

What Is Conscientiousness and How Can It Be Assessed?

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Conscientiousness is a personality construct that is a core determinant of health, positive aging, and human capital. A large body of work has contributed to our understanding of this important aspect of personality, but there are multiple conceptual and methodological issues that complicate our understanding of conscientiousness. Toward this end, we review (a) the conceptual standing of conscientiousness as a personality trait, (b) past research focusing on the underlying dimensions of conscientiousness, (c) the nomological network in which conscientiousness is embedded, and (d) the diverse methods that have been used to assess dimensions of conscientiousness. We conclude with recommendations for improving our understanding of the construct of conscientiousness, methods of assessment, and etiological underpinnings of conscientiousness. We believe this article can serve an important role in the larger goal of better understanding conscientiousness and its core role in the health of our society.

Keywords: conscientiousness, personality traits, nomological net, hierarchical structure, methods

Conscientiousness is a spectrum of constructs that describe individual differences in the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding (Roberts, Jackson, Fayard, Edmonds, & Meints, 2009). The importance of conscientiousness to health appears indisputable. Conscientiousness predicts most of the major preventative and risky behaviors for both physical health and mortality (Bogg & Roberts, 2004). Conscientiousness also predicts physical health (Hampson, Goldberg, Vogt, & Dubanoski, 2007; Moffitt et al., 2011), the onset of Alzheimer’s disease (Wilson et al., 2007), as well as longevity (Kern & Friedman, 2008), all at a magnitude similar to factors widely accepted as important health determinants, such as socioeconomic status and education (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). On the basis of these findings alone, it would be of critical importance to focus research attention on

conscientiousness, but the effects of conscientiousness apart from health are even more far-reaching.

Conscientiousness plays a role in most of the major domains of life and positive aging. Conscientiousness predicts higher achievement in both high school and college independent of cognitive ability (Nofle & Robins, 2007). It is one of the most reliable predictors of work outcomes, including job performance (Dudley, Orvis, Lebiecki, & Cortina, 2006), leadership (Judge, Bono, Ilies, & Gerhardt, 2002), income (Moffitt et al., 2011), and occupational attainment (Roberts et al., 2007). Conscientiousness also predicts marital stability (Roberts & Bogg, 2004), and conversely a tendency not to experience divorce (Roberts et al., 2007). Finally, conscientiousness is an independent predictor of major depression above and beyond other personality traits, such as neuroticism (Kendler & Myers, 2010). It seems that if one is interested in either living or promoting the possibility of a long, healthy, successful, and happy life, one should be interested in conscientiousness.

Although much is known about conscientiousness, there is much work yet to be done. Despite many years investigating and testing different trait taxonomies (Ashton, Lee, & Goldberg, 2004; De Raad et al., 2010), the lower order structure of conscientiousness has only recently become a focus of research, and the traits that make up the domain are only beginning to be identified. Moreover, our understanding of the relation between conscientiousness and important outcomes, such as health, longevity, and success in love and work, is only as sophisticated as our understanding of the construct of conscientiousness. Similar issues arise when considering important related questions, such as the genetic and developmental etiology of conscientiousness (Eisenberg, Duckworth, Spinrad, & Valiente, 2013; South & Krueger, 2013). The conse-

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quences of conscientiousness and its developmental arc can only be articulated if we understand the underlying structure of conscientiousness and know how best to assess the construct. Therefore, what follows is a review of the conceptual standing of conscientiousness as a personality trait, past research focusing on the underlying dimensions of conscientiousness, the nomological network in which conscientiousness is embedded, the diverse methods that have been used to assess dimensions of conscientiousness, and the future directions in research that are necessary to fulfill the potential of this construct.

Conscientiousness Is a Personality Trait

Most researchers are familiar with the term *conscientiousness* because of its inclusion in the Big Five taxonomy of personality traits: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness/Intellect (Goldberg, 1993). Conscientiousness is most often thought of as a personality trait, which reflects the relatively enduring, automatic patterns of thoughts, feelings, and behaviors that differentiate people from one another and that are elicited in trait-evoking situations (Roberts, 2009; Roberts & Jackson, 2008).

Speaking in historical terms, constructs associated with the domain of conscientiousness have some of the longest histories in psychology. Beginning with Freud's idea of the superego and the subsidiary concepts of the ego ideal and conscience, dispositions related to conscientiousness, such as achievement motivation and impulse control, have been studied for over 100 years. In the interim between Freud and the Big Five, related constructs were studied under terms such as *impulsivity*, *norm-favoring*, *social conformity*, and *ego control* (Block & Block, 1980). Many decades of clinical research have focused on components of psychopathology manifest in tests such as the Minnesota Multiphasic Personality Inventory that reflect low conscientiousness or disconstraint (Harkness, Finn, McNulty, & Shields, 2012; Sellbom, Ben-Orath, & Bagby, 2008). Numerous alternative descriptors have been used for the domain of conscientiousness, such as constraint, work, and superego strength (see John, Nauman, & Soto, 2008, for a review). As we have noted elsewhere (Roberts, Jackson, Fayard et al., 2009), the term *conscientiousness*, being broad and general in meaning, is well suited to represent the family of traits that define this domain.

The concept of a personality trait carries with it some unnecessary baggage that we would like to address forthwith. A common misperception of personality traits is that they denote the existence of highly heritable (e.g., 80%–90% heritable), unchangeable, and decontextualized constructs. We have provided an alternative vision of personality traits that expands on the structure, the developmental, as well as the contextual nature of traits that attempts to address these misperceptions (Roberts, 2009; Roberts & Jackson, 2008), which we summarize here. To start, although conscientiousness is heritable, the best estimate of the heritability of conscientiousness-related traits is between 40% and 50% (Krueger & Johnson, 2008). Thus, like almost all constructs studied in psychology, the majority of variance in conscientiousness is attributable to environmental influences (Krueger & Johnson, 2008). Moreover, the general heritability of a personality trait is an estimated population average value that collapses across diverse circumstances in which the heritability can be either higher or

lower than the average value. This observation signals the sensitivity of genetic effects on personality to environmental contexts (Krueger, South, Johnson, & Iacono, 2008; South & Krueger, 2013).

In addition, the assumption that traits are immutable is clearly wrong. Empirical evidence has repeatedly shown that conscientiousness, and the related constructs that fall within the conscientiousness spectrum, such as impulse control, are both changeable and continue to develop and change well into adulthood (Jackson et al., 2009; Roberts, Walton, & Viechtbauer, 2006). Though changeability should not be taken as meaning inconsistency, it is clear that personality traits retain robust rank-order consistency over time while showing slow, incremental changes from year to year (Roberts & Mroczek, 2008).

