trust other people.

*Partial correlation:* $r = -.56^* (-.34^*)$

**A8: Self-Centered Attitudes**

*Perception:* I’m more concerned about myself than about other people, I am more important than other people. *Ability:* Focusing on other people’s feelings in social situations. *Like:* Sympathizing with other people.

*Partial correlation:* $r = -.47^* (-.14^*)$

**Note.** Several representative items with loadings above .40 are given, in descending order of their loadings within rating category (likes, goals, abilities, perceptions). Rating categories are listed roughly in order of which categories tend to have the highest loading items for the dimension. In the second column, the first value indicates the correlation between the MAP item group and the BFI scale, and the second value (partial $r$) indicates the partial correlation controlling for the other item groups listed. Subscript $(R)$ indicates that the item loads negatively on the factor. The number in subscripts following the scale label indicates the corresponding scale that the items were considered as part of in Table 7.
Table 4. **MAPs Associated with Variation in BFI Conscientiousness**

<table>
<thead>
<tr>
<th>MAP item group and representative items</th>
<th>r (partial r)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C1: Importance of Being Dependable</strong>&lt;sup&gt;(13)&lt;/sup&gt;</td>
<td>.42* (.08)</td>
</tr>
<tr>
<td><em>Perception:</em> It’s important to learn a lot of things, I’m concerned with following through with plans I make, I feel if I say I am going to do something I better do it, I care a lot about the tasks I choose to take on, I feel a responsibility to use the abilities I have.</td>
<td></td>
</tr>
<tr>
<td><strong>C2: Preference for/Ability to Organize</strong>&lt;sup&gt;(16)&lt;/sup&gt;</td>
<td>.45* (.17*)</td>
</tr>
<tr>
<td><em>Likes:</em> Organizing things, making detailed plans. <em>Perceptions:</em> I am calmer when things are organized than when they’re not, I feel expected to be organized, I am uncomfortable if things are out of order.</td>
<td></td>
</tr>
<tr>
<td><em>Ability:</em> Organizing things</td>
<td></td>
</tr>
<tr>
<td><strong>C3: Ability to Manage Time</strong>&lt;sup&gt;(14)&lt;/sup&gt;</td>
<td>.60* (.48*)</td>
</tr>
<tr>
<td><em>Abilities:</em> Staying on task when there are distractions, managing my time, keeping my attention on tasks, completing tasks ahead of schedule, motivating myself to do uninteresting tasks, following through with plans.</td>
<td></td>
</tr>
<tr>
<td><strong>C4: Desire to Put in Little Effort</strong>&lt;sup&gt;(15)&lt;/sup&gt;</td>
<td>-.50* (-.30*)</td>
</tr>
<tr>
<td><em>Likes:</em> Putting in as little effort as possible to complete a task, doing anything other than my work, turning in mediocre work. <em>Ability:</em> putting tasks aside once I’ve started on them. <em>Perception:</em> It’s more important to enjoy myself than to get my work done.</td>
<td></td>
</tr>
<tr>
<td><strong>C5: Attention to Negative Attributes</strong>&lt;sup&gt;(9)&lt;/sup&gt;</td>
<td>-.36* (-.09*)</td>
</tr>
<tr>
<td><em>Like:</em> offensive jokes, being around negative people. <em>Perceptions:</em> When I meet people, I usually see more of their bad attributes than their good ones, offending others would gain attention for me, it’s important to care about other people&lt;sub&gt;(R)&lt;/sub&gt;, having a positive outlook on life is better for everyone&lt;sub&gt;(R)&lt;/sub&gt;.</td>
<td></td>
</tr>
<tr>
<td><strong>C6: Goals for High Achievement and Performance</strong>&lt;sup&gt;(13)&lt;/sup&gt;</td>
<td>.42* (-.06)</td>
</tr>
<tr>
<td><em>Goals:</em> Do my absolute best work, learn as much as possible, get good grades in school, get my work completed, achieve my career goals, be successful in everything I pursue.</td>
<td></td>
</tr>
<tr>
<td><strong>C7: Lack of Concern for One’s Actions</strong>&lt;sup&gt;(17)&lt;/sup&gt;</td>
<td>-.36* (-.14*)</td>
</tr>
<tr>
<td><em>Goals:</em> Break plans I have made with others, let other people down. <em>Perceptions:</em> Even if I don’t do the work required of me everything will work out in the end, I don’t care about the consequences of my actions.</td>
<td></td>
</tr>
<tr>
<td><strong>C8: Expected Positive Interactions with Others</strong>&lt;sup&gt;(22)&lt;/sup&gt;</td>
<td>.33* (.09*)</td>
</tr>
<tr>
<td><em>Perceptions:</em> I feel that I won’t be accepted by others&lt;sub&gt;(R)&lt;/sub&gt;, other people don’t want to talk to me&lt;sub&gt;(R)&lt;/sub&gt;, people listen to my opinions. <em>Ability:</em> Knowing how to act in social situations.</td>
<td></td>
</tr>
<tr>
<td><strong>C9: Desire/Ability to Lead</strong>&lt;sup&gt;(5)&lt;/sup&gt;</td>
<td>.28* (.05)</td>
</tr>
<tr>
<td><em>Like:</em> Being a leader, <em>Ability:</em> Leading groups effectively, <em>Perception:</em> It’s important to step up and be a leader</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Several representative items with loadings above .40 are given, in descending order of their loadings within rating category (likes, goals, abilities, perceptions). Rating categories are listed roughly in order of which categories tend to have the highest loading items for the dimension. In the second column, the first value r indicates the correlation between the MAP item group and the BFI scale, and the second value (partial r) indicates the partial correlation controlling for the other item groups listed. Subscript (R) indicates that the item loads negatively on the factor. The number in subscripts following the scale label indicates the corresponding scale that the items were considered as part of in Table 7.
Table 5. **MAPs Associated with Variation in BFI Neuroticism**