The Hierarchical Structure of Conscientiousness

Conscientiousness, like all other personality traits, is a hierarchically structured system. In terms of the hierarchy, traits can be ordered from broad to narrow. When conceptualized at the level of the broad conscientiousness domain, the trait-eliciting contexts are multifaceted because they aggregate across the component parts of the broader conscientiousness spectrum. When narrow facets of conscientiousness are examined, the contextual aspects of the specific elements of the broader domain become apparent. Self-control necessitates the presence of something tempting. Industriousness implies the opportunity to work.

Our sociogenomic model of a personality trait (see Figure 1; Roberts & Jackson, 2008) explicitly identifies the two basic levels of analysis embodied in personality dispositions—the trait level, which reflects the relatively enduring signature typical to personality traits, and the state level, which reflects moment-to-moment fluctuations in functioning (see, e.g., Fleeson, 2001; Nesselrode, 1988). The model also specifies the fact that traits are made up of three things: characteristic thoughts, feelings, and behaviors. The inclusion of all three of these categories makes it clear that traits are not reducible to behavior, which is a common claim (Bandura, 2012; Jackson, Hill, & Roberts, 2012). It also allows for a successful integration of prototypical trait models, such as the five-factor model (McCrae & Costa, 2008), and social cognitive models of personality, such as Mischel and Shoda's (2008) cognitive-affective processing system (CAPs) model. According to the sociogenomic model of personality traits, there is no real conflict between the five-factor and CAPs models of personality. The choice between a trait and social cognitive approach to personality is simply a choice of what level of analysis one wants to work at (Roberts, 2009; Roberts & Pomerantz, 2004). Trait models emphasize the level revealed over long spans of time, whereas social cognitive models emphasize the state level, or a more idiographic focus.

What then is the composition of the family of traits within the conscientiousness domain? A number of studies have examined personality descriptors and produced information on the lower order structure of the conscientiousness domain. Table 1 contains a list of relevant studies and the resulting facets of the domain of conscientiousness that were revealed. It should be said that not all of these studies set out to identify all of the lower order facets of conscientiousness; therefore, we see the aggregate set of dimensions identified as an overly inclusive start to the identification of

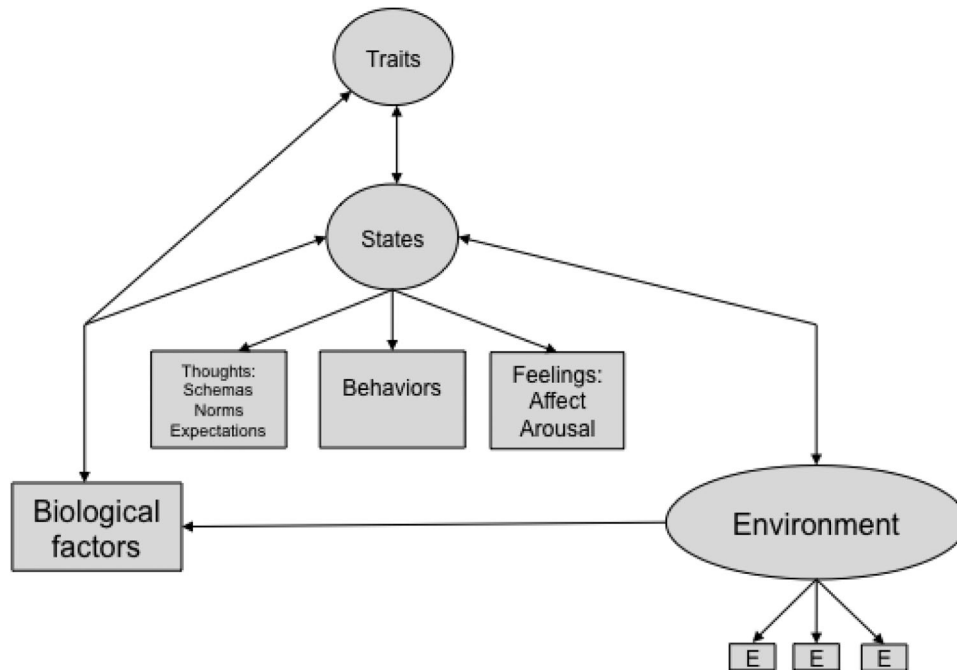


Figure 1. Sociogenomic model of personality traits (Roberts & Jackson, 2008).

the key aspects of the domain. The two most common domains are orderliness and industriousness. Orderliness encompasses the overarching tendency to be “prepared,” which includes tendencies toward neatness, cleanliness, and planfulness on the positive side, or disorderliness, disorganization, and messiness on the negative end of the spectrum. Industriousness captures the tendencies to work hard, aspire to excellence, and persist in the face of challenge. Several studies have identified a separate persistence factor (De Raad & Peabody, 2005; MacCann, Duckworth, & Roberts, 2009), which can be thought of as a construct that bridges conscientiousness and ambition, a facet of extraversion. Given that the facet of industriousness also correlates with components of extraversion (Roberts, Bogg, Walton, Chernyshenko, & Stark, 2004), it might be appropriate to categorize persistence as a form of industriousness.

The next two most common domains identified are self-control and responsibility. Self-control represents the propensity to control impulses or, in the terminology of cognitive researchers, the ability to inhibit a prepotent response. On the negative end of this facet, one finds the tendency to be reckless, impulsive, and out of control. Similarly, responsibility was identified in most of the studies listed in Table 1. On the high end of the spectrum, responsibility reflects the tendency to follow through with promises to others and follow rules that make social groups work more smoothly. On the low end, it reflects the tendency to be an unreliable partner in achievement settings and to break one’s promises. Although identified as a conscientiousness facet in most of the listed studies, responsibility measures also tend to correlate quite highly with agreeableness; therefore, its placement may shift depending on the content of the measures used to tap this facet.

Most of the remaining facets of conscientiousness have been found at least twice. Conventionalality reflects a tendency to endorse

and uphold rules and conventions found in society. Decisiveness subsumes the propensity to act firmly and consistently. Formalness reflects a tendency to follow rules of decorum, such as keeping one’s appearance neat and clean, holding doors for others, and shaking hands. Punctuality reflects the simple tendency to show up on time to previously scheduled appointments. Originally thought to be too narrow to constitute a separate facet (e.g., Roberts et al., 2004), more recent work has pointed to an intriguing feature of punctuality. Of all of the potential facets of conscientiousness, punctuality appears to be most strongly correlated with all the remaining facets of conscientiousness (Jackson et al., 2010). That is to say, being punctual appears important when considering one’s ability to plan (orderliness), work hard to get somewhere (industrious), avoid temptations that might lead one to be late (self-control), care enough to meet other people on time (responsibility), and understand the rules and conventions surrounding one’s social group (conventionality).