<table>
<thead>
<tr>
<th>MAP item group and representative items</th>
<th>( r ) (partial ( r ))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N1: Need for a Plan(_{16})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Perception:</em> I find it stressful when there is not a plan, if I don’t plan things out bad things will happen, I am uncomfortable if things are out of order. <em>Like:</em> Being a perfectionist. <em>Ability:</em> Getting tasks done at the last minute(_R).</td>
<td></td>
</tr>
<tr>
<td>(.43*. .09*)</td>
<td></td>
</tr>
<tr>
<td><strong>N2: Negative Expectations of Others(_{18}^2)</strong></td>
<td></td>
</tr>
<tr>
<td><em>Perceptions:</em> Nobody is really there to help me out, I feel that I won’t be accepted by others, other people do things to upset me on purpose, people expect me to do things that I just can’t do, other people don’t want to talk to me</td>
<td></td>
</tr>
<tr>
<td>(.47*. .27*)</td>
<td></td>
</tr>
<tr>
<td><strong>N3: Ability to be work-oriented(_{14})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Abilities:</em> Doing well academically, understanding new things, understanding abstract ideas and concepts, staying on task when there are distractions, keeping my attention on tasks.</td>
<td></td>
</tr>
<tr>
<td>(-.36* -.12*)</td>
<td></td>
</tr>
<tr>
<td><strong>N4: Worry about Situations(_{11})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Perceptions:</em> I don’t worry about things I can’t control(_R), I worry about my future, I worry about messing up on school assignments. <em>Abilities:</em> Keeping from getting overwhelmed by large amounts of work(_R), stressing about situations.</td>
<td></td>
</tr>
<tr>
<td>(.64*. .40*)</td>
<td></td>
</tr>
<tr>
<td><strong>N5: Desire for/Ability to Talk Negatively about Others(_{10})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Ability:</em> Talking behind somebody’s back. <em>Like:</em> Gossiping about people. <em>Perception:</em> Getting back at others in the same way they hurt you makes them realize how it feels</td>
<td></td>
</tr>
<tr>
<td>(.29*. .00)</td>
<td></td>
</tr>
<tr>
<td><strong>N6: Ability to See the Positive Side of Situations(_{19})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Abilities:</em> Letting things go that could make me angry, managing my anger, getting angry at other people(_R), seeing the positive side of bad situations. <em>Perception:</em> People are generally good</td>
<td></td>
</tr>
<tr>
<td>(-.52* -.33*)</td>
<td></td>
</tr>
<tr>
<td><strong>N7: Goal of Staying Positive(_{13})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Perceptions:</em> Staying calm in situations is beneficial for everyone, acting calm under pressure makes it easier to perform. <em>Goals:</em> Stay positive in stressful situations, allow things to bother or worry me(_R).</td>
<td></td>
</tr>
<tr>
<td>(-.31* -.12*)</td>
<td></td>
</tr>
<tr>
<td><strong>N8: Ability to/Desire for Taking Risks(_{17})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Abilities:</em> Taking substantial risks, trying new things, doing things that are out of my comfort zone. <em>Like:</em> Playing it safe(_R).</td>
<td></td>
</tr>
<tr>
<td>(-.31*. .03)</td>
<td></td>
</tr>
<tr>
<td><strong>N9: Lack of Concern for what Others Think(_{20})</strong></td>
<td></td>
</tr>
<tr>
<td><em>Perceptions:</em> I don’t care what others think of me, it bothers me when other people insult me or put me down(_R). <em>Ability:</em> Brushing off what other people think of me. <em>Goal:</em> Have others’ approval(_R).</td>
<td></td>
</tr>
<tr>
<td>(-.39* -.18*)</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Several representative items with loadings above .40 are given, in descending order of their loadings within rating category (likes, goals, abilities, perceptions). Rating categories are listed roughly in order of which categories tend to have the highest loading items for the dimension. In the second column, the first value \( r \) indicates the correlation between the MAP item group and the BFI scale, and the second value (partial \( r \)) indicates the partial correlation controlling for the other item groups listed. Subscript \(_R\) indicates that the item loads negatively on the factor. The number in subscripts following the scale label indicates the corresponding scale that the items were considered as part of in Table 7.
Table 6. MAPs Associated with Variation in BFI Openness to Experience