One conceptual question that arises when confronting a heterogeneous set of facets such as these is why are they correlated with one another? This is really a question about the etiology of conscientiousness. Historically, two opposing explanations have been provided for why these specific facets form a coherent latent dimension or domain of individual differences. The dynamical systems perspective posits that there is nothing shared in common by these disparate factors and that they arise through bottom-up processes (Cramer et al., 2012). For example, punctuality would be presumed to arise from experiences, such as having parents who teach their children to be on time for events. From this perspective, there is no reason to consider a latent dimension of conscientiousness underlying these specific factors, and the correlations among these facets arises because of direct causal relations among these facets.

Table 1
Constructs Identified as Part of the Domain of Conscientiousness in Past Research

Past research	Orderliness	Industriousness	Self-control	Responsibility	Traditionality	Decisiveness	Formality	Punctuality	Persistence	Virtue
DeYoung et al. (2007)	Orderliness	Industriousness								
Roberts et al. (2005)	Order	Industriousness	Self-control	Responsibility	Traditionalism					Virtue
Roberts et al. (2004)	Orderliness	Industriousness	Impulse control	Reliability	Conventionality	Decisiveness	Formalness	Punctuality		
Jackson et al. (2010)	Organization; Cleanliness	Avoid work; Industriousness; Laziness	Impulsivity	Responsibility			Formality	Punctuality		
Perugini & Gallucci (1997)	Meticulousness; Inaccuracy	Superficiality	Recklessness	Reliability						
Saucier & Ostendorf (1999)	Orderliness	Industriousness		Reliability		Decisiveness				
De Raad & Peabody (2005)	Orderliness	Work	Impulse control	Responsibleness					Persistence	
MacCann et al. (2009)	Tidiness; Task planning	Industriousness; Perfectionism; Procrastination refrainment	Control; Caution							Perseverance

An opposing perspective is that conscientiousness represents a coherent psychobiological construct that influences the multiple facet manifestations (Goldberg, 1993). This is the latent dimensional approach to conceptualizing personality constructs. This latter approach is supported by evidence, such as latent trait models better fitting data on the joint distribution of lower conscientiousness and the social costs of low conscientiousness (such as problems with drugs and alcohol), when compared with models that posit highly specific and categorically distinct aspects of elements in the broad domain of conscientiousness-related individual differences (see Krueger & South, 2009, for a review).

In adult samples, the two models appear to be equally valid accounts for the common variance shared among similar constructs. However, we believe there is a key piece of evidence from development research that tips the evidence in the direction of the latent trait model. Specifically, a number of studies have shown that childhood temperament, such as effortful control (Rothbart & Ahadi, 1994), predicts adult personality at nontrivial magnitudes (see also Caspi & Silva, 1995; Moffitt et al., 2011). Most tellingly, childhood dimensions of temperament, which by definition are more global and less contextualized than adult traits, show conceptually coherent correlations across the Big Five (Deal, Halverson, Havill, & Martin, 2005). For example, childhood impulsivity correlates with both agreeableness and conscientiousness in adolescence. What this indicates is that the general dimension of impulsivity in children gets differentiated through experience into the two different trait domains of agreeableness and conscientiousness. Presumably, agreeableness is the manifestation of self-control in interpersonal settings, such as being polite when someone else is being rude (e.g., being kind or “soft-hearted”). Likewise, conscientiousness is the manifestation of self-control within work settings (e.g., avoiding temptation to meet long-term goals). Similarly, we might hypothesize that the general dimension of conscientiousness gets differentiated further into specific facets such as industriousness and orderliness with time and experience, especially in childhood and adolescence.

One might question the rationale behind spending our research energies on identifying the facet structure of conscientiousness. We see three primary reasons for doing so. First, research has supported the claim that facet measures are capable of capturing criterion-related variance unexplained by broader domain measures (see, e.g., Paunonen & Ashton, 2001). Second, looking at the lower order structure allows one to better see the connections between conscientiousness and related constructs in other literatures, such as social, developmental, or clinical psychology. Third, doing so also provides a better understanding of how conscientiousness might manifest within different contexts.

Specifically, by discussing the facets, the contextual aspects of conscientiousness begin to emerge more clearly. For example, orderliness is typically manifest in homes and workplaces, not in public spaces or social interactions. Likewise, industriousness is manifest in achievement settings, which in modern society means school and work. Being responsible often necessitates contexts that include other people. Detailing the contexts intrinsic to the facets of conscientiousness is conceptually important because it helps to identify environments in which the traits are afforded the opportunity to be expressed. This level of contextualization is, as is found in broader measures of personality, typically implicit in the definitions yet explicit in the items that make up the measures.

However, personality researchers seldom openly identify these contexts.

Alternatively, one can proactively identify the contexts in which conscientiousness may be expressed. One way to capture context more explicitly is to identify the state manifestations of conscientiousness rather than the general tendencies people might use. Reflecting the traditional trait-state models and distinctions, moving to this level of specificity usually means measuring the components of a trait domain as they are manifest moment to moment. The most common approach to doing so is to use an online assessment technique, such as experience-sampling methods (ESM; Fleeson, 2001) or ecological momentary analysis (Conner, Barrett, Tugade, & Tennen, 2007). For example, Jackson et al. (2010) created a behavioral measure of conscientiousness with one goal being to provide a measure of conscientiousness that could be used with ESMs. Another statelike approach to assessing the more specific components of the conscientiousness family would be to use standardized laboratory-based computerized approaches. As these techniques assess very basic cognitive processes, decision making, or behavioral outcomes, their level of specificity is unparalleled. At a conceptual level, most of these laboratory-based approaches are intended to tap the self-control domain of conscientiousness, though it is an open question as to whether they do in fact measure conscientiousness or some other construct, such as fluid intelligence (Duckworth & Kern, 2011).

The second way to further contextualize a domain is to explicitly frame the measurement of the construct within specific roles or environments (Wood & Roberts, 2006). For example, instead of asking persons whether they are organized in general, one asks whether they are organized at work, or at home, or with friends (Roberts & Donahue, 1994; Smith, Hanges, & Dickson, 2001). Contextualizing personality measures in this fashion typically leads to a small increase in predictive validity for outcomes found in the corresponding context. It is also the case that one finds a modal correlation between the generalized and contextualized ratings that exceed 0.5 (Wood & Roberts, 2006).

The framing or contextualizing of dimensions often proceeds to a point where researchers come to see the measure as distinct from the overarching domain from which the measure emerges. Contextualizing measures to this degree happens for two well-justified reasons. First, specific theoretical frameworks are explicitly hostile to the idea of generalized dispositions. For example, self-efficacy theory, as originally proposed, avoided the role of generalized features of human nature and instead emphasized the expectations for success that emerge in very specific situations, such as when confronting fears or the academic challenges intrinsic to a specific course or topic (Bandura, 1977). Second, researchers often become interested in behaviors exhibited in very specific contexts and create measures to tap them without considering how they might be embedded in a broader nomological net.