<table>
<thead>
<tr>
<th>MAP item group and representative items</th>
<th>$r$ (partial $r$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O1: Desire/Ability to Think Creatively</strong>&lt;sub&gt;(21)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Abilities: Appreciating art, understanding art. Likes: doing creative things like painting or drawing, the arts, interpreting and thinking deeply about art. Goal: Appreciate art. Perceptions: Appreciating art and natural beauty will help me as a person, underlying meanings in art are important.</td>
<td>.69*(.45*)</td>
</tr>
<tr>
<td><strong>O2: Desire/Ability to Initiate Social Interactions</strong>&lt;sub&gt;(2)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Perception: I am scared to speak up in social situations&lt;sub&gt;(R)&lt;/sub&gt;, I am comfortable around people I don’t know. Ability: Approaching other people to start conversations. Likes: Speaking for myself in social situations, talking to strangers, being a leader.</td>
<td>.38* (.14*)</td>
</tr>
<tr>
<td><strong>O3: Desire to Learn New Things</strong>&lt;sub&gt;(13)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Likes: Observing things and people, learning new things. Perceptions: I don’t feel the need to learn new things&lt;sub&gt;(R)&lt;/sub&gt;, it’s important to be exposed to a lot of different ideas, it would be boring if everyone was the same.</td>
<td>.38* (.04)</td>
</tr>
<tr>
<td><strong>O4: Need for Routine</strong>&lt;sub&gt;(16)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Perception: Having routines makes me feel comfortable and secure. Likes: having a set routine, unstructured open-ended tasks&lt;sub&gt;(R)&lt;/sub&gt;.</td>
<td>-.43* (-.20*)</td>
</tr>
<tr>
<td><strong>O5: Desire to be different from others</strong>&lt;sub&gt;(23)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Goals: Be different from other people, do things my own way. Like: Standing out by being different from the crowd, being a mystery to other people. Perception: If I was different from other people, I would feel special.</td>
<td>.42* (.09*)</td>
</tr>
<tr>
<td><strong>O6: Importance of Abstract Concepts</strong>&lt;sub&gt;(22)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Perceptions: Abstract ideas (like philosophy) are important to me, It’s helpful to think in abstract terms. Ability: understanding abstract ideas and concepts. Likes: abstract ideas, debating ideas with other people.</td>
<td>.66* (.27*)</td>
</tr>
<tr>
<td><strong>O7: Desire/Ability to Take Risks</strong>&lt;sub&gt;(7)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Abilities: Taking substantial risks, trying new things, doing things that are out of my comfort zone. Like: Taking substantial risks. Goal: Try new things.</td>
<td>.37* (-.04)</td>
</tr>
<tr>
<td><strong>O8: Desire to Understand Other Perspectives/Explore the World</strong>&lt;sub&gt;(13)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Goals: Understand the perspectives of others, start conversations with others, see beauty in everything, learn as much as possible, explore the world around me. Like: Getting to know other people.</td>
<td>.45* (.04)</td>
</tr>
<tr>
<td><strong>O9: Ability to Read People/Take Perspectives</strong>&lt;sub&gt;(14)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Abilities: Reading people, understanding new things, drawing meaning from simple things, seeing things from other people’s perspectives.</td>
<td>.44* (.09*)</td>
</tr>
<tr>
<td><strong>O10: Desire to Find Single Best/Right Answer</strong>&lt;sub&gt;(24)&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Perception: It’s better to find a single right answer to an issue than to consider multiple interpretations. Like: Knowing there is only one right answer to problems.</td>
<td>-.34* (-.07)</td>
</tr>
</tbody>
</table>

**Note.** Several representative items with loadings above .40 are given, in descending order of their loadings within rating category (likes, goals, abilities, perceptions). Rating categories are listed roughly in order of which categories tend to have the highest loading items for the dimension. In the second column, the first value $r$ indicates the correlation between the MAP item group and the BFI scale, and the second value (partial $r$) indicates the partial correlation controlling for the other item groups listed. Subscript $(R)$ indicates that the item loads negatively on the factor. The number in subscripts following the scale label indicates the corresponding scale that the items were considered as part of in Table 7.
Table 7. Relation between Self-Reported Traits and MAP Scales

<table>
<thead>
<tr>
<th>Scales</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow BFI Scales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Assertiveness</td>
<td>(.75)</td>
<td>.18</td>
<td>.01</td>
<td>.00</td>
<td>.07</td>
<td>.06</td>
<td>.04</td>
<td>-.02</td>
<td>.03</td>
<td>.00</td>
</tr>
<tr>
<td>2. Enthusiasm</td>
<td>.57</td>
<td>(.70)</td>
<td>.17</td>
<td>.09</td>
<td>.04</td>
<td>.14</td>
<td>-.03</td>
<td>-.05</td>
<td>.08</td>
<td>.11</td>
</tr>
<tr>
<td>3. Kindness</td>
<td>.15</td>
<td>.39</td>
<td>(.66)</td>
<td>.24</td>
<td>.07</td>
<td>.13</td>
<td>-.02</td>
<td>-.14</td>
<td>.04</td>
<td>.08</td>
</tr>
<tr>
<td>4. Forgiveness</td>
<td>-.02</td>
<td>.18</td>
<td>.60</td>
<td>(.69)</td>
<td>.10</td>
<td>.09</td>
<td>-.09</td>
<td>-.12</td>
<td>.00</td>
<td>.06</td>
</tr>
<tr>
<td>5. Order</td>
<td>.05</td>
<td>.08</td>
<td>.16</td>
<td>.17</td>
<td>(.63)</td>
<td>.25</td>
<td>-.07</td>
<td>-.10</td>
<td>.07</td>
<td>.04</td>
</tr>
<tr>
<td>6. Self-Discipline</td>
<td>.15</td>
<td>.31</td>
<td>.29</td>
<td>.20</td>
<td>.56</td>
<td>(.73)</td>
<td>-.11</td>
<td>-.09</td>
<td>.08</td>
<td>.10</td>
</tr>
<tr>
<td>7. Anxiety</td>
<td>-.13</td>
<td>-.20</td>
<td>-.18</td>
<td>.26</td>
<td>-.06</td>
<td>-.16</td>
<td>(.75)</td>
<td>.18</td>
<td>-.04</td>
<td>-.08</td>
</tr>
<tr>
<td>8. Depression</td>
<td>-.14</td>
<td>-.25</td>
<td>-.42</td>
<td>-.41</td>
<td>-.17</td>
<td>.25</td>
<td>.50</td>
<td>(.65)</td>
<td>.02</td>
<td>.03</td>
</tr>
<tr>
<td>9. Openness to Art</td>
<td>.05</td>
<td>.11</td>
<td>.06</td>
<td>.05</td>
<td>.02</td>
<td>.11</td>
<td>-.13</td>
<td>.08</td>
<td>(.78)</td>
<td>.17</td>
</tr>
<tr>
<td>10. Openness to Ideas</td>
<td>.18</td>
<td>.24</td>
<td>.13</td>
<td>.12</td>
<td>-.06</td>
<td>.15</td>
<td>-.32</td>
<td>-.04</td>
<td>.47</td>
<td>(.75)</td>
</tr>
</tbody>
</table>