At this time, it would be rash to categorize all of these highly contextualized measures as components of conscientiousness. In many cases, measures such as self-efficacy for achievement or exercise are seen as intervening variables between conscientiousness and behavioral outcomes (Bogg, 2008; Trautwein, Ludtke, Roberts, Schnyder, & Niggli, 2009). However, the similarities in form and function of many of these measures would warrant a systematic investigation of whether they belong to the family of constructs within the hierarchy of conscientiousness. For example,

many measures of achievement motivation, which are often framed specific to school or work situations, are both indistinguishable from broader personality measures and correlated so highly with trait measures of conscientiousness as to warrant asking whether they should be distinguished (e.g., Richardson & Abraham, 2009). We believe that one of the key agendas moving forward is to clarify the generality and specificity of these contextualized measures using sophisticated measurement systems in order to test more explicitly whether they belong to the family of conscientiousness constructs.

The Nomological Network for Conscientiousness

Readers might notice similarities between the facets discussed above and other prominent psychological constructs. Indeed, the behavioral and theoretical signature of conscientiousness coincides with numerous variables often classified with respect to their “social,” “cognitive,” or “developmental” nature, as well as other personality constructs. In fact, many constructs not typically considered “personality” have robust research paradigms that often run parallel to the work done in personality psychology. It is our contention that many of these variables should be viewed as part of the family of conscientiousness constructs, if not be seen as measuring facets of the trait. Below, we describe some of the more prominent examples from other fields, such as developmental psychology (effortful control, ego control, delay of gratification), social psychology (self-control, self-regulation), clinical psychology (impulsiveness, constraint), and positive psychology (grit).

Delay of Gratification

Delay of gratification, a prominent construct in the developmental literature, is typically thought of as a measure of one’s capability for self-control or self-regulation (e.g., Mischel, Shoda, & Rodriguez, 1989). A number of studies now have demonstrated that children differ in their ability to refrain from immediate gratification in order to receive a more desirable outcome in the future (for a review, see Mischel, Shoda, & Rodriguez, 1992). Moreover, these individual differences predict meaningful long-term outcomes (Mischel, Shoda, & Peake, 1988). These studies set the stage for recent work demonstrating that self-control during childhood predicts health, wealth, and substance use over a quarter century later (Moffitt et al., 2011). Moreover, it is worth noting that delay of gratification has been seen as a precursor or component to some forms of moral behavior (e.g., Kanfer, Stifter, & Morris, 1981; Thompson, Barresi, & Moore, 1997). Given that being conscientious often has moral implications, such as being virtuous and rule-abiding (Hill & Roberts, 2011; Roberts, Chernyshenko, Stark, & Goldberg, 2005), delay of gratification thus not only can be seen as an early predictor of conscientiousness later in life, but it also helps explain the occasionally moralistic nature of the trait.

Ego Control

Another member of the conscientiousness family with a rich history in developmental psychology is ego control. Stemming primarily from the work of Jack Block and colleagues (e.g., Block & Block, 1980; Funder & Block, 1989; Kremen & Block, 1998),

ego control refers to one's ability to inhibit impulses and delay gratification across different domains, marking a clear connection to the conscientiousness facet of self-control. Indeed, multiple studies have noted significant correlations between ego control and conscientiousness in both children (Huey & Weisz, 1997; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996) and adults (e.g., Gramzow et al., 2004; Letzring, Block, & Funder, 2005). When considering the items from one self-report ego control scale (Letzring et al., 2005), one also can see clear parallels with conscientiousness beyond just the self-control facet. For instance, individuals with less ego control respond positively to items such as "I can remember 'playing sick' to get out of something" (industriousness) and "At times, I am tempted to do or say something that others would think inappropriate" (conventionality), but negatively to items like "I am steady and planful rather than unpredictable and impulsive" (orderliness and self-control) and "I do not let too many things get in the way of my work" (industriousness). Given these clear connections, conscientiousness researchers may wish to borrow from the ego control literature in order to help present a more nuanced developmental portrayal of the trait. For instance, ego control has been conceptualized less as a trait and more as an ability that one can turn on and off as needed (see, e.g., Block & Block, 1980). This proposal may prove an interesting avenue for future work on conscientiousness, given that being overly hardworking or orderly may prove maladaptive in certain contexts (see Shanahan, Hill, Roberts, Eccles, & Friedman, 2013).

Effortful Control

Researchers have suggested that effortful control comprises an integral part of self-regulation (Carver, Johnson, & Joormann, 2008), and thus clearly has relevance to the discussion of conscientiousness. Work on *effortful control* comes largely from temperament literatures and refers to the ability to inhibit prepotent responses (e.g., Kochanska, Murray, & Harlan, 2000), and the construct has demonstrated longitudinal stability during the childhood years (e.g., Kochanska, Murray, & Coy, 1997; K. T. Murray & Kochanska, 2002). Given that impulse control is a reliable indicator of conscientiousness, it is unsurprising that effortful control measures have demonstrated consistently positive relationships with the trait (e.g., Evans & Rothbart, 2007; MacDonald, 2008). Indeed, effortful control has been thought of as a developmental predecessor to conscientiousness (Ahadi & Rothbart, 1994; Rothbart, Ahadi, & Evans, 2000), and thus clearly belongs to the nomological network of constructs for the trait.

Self-Control

One of the more obvious connections comes with respect to *self-control*, which has been defined as "the capacity for altering one's own responses, especially to bring them into line with standards such as ideals, values, morals, and social expectations, and to support the pursuit of long-term goals" (Baumeister, Vohs, & Tice, 2007, p. 351). Being categorized as a "self" variable, self-control is often studied independently of the Big Five and conscientiousness, as variables categorized in the self and identity literature tend not to carry the connotations of personality traits. That said, the definition is strikingly similar to the one used to define conscientiousness as is also the set of items used to assess self-control (Tangney, Baumeister, & Boone, 2004).

As noted above, personality psychologists often have defined self-control as a primary facet of conscientiousness, using a similar definition of the trait. Furthermore, the definition of self-control given above includes content considerably outside of the self-control facet of conscientiousness that overlaps quite strongly with the remaining facets. For example, the focus on values, morals, and social norms is more synonymous with the conventionality facet of conscientiousness. The link to facets other than self-control becomes even clearer when evaluating questionnaires that assess self-control. For example, one prominent measure (Tangney et al., 2004) includes several items viewed as "classic" indicators of conscientiousness, such as "I am lazy," "I am reliable," and "I am always on time." In fact, it is perhaps noteworthy that these are typically used to assess facets of conscientiousness such as industriousness, responsibility, and punctuality. Therefore, as it is typically conceived and measured, self-control should be viewed as lying within the domain of conscientiousness.

Self-Regulation

Work on self-regulation can be organized into two broad subfields of emotional and behavioral self-regulation. Emotion self-regulation appears to be more strongly related to the personality trait of neuroticism than conscientiousness. In contrast, behavioral self-regulation represents an extremely similar construct to self-control, and thus conscientiousness. Indeed, effective behavioral self-regulation entails being able to control one's thoughts, feelings, and behaviors in an effort to act in goal-directed ways (e.g., Hoyle, 2010), which appears quite strongly linked to both self-control and industriousness. The self-regulation literature has frequently emphasized its link to the construct of goal setting (e.g., Carver & Scheier, 1998). For example, research has noted the importance both of pursuing personal goals and giving up on unattainable goals for adaptive self-regulation (Wrosch, Scheier, Carver, & Schulz, 2003; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Accordingly, self-regulation is a construct that appears to combine the self-control and achievement-striving aspects of conscientiousness. However, it should be pointed out that most research on self-regulation focuses on the state level of the sociogenomic model. How self-regulation exists and works as a trait has not received an equivalent amount of attention.

Impulsivity

The placement of impulsivity, or its converse, impulse control, in the Big Five and other trait taxonomies has long been a vexing issue for two reasons. First, researchers have called many scales with different meanings "impulsivity." For example, originally, H. J. Eysenck (1958) included impulsivity within extraversion, but then over time carved it into its own dimension (S. B. G. Eysenck, Pearson, Easting, & Allsopp, 1985). Conceptual systems related to Eysenck's model, such as Zuckerman's work on sensation seeking (Zuckerman, Eysenck, & Eysenck, 1978), also places impulsivity close to extraversion (see also Revelle, 1997; Rocklin & Revelle, 1981). Alternatively, others have placed impulsivity in the domain of neuroticism because of an emphasis on the control of anxiety (e.g., Costa & McCrae, 1992; Goldberg et al., 2006). Of course, others have argued for impulsivity being mostly located in conscientiousness (Roberts et al., 2005).

The location of impulsivity is further complicated by a second issue, which is the multidimensional nature of the construct. Taken at face value, “impulse control” is, at the very least, two constructs: some form of impulse combined with the ability to control that impulse. We believe that much of the conceptual confusion surrounding the definition of impulsivity and impulse control derives from the fact that impulses can come in many forms—sex, food, drugs, alcohol, emotions, and even shopping. The control side appears to be less complex, having to do with the control of these impulses. That said, it is unclear whether the control of sexual urges is the same construct as the ability to control one’s urge to overeat. Unfortunately, most past work on impulsivity and impulse control has failed to take seriously the variety of impulses that can be combined with control; thus, most of the measures of impulsivity, impulse control, and even self-control hopelessly conflate the impulse and control aspect of this multidimensional domain.

The lack of specificity and multidimensionality of impulsivity is one potential reason why measures of impulsivity end up aligning with many different combinations of the Big Five. And yet, when considering the few efforts that take the multidimensionality of the domain seriously, the clear connection of impulsivity to conscientiousness comes through. For instance, Whiteside and Lynam (2001) found that extant impulsivity questionnaires generally involve four facets: sensation seeking, felt urgency, as well as the lack of premeditation and perseverance. These last two components fall squarely within the domain of conscientiousness. Indeed, one study found that both self-reported conscientiousness and peer ratings of conscientiousness correlate negatively with impulsivity, with the strongest correlation, not surprisingly, evidenced with respect to the facet of self-control (Edmonds, Bogg, & Roberts, 2009). Therefore, impulsivity (or at least some of its subcomponents) seems to locate within the conscientiousness network, although perhaps not as fully as the constructs discussed above.

Constraint

On the opposite end from impulsivity comes the construct of constraint. Temperament researchers have defined constraint as individual differences in the tendency toward planfulness and a focus on the future rather than toward risk taking and recklessness (Clark & Watson, 2008; Watson & Clark, 1993). In other words, constraint reflects at least two primary conscientiousness facets, namely, self-control and conventionality (see Roberts et al., 2005). The most popular instrument for assessing constraint from a personality perspective is the Multidimensional Personality Questionnaire (Tellegen & Waller, 2008). Work using this scale has confirmed the fact that constraint primarily reflects conscientious dispositions. For example, one study found that constraint scores correlated at a magnitude greater than .5 with overall conscientiousness and demonstrated medium to strong correlations with all six conscientiousness facets under study (Gaughan, Miller, Pryor, & Lynam, 2009). Therefore, temperament researchers can view constraint as having a clear parallel in the construct of conscientiousness, especially when one considers the full complement of underlying facets that make up the spectrum of conscientiousness.

Grit

Grit has been defined as “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007) and

appears to predict achievement in academic domains (Duckworth et al., 2007; Duckworth & Quinn, 2009). Given again that conscientious individuals tend to strive more toward goals and achievements, it is unsurprising that there also is an extremely high correlation between grit and conscientiousness ($r = .77$; Duckworth & Quinn, 2009). Although Duckworth and Quinn found some evidence that grit uniquely predicted educational attainment when controlling for the Big Five trait, clearly there are both theoretical and empirical grounds for considering grit as at least a subcomponent of conscientiousness, if not a direct measure of the broader domain.

Although the literature on the constructs above often developed largely without much mention of conscientiousness, clearly each shares core elements with facets of the trait. In this respect, one benefit of detailing the facet level of conscientiousness is that it allows greater opportunities to connect to other, highly relevant literatures. Moreover, as noted above, another benefit of identifying the lower order structure is that it allows us to see how conscientiousness plays out within specific contexts.

Methods for Assessing Conscientiousness

The methods for assessing the family of conscientiousness-related constructs are limited only by the imagination of the researchers focusing on the task. The most common approach to measure conscientiousness is through the use of self-report. In addition, self-reports can be complemented with observer ratings made by knowledgeable friends and family members (Vazire, 2006). Alternatively, researchers can use more “objective” indices, such as experimentally derived measures, or even venture to assess constructs with implicit approaches that are thought to be less susceptible to biases. We review each of these approaches below.

Self-Report Measures

Self-reports of conscientiousness constructs vary in their own way depending on the level of analysis with which researchers approach the task. The most common approach is to use global personality trait self-report ratings. Researchers often make three problematic assumptions about self-report measures. First, many people assume that personality trait ratings reflect frequency estimates of specific behaviors. In actuality, most personality inventory measures of conscientiousness encompass a mix of items tapping behaviors, feelings, and thoughts. Moreover, the items are often heuristic in nature (e.g., “I believe people should be punctual”). What can be said about broad personality inventory ratings is that they either explicitly or implicitly ask for global, stable, internal attributions (Goldberg, 1978). These global attributions are presumed to tap what researchers really want, which is evidence for a coherent pattern of thoughts, feelings, and behaviors that can be observed over many situations and over a long period of time.