MAP Scales

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>
| Enjoyment of Social Involvement
(1) | .51 | .59 | .35 | .16 | -.02 | .16 | -.12 | -.22 | .07 | .16 |
| Social Fear/Difficulties
(2) | -.56 | -.52 | -.41 | -.30 | -.08 | -.26 | .42 | .46 | -.09 | -.30 |
| Desire/Ability to Gain Attention
(3) | .51 | .45 | -.07 | -.22 | -.14 | -.09 | -.03 | .10 | .06 | .15 |
| Positive Social Interaction Skills
(4) | .38 | .47 | .39 | .23 | .09 | .27 | -.26 | -.27 | .13 | .23 |
| Desire/Ability to Lead
(5) | .46 | .41 | .20 | .07 | .13 | .27 | -.19 | -.16 | .09 | .21 |
| Desire to Have Opinions/Debate
(6) | .37 | .32 | .07 | -.03 | .01 | .14 | -.16 | -.03 | .22 | .38 |
| Desire/Ability to Take Risks
(7) | .39 | .36 | .13 | .09 | -.15 | -.01 | .39 | -.16 | .17 | .42 |
| Desire/Ability to Express Emotions
(8) | .38 | .31 | .19 | .03 | .08 | .02 | .07 | .07 | .05 | .06 |
| Negativity is Unpleasant/Unhelpful
(9) | -.01 | .20 | .47 | .53 | .11 | .20 | -.08 | -.27 | .15 | .14 |
| Desire/Ability to Gossip
(10) | .01 | -.11 | -.34 | -.42 | -.11 | .27 | .25 | .31 | .09 | .23 |
| Concern w/ Self over Others
(11) | -.05 | -.15 | -.41 | -.40 | -.01 | -.12 | .06 | .15 | -.12 | -.10 |
| Desire/Ability to Confront Others
(12) | .26 | .09 | -.28 | -.41 | -.12 | -.09 | -.08 | .15 | -.04 | .13 |
| Importance of Respecting Others
(13) | .15 | .30 | .39 | .32 | .18 | .31 | -.07 | -.17 | .21 | .20 |
| Planning/Organization Skills
(14) | .13 | .27 | .15 | .12 | .40 | .59 | -.24 | -.24 | .01 | .10 |
| Acceptability of Distraction/Low Effort
(15) | -.08 | -.12 | -.16 | -.11 | -.32 | -.51 | -.06 | .10 | -.06 | -.07 |
| Need for Routine/Order
(16) | .00 | .06 | .00 | -.06 | .46 | .34 | .34 | .15 | -.08 | -.25 |
| Acceptability of Breaking Commitments
(17) | -.05 | -.08 | -.30 | -.27 | -.28 | -.31 | -.04 | .14 | -.04 | .01 |
| Need/Aptitude to Worry About Tasks
(18) | -.08 | -.08 | -.05 | -.12 | .02 | .00 | .66 | .37 | .00 | .21 |
| Ability to Manage Anger/See Perspectives
(19) | .07 | .23 | .40 | .48 | -.06 | .08 | -.47 | -.43 | .14 | .24 |
| Unconcern about Social Disapproval
(20) | .15 | .08 | -.03 | -.05 | -.04 | .00 | -.40 | -.21 | .03 | .20 |
| Desire/Ability to Appreciate/Create Art
(21) | .06 | .11 | .05 | .08 | -.06 | .05 | -.15 | .06 | .75 | .46 |
| Appreciation of Abstract Ideas
(22) | .07 | .09 | .04 | .10 | -.14 | .01 | -.25 | .02 | .47 | .66 |
| Desire to Stand Out/Be Different
(23) | .17 | .22 | .03 | -.10 | -.11 | -.02 | -.17 | -.01 | .31 | .38 |
| Desire to Find Single Best/Right Answer
(24) | -.05 | .03 | -.08 | -.15 | .00 | .00 | .16 | .04 | -.28 | -.33 |

Note. Diagonals of correlations between 10 Big Five aspect scales (Soto & John, 2009) represent the multiple correlation between the 24 MAP scales as simultaneous predictors of the scale. The correlations below the diagonal represent zero-order correlations between Big Five aspects, the correlations above the diagonal represent the part or semi-partial correlations after controlling for the 24 MAP scales, and are given in italics. MAP scales have been arranged roughly by the Big Five domain showing the largest magnitude correlations. All statistically significant correlations are underlined; all |r| ≥ .20 are additionally bolded. The number in subscripts following the label for each MAP scale can be compared with Tables 2 through 6 to find which scales and items were aggregated.
Supplementary Materials