Second, another common misunderstanding is how self-report items are selected for global personality scales. Some researchers mistakenly believe that items are selected for high test–retest reliability. In actuality, items are typically evaluated for internal consistency only. Presumably, the test–retest reliability of the scales is typically a by-product of asking for general, global, internal attributions.

Third, the final myth perpetrated on self-report personality assessments is that they lack validity (Lewis, 2001; Morgeson et al., 2007). The truth is far less dramatic and potentially much more interesting. Self-reports of personality are no different than any other technique or method of assessment, at least in terms of their level of validity (Roberts et al., 2007). The average validities in psychology of single variables predicting single outcomes typically ranges between .1 and .4 on a correlational metric (Meyer et al., 2001). Self-reports of personality traits are no different. Moreover, given the fact that they are only an approximation of what researchers really want to measure, it is rather impressive that they predict so many outcomes so well and so economically. Self-report personality measures have been used to predict mortality, wealth, criminality, disease progression, divorce, relationship functioning, as well as numerous indicators of well-being and psychopathology (Ozer & Benet-Martinez, 2006). Self-reports definitely benefit from being supplemented with other methods (e.g., reports from knowledgeable observers; Connelly & Hülsherger, 2012), but as a stand-alone approach to assessing personality, they deserve no more ire than any other other approach used in isolation.

Implicit Measures

A fourth viable alternative to self- or observer reports is to measure conscientiousness with implicit measures. Historically, implicit measures relied on projective tests, such as the Thematic Apperception Test or picture-story exercise (Schultheiss & Pang, 2007). As there are no functionally equivalent projective tests of conscientiousness, there appears to be little or no evidence for this type of approach. However, newer implicit assessment approaches, such as the Implicit Association Test, have been applied to the assessment of conscientiousness (Vianello, Robusto, & Anselmi, 2010). This literature appears to suggest that implicit and explicit measures of conscientiousness are relatively uncorrelated and both predict examination performance prospectively. Thus, these two methods appear to capture unrelated, yet valid variance. One of the main methodological challenges going forward is to solve the riddle these findings pose, which is, are these two types of measures really tapping the same construct, and if so, why are they uncorrelated?

Experimental or Behavioral Approaches

Finally, one can use experimental approaches to assessing constructs from the conscientiousness family. Experimental measures of conscientiousness include measures that directly assess specific behaviors of interest using standardized laboratory-based computerized tasks. Recent evidence indicates these assessments can be organized into three broad domains: impulsive decision making, inattention, and disinhibition (de Wit, 2009; Reynolds, Penfold, & Patak, 2008). Measures of decision making generally involve the participant making choices between rewards that are delayed/immediate or probabilistic/certain. Comparatively, measures of inattention do not involve the participant making choices, but rather evaluate the participant's ability to maintain alertness and receptivity for a particular set of stimuli or stimuli changes over time. Measures of disinhibition emphasize the ability to inhibit prepotent motor responses or unwanted behaviors. These three domains are uniquely sensitive to acute drug effects (see below).

Such findings illustrate the importance of a multidimensional conceptualization of these measures, similar to the factor structures identified with self-report measures of conscientiousness. Although not typically considered with measures of disinhibition, a related construct of distress intolerance also has an emerging history of behavioral assessment (Lejuez, Kahler, & Brown, 2003). These tasks are targeted at the assessment of one's ability to persist in goal-directed behavior in the context of emotional distress and can provide a model for considering the impact of in-the-moment emotional states on conscientiousness.

These experimental and behavioral measures of conscientiousness have several advantages over self-report measures for certain types of research questions. A strength of these measures is their suitability for repeated use in treatment studies and within-subjects designs (Dougherty, Mathias, Marsh, & Jagar, 2005), following appropriate methodological and/or statistical correction for learning effects and test-retest stability (e.g., using reliable change index or using alternate forms; Halperin, Sharma, Greenblatt, & Schwartz, 1991). These measures are sensitive to state-dependent change in behavior, including pharmacological, physiological, and environmental manipulation (Dougherty, Marsh-Richard, Hatzis, Nouvion, & Mathias, 2008; Swann, Dougherty, Pazzaglia, Pham, & Moeller, 2005). For example, behavioral measures reveal that administration of dopamine antagonists, alcohol and 3,4-methylene dioxymethamphetamine, uniquely affect facets of decision making, attention/vigilance, and disinhibition (Dougherty et al., 2008, 2005; Ramaekers & Kuypers, 2006) as does phase of illness in bipolar disorder (Swann, Pazzaglia, Nicholls, Dougherty, & Moeller, 2003).

Other advantages of using behavioral measures of conscientiousness include their appropriateness for use with young children and adolescents, and the availability of nonhuman animal models for many of the measures used with humans (Winstanley, Theobald, Dalley, Cardinal, & Robbins, 2006). Compared with self-report measures, behavioral procedures do not require the capacity for abstraction during the assessment beyond the task itself. Therefore, young children who may have trouble accurately completing a self-report measure can still complete most behavioral measures. For this same reason (i.e., lack of need for abstraction), many of the behavioral measures used with humans have nonhuman animal counterpart procedures (see Richards, Mitchell, de Wit, & Seiden, 1997). This ability to extend research to nonhuman animal models allows researchers to more feasibly explore certain types of questions that may be difficult to address in human studies, for example, what are the specific neural mechanisms associated with a type of impulsive behavior or drug effects on that behavior?

There also are disadvantages to using laboratory behavioral measures of conscientiousness. Chief among these difficulties is that many behavioral measures of conscientiousness are adapted from neuropsychological assessments, and thus are sensitive to neurological damage. Therefore, these measures may not be valid indicators of conscientiousness among individuals with neurological problems or intellectual disability where what may look like issues related to conscientiousness are actually issues specific to the neurological damage that may be unrelated to conscientiousness (Willner, Bailey, Parry, & Dymond, 2010). Measures that rely on some level of learning, especially decision-making tasks, also may show a deficit for those with lower education and/or IQ for these reasons as opposed to conscientiousness (Buelow & Suhr,

2009). Also, these measures, though definitionally indistinguishable from conscientiousness, are correlated with self-report and observer ratings of conscientiousness at such a low level as to question whether they measure the same construct (Duckworth & Kern, 2011; Edmonds et al., 2009). Furthermore, because behavioral assessments are still in the early stages of development, there is relatively little information available regarding the validity/utility of these measures in predicting overt behaviors and long-term outcomes.

Observer Report Measures

Observer ratings, which are typically gathered from knowledgeable informants, such as friends, coworkers, and family members, constitute a viable and often overlooked method for assessing constructs such as conscientiousness (Vazire, 2006). Like self-reports, observer ratings tend to be internally consistent, with relatively high levels of interjudge agreement (John & Robins, 1993) and equally high test–retest reliabilities (Viswesvaran & Ones, 2000). Moreover, observer reports tend to demonstrate equivalent levels of predictive validity to self-reports (e.g., Connelly & Ones, 2010; Lodi-Smith et al., 2010; Vazire, 2010).

This is not to say that observer reports are interchangeable with self-reports. As demonstrated in the Self-Other Knowledge Asymmetry model (Vazire, 2010), observer reports tend to complement self-reports in very specific conditions. For certain types of attributes, self-reports tend to be more valid. This is especially the case for psychological features that are less visible to others. In contrast, when psychological features are highly evaluative, observer ratings tend to be more accurate. And, when a personality domain is both observable and not too evaluative, these two methods appear to be interchangeable (Vazire, 2010).

ESMs

A fifth technique that reflects a move down the hierarchy to more contextualized or specific measurements of psychological domains is an experience-sampling, or ecological momentary analysis approach (Conner et al., 2007). These methods are manifested by asking people to rate their behaviors, feelings, or thoughts in real time over a prespecified period of time that typically lasts for a few days to a few weeks. These approaches are excellent for assessing what people are actually thinking, feeling, or doing, and often are accorded more respect than global self-reports (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004). Although this positive appraisal may be warranted if one is only interested in a relatively thin slice of time and psychological functioning, it is problematic when one considers other levels of analysis in the personality hierarchy. Assessing an individual for a few days or weeks can hardly make it possible to gain the type of information necessary to infer a trait, for example. Furthermore, studies that have assessed constructs using ESM and global approaches typically find that they are modestly related (Jackson et al., 2010) and provide independent sources of validity (Wirtz, Kruger, Napa-Scollon, & Diener, 2003).

Challenges and Future Directions

Conscientiousness plays multiple roles in determining health, wealth, longevity, as well as happiness and psychological adjust-

ment (Roberts et al., 2009). Given the importance of conscientiousness, it is imperative that research continues to clarify, enhance, and push forward our knowledge of this domain. In closing, we outline directions we believe research should take in the coming decade consistent with our review. We foresee four critical goals concerning (a) further enhancing our understanding of the domain of conscientiousness; (b) improving the measurement of conscientiousness; (c) reconciling the links between conscientiousness and motivation; and (d) identifying the developmental etiology of conscientiousness.

Further Enhancing our Understanding of the Domain of Conscientiousness

Some may believe that with the advent of the Big Five personality trait structure and the publication of numerous measures intended to measure each of these trait domains that the work has already been done identifying the key components of conscientiousness. We do not believe this to be the case. No existing omnibus personality inventory covers the broad array of dimensions that have been associated with the domain of conscientiousness (Roberts et al., 2005).¹ The Big Five is an organizational taxonomy, delineating the broad domains of normal range personality variation. It is not a comprehensive account of all the narrow, facet-level traits within those domains. As our review showed, further work on delineating the entire family of traits contained in the domain of conscientiousness would be useful because these narrowband traits often carry predictive utility beyond the utility of the broad domain.

Three challenges await future research focusing on identifying the family of conscientiousness dimensions. First, basic work on the lower order structure needs to continue, largely to help clarify which constructs are core members of the conscientiousness family, which constructs are close relatives, and which constructs are unrelated. This type of basic science research is critical as clarifying the content domain of conscientiousness is necessary for the remaining agendas going forward. If we do not have a clear picture of the phenotype of conscientiousness and its constituent elements, then work on other issues, such as the development and/or physiology or genetic architecture of conscientiousness, will be undermined.

The basic work on the construct of conscientiousness should continue to assess adjectival, behavioral, attitudinal, and affective domains and preferably do so across major language families (Saucier, 2009). Also, this type of work must confront issues that have been ignored to date, such as by what standard do we judge something to belong to a family or domain of constructs? The classic multitrait–multimethod approach has limited value as there are only rules of thumb concerning what level of correlation is equitable to convergence. New theoretical and conceptual psychometric work along the lines of clarifying whether a construct belongs to a domain or not would be very helpful to the effort to determine just which constructs belong to family of conscientiousness-related traits.

The second challenge to the “what” question concerns the vertical integration of the domain. Just as identifying the broad content areas within conscientiousness is important, it is equally

¹ Hill and Roberts (2011) have published a measure that assesses five of the replicable facets of conscientiousness itself.

important to examine the manifestations of these content domains at multiple levels of analysis. For example, responsibility felt toward one's parents or friends is the focus of adolescent research, as these very contextual feelings can be strongly related to many positive outcomes (Wood, Larsen, & Brown, 2009). However, the extent to which feelings of filial responsibility are linked to conscientiousness and may actually be a component of the trait family of conscientiousness remains unknown. It may be that the variance in filial responsibility linked to adolescent functioning is entirely attributable to the global domain of conscientiousness. Therefore, it would be prudent to garner a better understanding of the contexts that interface with conscientiousness and how they constrain expression of the domain.

The third challenge for the "what" question concerns multidimensionality versus unidimensionality, with special attention to impulse control. Impulse control is especially problematic because so many different measures have been described as measuring the domain (DeYoung, 2011). When considered in total, the domain of impulse control is clearly multidimensional because so many different constructs have been described as measuring the construct. In addition, many widely used measures of impulse control are themselves multidimensional (Whiteside & Lynam, 2001). To this end, it is important to get a better understanding of how constructs better thought of as a composite of several relatively unrelated constructs (e.g., a syndrome) rather than as a unitary dimension are and are not related to conscientiousness. As noted above, one place to start would be to disentangle the impulse side of the construct from the control side. This may bring greater clarity to important issues, such as the link between conscientiousness and clinical psychopathology.

Improving the Measurement of Conscientiousness

The second major area of focus for future research is how to measure dimensions related to the domain. To date, the methods used to assess conscientiousness-related constructs are problematically correlated with level of analysis and multidimensionality. That is, most self-report or observer approaches focus on broad, traitlike dimensions, and most experimental, behavioral approaches assess very contextualized aspects of conscientiousness. Given the distinct inconsistency in the correlations across these methods (Duckworth & Kern, 2011; Edmonds et al., 2009), it is imperative that more research focuses on trying to bridge the gap across these approaches. It would help if future research could identify behavioral measures that start with an understanding of the domain of conscientiousness, rather than starting with a tractable experimental method.

We like to refer to this dilemma as the *adult marshmallow task problem*. In the seminal work on children's delay of gratification, conscientiousness-related traits were assessed by tempting young children with marshmallows (Mischel et al., 1992). Children who gave in to the temptation to eat the marshmallows were deemed to be low on delay of gratification. The challenge for future research is to identify an equivalent to the marshmallow task that is just as compelling for adults. We doubt very much that the experimental approaches developed to date are in any way analogous to the marshmallow task. Not responding to a tone when asked (e.g., go, no-go) is hardly as emotionally compelling as refraining from eating a tempting marshmallow to a 5-year-old. It is clear that

adults face many similar challenges to the marshmallow task in their day-to-day lives (e.g., not eating desert after dinner), but moving these types of dilemmas into the lab has proved challenging. Some work has begun on this front (Forstmeier, Drobetz, & Maercker, 2011), but like much previous research, the experimental tasks show strikingly small correlations with typical measures of conscientiousness. We hope that work continues on this front, as more objective indicators of conscientiousness would help to overcome trenchant criticisms of more subjective methods of assessing the construct.