Appendix A

Materials for Generating Reasons for Trait Related Behavior

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

<table>
<thead>
<tr>
<th>Original IPIP Item</th>
<th>Interview Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extraversion</strong></td>
<td></td>
</tr>
<tr>
<td>I start conversations.</td>
<td>Are you typically someone that starts conversations?</td>
</tr>
<tr>
<td>I don’t talk a lot.</td>
<td>Would you say that you talk a lot?</td>
</tr>
<tr>
<td>I am skilled in handling social situations.</td>
<td>How skilled would you say that you are in handling social situations?</td>
</tr>
<tr>
<td>I keep in the background.</td>
<td>Do you feel that you keep to the background in social situations, or that you make yourself prominent?</td>
</tr>
<tr>
<td>I talk to lots of different people at parties.</td>
<td>Would you say that you talk to lots of different people at parties?</td>
</tr>
<tr>
<td>I find it difficult to approach others.</td>
<td>How easy do you feel that it is to approach other people?</td>
</tr>
<tr>
<td>I make friends easily.</td>
<td>Would you say that you make friends easily?</td>
</tr>
<tr>
<td>I often feel uncomfortable around others.</td>
<td>How comfortable are you around other people?</td>
</tr>
<tr>
<td>I warm up quickly to others.</td>
<td>Would you say that you are someone who warms up quickly to others?</td>
</tr>
<tr>
<td>I seem to derive less enjoyment from interacting with other people than others do.</td>
<td>Do you feel that you get more or less enjoyment from interacting with people than others do?</td>
</tr>
</tbody>
</table>

| **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? |
Original IPIP Item
Conscientiousness
I follow through with my plans.
I don’t finish the things that you start.
I usually take care of my responsibilities as soon as possible.
I find it difficult to organize tasks and activities.
I complete tasks successfully.
I have difficulty keeping my attention on a task.
I like to organize things.
I hardly ever finish things on time.

Interview Item
Would you say that you typically follow through with plans you make?
Would you say that you finish the things that you start?
When you have responsibilities, would you say that you are someone who takes care of them as soon as you can?
Do you have difficulty organizing tasks and activities?
Are you someone who completes tasks successfully?
Do you have difficulty keeping your attention on tasks?
Are you someone who likes to organize things?
Are you someone who finishes things on time?

Emotional Stability vs. Neuroticism
I am relaxed most of the time.
I get stressed out easily.
I remain calm under pressure.
I panic easily.
I rarely worry.
I am moody.
I am not easily bothered by things.
I am afraid of many things.

Interview Item
Are you usually a relaxed person?
Are you someone who gets stressed out easily?
Are you someone who remains calm under pressure?
Would you say you are someone who panics easily?
Would you say that you are someone who worries a lot?
Are you a moody person?
Are you easily bothered by things?
Would you say that you are afraid of many things?

Openness
I believe in the importance of art.
I seldom notice the emotional aspects of paintings and pictures.
I have a vivid imagination.
I am not interested in abstract ideas.
I see beauty in things that others might not notice.
I do not like art.
I enjoy hearing new things.
I have difficulty understanding abstract ideas.

Interview Item
Do you believe in the importance of art?
Are you someone who notices the emotional aspects of paintings and pictures?
Do you have a vivid imagination?
Are you someone who is interested in abstract ideas?
Do you think that you see beauty in things that others might not notice?
Do you like art?
Are you someone who enjoys hearing new things?
Do you have an easy or difficulty time understanding abstract ideas?
2. Materials for Generating Explanations of High and Low 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.
Appendix B

*Items Included in Final MAP Scales*

Items are listed here in their order of highest to lowest items on the first unrotated principle component in a factor analysis, and preceded with a summary label. (R) indicates the item relates negatively to the factor. A = ability item (easy/difficulty of item), L = liking item (item is desirable/undesirable), G = goal item (person wants/doesn’t want to perform item). Items not preceded by “A” “L” or “G” are perception items rated on an agree/disagree scale.

1. **Enjoyment of Social Involvement:** G: Start conversations with other / L: Making new friends / L: Other people / L: Getting to know other people / L: Surrounding myself with other people / I tend to think that starting conversations with others will benefit me / A: Spending time in large groups of people / L: Meeting people on my own / L: Having a large group of friends / L: Being around upbeat people / L: Talking to strangers / It's important to take part in conversations in social situations / L: Making other people feel comfortable in social situations / L: Meeting people through mutual friends / G: Talk to people I don't know / A: Engaging in "small-talk" with other people / Talkative people are interesting / I think other people are usually entertaining / It's easy to be outgoing when you have a lot of friends

2. **Social Fears/Difficulties:** I am scared to speak up in social situations / A: Making friends (R) / I feel comfortable around other people (R) / A: Meeting new people (R) / Other people don't want to talk to me / I often feel that I will sound foolish in social situations / I feel that I won't be accepted by others / I am comfortable with myself (R) / A: Approaching other people to start conversations (R) / If I were to be talkative in a situation, I feel that others would criticize what I say / I am intimidated by new situations / If I keep to the background in a social situation, I'll minimize the chances that I'll embarrass myself / I am comfortable around people I don't know (R) / People who are outgoing and talkative are intimidating

3. **Desire/Ability to Gain Attention:** L: Being the center of attention / A: Making myself the center of attention / I need to be the center of attention to be comfortable / G: Be dominant in social situations / G: Get attention from others / People expect me to be the "life of the party" / L: Talking about myself / I am someone who needs a lot of social interaction / L: Doing strange things to get a reaction out of others

4. **Positive Social Interaction Skills:** A: Getting along with different people / A: Getting attention from others in positive ways / A: Knowing how to act in social situations / A: Being friendly to other people / People listen to my opinions / A: Reading people / A: Realizing how I come across to other people / Other people depend on me

5. **Desire/Ability to Lead:** L: Being a leader / A: Leading groups effectively / It’s important to step up and be a leader

6. **Desire to Have Opinions/Debate:** L: Forming my own opinions / L: Speaking for myself in social situations / L: Debating ideas with other people / G: Have others value my opinion

7. **Desire/Ability to Take Risks:** A: Taking substantial risks / L: Taking substantial risks / A: Trying new things / A: Doing things that are out of my comfort zone / G: Try new things / L: Making impulsive decisions / L: Playing it safe (R) / L: Living in the moment

8. **Desire/Ability to Express Emotions:** L: Expressing my emotions / A: Telling others about my problems / A: Opening up to other people / L: Keeping my emotions to myself (R) / G: Express my emotions when I have problems / A: Keeping my problems to myself (R)
9. **Negativity is Unpleasant/Unhelpful:** It's important not to look down on others / L: Offensive jokes$_{(R)}$ / There is no point to being rude to other people / I would feel bad if I insulted someone / It's not fair to insult other people / All people deserve respect / L: Being around negative people$_{(R)}$ / I can say things behind people's backs without any consequences$_{(R)}$ / Having a positive outlook on life is better for everyone / A: Respecting other people / You shouldn't judge other people / Offending others would gain attention for me$_{(R)}$ / A: Thinking of good insults / When I meet people, I usually see more of their bad attributes than their good ones$_{(R)}$ / It's not worth it to get revenge on others / It's important not to upset others / If I respect others, they too will respect me.

10. **Desire/Ability to Gossip:** L: Gossiping about people / A: Talking behind somebody’s back / Getting back at others in the same way they hurt you makes them realize how it feels.

11. **Concern w/ Self over Others:** I'm more concerned about myself than about other people / L: Sympathizing with other people$_{(R)}$ / I am more important than other people / A: Focusing on other people's feelings in social situations$_{(R)}$.

12. **Desire/Ability to Confront Others:** L: Confronting others / A: Saying something that is bothering me to the person's face / G: Confront others / G: Get angry at other people / L: Disappointing or angering other people / G: Come across to others as a moody person / L: Arguing with other people / G: Let others know when they have upset me.

13. **Importance of Respecting Others:** It's important to respect others / G: Be respectful of others / G: Come across as being an "angry" person$_{(R)}$ / G: Have the reputation of being a "good person" / It's important to be exposed to a lot of different ideas / My friendships are important / G: Accept people as they are / It's important to care about other people / G: Do my absolute best work / G: Offend other people$_{(R)}$ / It's important to be a good friend to others / G: Be respected by others in all situations / You miss out on valuable things if you are not open to new ideas or experiences / It's important to help other people if you can / G: Be successful in everything I pursue / It's important to learn a lot of things / G: Have confidence in myself / G: Achieve my career goals / G: Learn as much as possible / G: Get good grades in school / G: Get my work completed / It's important to make other people feel accepted and appreciated / G: Make a difference in other people's lives / G: Appear approachable to others / I don't feel the need to learn new things$_{(R)}$ / I feel expected to complete things on time / G: To be insulted by other people$_{(R)}$ / G: Understand the perspectives of others / Everyone makes mistakes / It is important to be myself / G: Help other people I know to succeed in their lives / I value people in my life more than the material things I have / It's important to be able to view things from multiple perspectives / G: Explore the world around me / I feel a responsibility to use the abilities I have / It would be boring if everyone was the same / L: Learning new things / G: Stay positive in stressful situations / It's important to sympathize with others / If I am there for people when they need me, I'll gain their trust / I feel if I say I am going to do something, I better do it / G: Have other people get to know me / G: Be seen by others as dependable / It's important to do things on time / I care a lot about the tasks I choose to take on / G: See beauty in everything / G: Allow things to bother or worry me$_{(R)}$ / L: Observing things and people / Staying calm in situations is beneficial for everyone / G: Appear as if I'm putting a lot of effort into my work / G: Manage my time wisely / Others respect people who are organized and dependable / Traveling and learning about other cultures will help me in life / If people pay attention to details, they will appreciate things more / G: Be "on top of things" at all times / It bothers me to turn things in late.