Reconciling the Relation Between Conscientiousness and Motivation

One of the long-standing issues for the field of personality psychology is the divide, or lack thereof between traits and motives (Winter, John, Stewart, Klohnen, & Duncan, 1998). This issue is especially true for the trait of conscientiousness, as many researchers have referred to conscientiousness as a "motivational trait" (Roberts et al., 2009). Other models place motives at the core of the trait system, acting on feelings and behaviors (Funder, 1991), whereas other personality systems simply omit traits and claim that all behavior is generated by some as yet unidentified underlying motivation. The latter does nothing to help researchers, as it means there is no counterfactual to motives as explanations of behavior. Thus, it puts us right back where psychology started, with Freud, and circular ideas that could not be disproved. In contrast, a number of theoreticians draw a line between traits and motives and have argued that they are conceptually and empirically distinct (McAdams & Pals, 2006; Roberts & Wood, 2006; Winter et al., 1998). The lack of clarity on this issue can lead to confusion, as some researchers may believe they have measured both conscientiousness and motivation with a simple Big Five inventory. Conversely, many motivation researchers believe they have measured something distinct from the Big Five, but have mistakenly assessed a simple facet of conscientiousness without tapping anything motivational. For example, motivations have been proposed as mediators between conscientiousness and job performance (Barrick, Stewart, & Piotrowski, 2002), yet the measures of goal setting used in these studies assess stable, global, internal attributions of work style, not what a person wants or desires. Some serious thinking is due on the front of reconciling traits and motives.

The task of differentiating and/or integrating conscientiousness and motivation would be made easier if several issues were addressed directly. For example, there is no widely accepted taxonomy of motivation. Early work based on H. A. Murray's (1938) system of needs started with an extensive list of motivations, as there was, and still is, little clarity on how to measure motivation. The resulting efforts to measure Murray's needs appeared to be derailed by a quirk of assessment history in which the measures created to assess these motives inadvertently ended up measuring traits instead (Costa & McCrae, 1988). Early psychodynamic researchers honed in on three motives (power, achievement, and affiliation) with little or no attempt to argue that these are the only three worth studying. Another example is the recent work in self-determination theory, in which it has been argued that a limited set of universal motives (autonomy, competence, and relatedness) guide most behavior (Deci & Ryan, 2000). In addition,

there are many theories of motivation that focus on particular domains, such as achievement, work, or school (e.g., Eccles (Parsons), Adler, & Meece, 1984; Elliott & Church, 1997), and it is unclear where these overlap with broader systems. Finally, an even broader and more inclusive perspective on motivation would include constructs like interests and values (things people desire). Future research that attempts to bring clarity to this confusing array of constructs would need to also include these additional constructs.

Another challenge in reconciling the link between conscientiousness and motivation revolves around the methods used to assess motives. On one hand, some approaches to studying motivation are quite doctrinaire. Psychodynamic-inspired systems, for example, exclude self-reports entirely and typically rely on behaviors expressed in response to ambiguous stimuli (e.g., Schultheiss, 2008). Tying the definition of constructs so tightly to specific methods invites serious limits to any prospect of reconciling differing constructs that are measured in distinctly different ways. First, as noted above, convergence across measurement modalities is typically modest to begin with, so tying a concept to a specific method automatically hinders the ability to find convergence. Second, it creates problematic methodological confounds. For example, motivations from a psychodynamic perspective are often only accessible through interpreting behavior. Limiting motivation to behavior creates challenging identification problems. Motives would then be indistinguishable from personality traits as they both include behavior as part of their definition—though based on our definitions, personality traits include more. Moreover, limiting the operationalization of motivation to only behavior creates a problematic causal circularity (e.g., He talked, therefore, he was motivated to talk).

On the opposite end of the spectrum is the plurality of methods used by many researchers to assess motives. Researchers have used everything from ratings of goal importance; to effort expended in pursuit of goals; to semistructured projective tests; to typical thoughts, feelings, and behaviors—with the latter being problematically similar to how personality traits are assessed. This lack of clarity on how best to assess motives further complicates our ability to understand the interface between constructs, such as conscientiousness, and motivation. Hopefully, future research can clarify the methodological confounds that inhibit a clear exposition of the links between personality traits and motives.

Identifying the Developmental Etiology of Conscientiousness

Finally, research on the developmental etiology of conscientiousness would be especially important. Clearly, this would include research on genetic contributions to individual differences in conscientiousness. With new advances in behavior genetics and genotyping technology (McGue, 2011), it appears that much interesting research is near at hand, albeit there are also extraordinary challenges inherent in linking the multiplicity of measurable genomic difference with psychological individual differences (South & Krueger, 2013). Several ideas may enhance these more biologically focused efforts. Better knowledge of the physiological systems involved in conscientiousness may inform the hunt for genetic links. Rather than approaching the task atheoretically, research could focus more closely on physiological systems in-

involved in individual differences in conscientiousness. For example, research on the immune system and its links to loneliness has provided far more informative and replicable genetic information than hunting for the loneliness gene using candidate gene and genomewide association study approaches (Cole, 2008). Genes relevant to immune response have been identified, such that it has been possible to show how those genes are expressed differentially depending on whether people are lonely versus socially integrated (Cole, 2008). A similar approach with conscientiousness may be profitable. One possible area of interest would be to know whether the genes known to impact physical health are expressed differently in persons who are higher versus lower on conscientiousness.

There is also a need for more research examining the environmental constraints and facilitators of genetic effects. Research analogous to the work examining how parent–child relationships can affect the etiology of neuroticism (Krueger et al., 2008), focusing on the developmental environmental antecedents to conscientiousness, would be very informative. The latter idea highlights a glaring fact that needs further attention; very little is known about how someone arrives in adulthood possessing any form of conscientiousness. Well-informed longitudinal studies tracing the development of conscientiousness and its formative antecedents from childhood to adulthood would appear imperative. Combining these types of studies with a genetically informed research design would be ideal.

Conclusion

Further research on conscientiousness is warranted by the impressive predictive capability of the trait. Indeed, the fact that conscientious individuals fair better on several important life outcomes should motivate researchers toward advancing our understanding of the trait. To this point, a foundation has been laid with respect to what conscientiousness is and how we should measure it. However, the challenge now is to build on this foundation as well as to use it as a basis for investigating the developmental, physiological, and genetic character of conscientiousness. Put differently, now that we know what conscientiousness can do, we must progress toward a better understanding of what it is and where it comes from.

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