14. **Planning/Organization Skills:** A: Managing my time / A: Staying on task when there are distractions / A: Completing tasks ahead of schedule / A: Keeping track of tasks when I have a lot to do / A: Keeping my attention on tasks / A: Starting tasks I need to do / A: Planning tasks and activities in advance / A:
Following through with plans / A: Motivating myself to do uninteresting tasks / A: Doing well academically / A: Thinking rationally / A: Understanding new things

15. Acceptability of Task Distraction/Low Effort: L: Putting in as little effort as possible to complete a task / L: Being distracted from my tasks / L: Doing anything other than my work / It's more important to enjoy myself than to get my work done / A: Putting tasks aside once I've started on them

16. Need for Routine/Order: Organization is necessary / Having routines makes me feel comfortable and secure / L: Having a set routine / I find it stressful when there is not a plan / I am calmer when things or organized than when they're not / Organization makes life easier by saving time / L: Organizing things / L: Making detailed plans / I am uncomfortable if things are out of order / G: Appear as a neat and clean person to others / G: Know about plans in advance / I get stressed out if my plans change / A: Organizing things / If I don't plan things out, bad things will happen / I feel expected to be organized / L: Being a perfectionist

17. Acceptability of Breaking Commitments: G: Break plans I have made with others / G: Let other people down / I don't care about the consequences of my actions / Even if I don't do the work required of me, everything will work out in the end

18. Need/Ability to Worry About Tasks: A: Stressing about situations / I worry about my future / I am someone who needs to worry about things / I worry about messing up on school assignments / I don't worry about things I can't control / A: Keeping from getting overwhelmed by large amounts of work / I often worry about disappointing others / I get stressed out sometimes by being concerned about someone else's problems that aren't directly my own

19. Ability to Manage Anger/See Perspectives: A: Letting things go that could make me angry / A: Seeing the positive side of bad situations / A: Seeing things from other people's perspectives / A: Managing my anger / A: Putting things into perspective / A: Accepting people who are different from me / A: Adjusting when plans change / A: Getting angry at other people / A: Respecting decisions I don't necessarily agree with

20. Unconcern about Social Disapproval: A: Brushing off what other people think of me / I don’t care what others think of me / G: Have others’ approval / It bothers me when other people insult me or put me down

21. Desire/Ability to Appreciate/Create Art: A: Appreciating art / L: Interpreting and thinking deeply about art / G: Appreciate art / A: Understanding art / L: The arts (such as theater, dance, music) / Appreciating art and natural beauty will help me as a person / I find that art and music really influence me / Underlying meanings in art are important / L: Doing creative things like painting or drawing / A: Creating visual art (drawing, painting) / The people I am close to don't appreciate art / People who don't like art are boring

22. Appreciation of Abstract Ideas: L: Abstract ideas / Abstract ideas (like philosophy) are important to me / It's helpful to think in abstract terms / A: Understanding abstract ideas and concepts

23. Desire to Stand Out/Be Different: L: Standing out by being different from the crowd / G: Be different from other people / If I was different from other people, I would feel special / G: Do things my own way / L: Being a mystery to other people

24. Drive to Find Single Right Answer: It’s better to find a single right answer to an issue than to consider multiple interpretations / L: Knowing there is only one right answer to problems
### Appendix C

#### Intercorrelations Between 24 Final MAP Scales

<table>
<thead>
<tr>
<th>MAP Scale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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</thead>
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Note.  \( N = 527 \) for all cells.