Several aspects of personality have robust prospective associations with subsequent physical health (Strickhouser, Zell, & Krizan, 2017). This research supports centuries-old speculation and clinical observation that the stable patterns of thought, emotion, and behavior comprising personality influence physiological functioning and ultimately the development of disease. In the prevailing psychobiologic or psychosomatic view, personality influences physiological stress responses, which in turn contribute to disease. In a second major pathway, personality influences health-relevant behavior (e.g., exercise, diet, substance use, adherence to medical treatment, utilization of preventive care), which alters risk of physical illness.

In recent decades of research on this topic, stronger approaches to the conceptualization and measurement of personality constructs are becoming routine, as is the utilization of rigorous prospective designs and objectively assessed health outcomes (Smith, Williams, & Segerstrom, 2015). Given these methodological improvements, this area has an expanding role in biomedical and biobehavioral sciences generally, and in health psychology in particular.

As impressive as this progress has been, the maturing study of personality and health faces further challenges. Expanding the evidence base will require greater integration of ongoing developments in personality science. Questions regarding the place of personality among other psychosocial influences on health (e.g., social functioning) point to a need for broader integrative perspectives. Finally, research on personality and health ultimately faces a challenge in supporting useful applications that can help to prevent or manage disease, and enhance health. This chapter provides an overview of traits that predict health outcomes, mechanisms underlying the associations, and conceptual and methodological approaches to current and future challenges.

**Traits Linked to Health**

In the mid-20th century, psychodynamic approaches to personality and health examined associations of unconscious processes with specific diseases, such as intra-psychic conflicts regarding anger expression and the development of essential hypertension. Limitations in the assessment of unconscious personality factors and a reliance on cross-sectional studies of clinical populations with existing disease limited the impact of this work (Holroyd & Coyne, 1987). The modern era of personality and health research can be dated to descriptions of the Type A behavior pattern (Friedman & Rosenman, 1959) and psychological hardiness (Kobasa, 1979). Rapid growth in recent decades has included
a wide variety of personality characteristics. In this selective review, we include those areas with strongest evidence of associations with health.

**The Type A Legacy: Hostility, Anger, Antagonism, and Dominance**

Competitiveness, achievement-striving, impatience, hostility, and vigorous (i.e., loud, emphatic, rapid, interrupting) speech define the Type A behavior pattern, once formally accepted as an independent risk factor for coronary heart disease (CHD; Cooper, Detre, & Weiss, 1981). Subsequent inconsistencies in this literature were in part due to the fact that interview-based behavioral measures of Type A predicted CHD more consistently than did self-reports, and the two types of measures were minimally related (Miller, Turner, Tindale, Posavac, & Dugoni, 1991). In response to these inconsistencies, research examined the individual elements of the broader Type A pattern, and hostility and related traits (e.g., anger, antagonism) were found to be best predictors of CHD (Chida & Steptoe, 2009). Although hostility is often considered the “toxic element” within the Type A pattern, at least one other characteristic predicts CHD and overall mortality risk. Specifically, the vigorous speaking style is an independent predictor (Houston, Babyak, Chesney, Black, & Ragland, 1997), consistent with studies in which a dominant interpersonal style predicts CHD and underlying coronary atherosclerosis (Siegman et al., 2000; Smith et al., 2008).

**Neuroticism, Negative Affectivity, and Emotional Stability**

Neuroticism (N) refers to the tendency to experience negative emotion and related patterns of thought and behavior. This trait overlaps with negative affectivity (NA), though the latter has a narrower focus on emotional responsiveness. The objective health consequences of N/NA were initially difficult to establish because this trait predicts excessive somatic complaints or illness behavior in the absence of physical illness (Costa & McCrae, 1987; Matthews, 1988). However, subsequent research indicates it is a robust predictor of adverse objective health outcomes (Graham et al., 2017). Beyond studies of the broad N/NA trait, other research has examined specific facets or elements and related symptoms of emotional disorder (e.g., anxiety, depressive symptoms). Depressive symptoms and disorders predict CHD development (Gan et al., 2014) and an adverse course (e.g., reduced survival) among CHD patients (Meijer et al., 2013), as do self-reported stress (Richardson et al., 2012) and anxiety symptoms and disorders (Celano et al., 2015; Edmondson, Kronish, et al., 2013; Roest, Martens, de Jong, & Denollet, 2010). These symptoms also predict diabetes (Knol et al., 2006) and HIV progression (Leserman, 2008).

**Extraversion and Positive Affective**

The health consequences of extraversion are often combined with the effects of positive emotionality, given that the tendency to experience positive affect is a core element of this broad trait, along with sociability, activity level, excitement seeking, and assertiveness. These traits are generally associated with longevity and other positive health outcomes (Boehm & Kubzansky, 2012; Chida & Steptoe, 2008; R. Cohen, Bavishi, & Rozanski, 2016; Graham et al., 2017).

**Conscientiousness**

This trait is a core element or foundation of self-regulation, and includes the tendency toward organization, persistence, discipline, order, and competence in daily activities. Conscientiousness predicts longevity in both initially healthy groups and those with preexisting illness (Graham et al., 2017; Jokela, Pulkki-Rabak, Elovainio, & Kivimaki, 2014; Kern & Friedman, 2008; Roberts, Kuncel,
Personality and Health

Shiner, Caspi, & Goldberg, 2007). As described previously, studies of conscientiousness provide perhaps the strongest evidence of health behavior as a mechanism linking personality and subsequent health (Turiano, Chapman, Gruenwald, & Mroczek, 2015).

Openness to Experience

The broad trait of openness to experience includes curiosity, imagination, attentiveness to inner experience, and flexibility in thinking and behavior. Higher openness predicts longevity and reduced all-cause mortality (Iwasa et al., 2008; Taylor et al., 2009) and less HIV progression (Ironson, O’Cleirigh, Weiss, Schneiderman, & Costa, 2008). Some of these beneficial effects are limited to a subset of openness facets (Jonassaint et al., 2007) or limited to subgroups of individuals (Graham et al., 2017).

Optimism

Dispositional optimism is defined as stable and general positive expectations about future events (Carver, Scheier, & Segerstrom, 2010). Compared to their more pessimistic counterparts, optimists have lower risk for cardiovascular disease (Boehm & Kubzansky, 2012; Kim, Park, & Peterson, 2011) and greater longevity (Tindle et al., 2009), although some null results have been reported (Chida & Steptoe, 2008). Some of the inconsistency may reflect the fact that the various measures of optimism are not closely correlated (Norem & Chang, 2001).

Hardiness and Sense of Coherence

The concept of psychological hardiness (Kobasa, 1979) as a source of personality-based resilience to the adverse effects of stress on health had a major impact on the field, although subsequent research suggested much of the supportive findings suffered from limitations associated with measures of hardiness and health outcomes (Funk, 1992). However, this seminal work contributed to related studies that have produce stronger evidence. For example, sense of coherence (SOC) is a personality characteristic in which individuals hold general and stable beliefs that their lives are manageable and meaningful. SOC predicts lower risk of cardiovascular disease and all-cause mortality (Surtees et al., 2006).

Type D Personality

The Type D or distressed personality (Denollet et al., 1996) combines high negative affectivity (NA) and social inhibition (SI), with the synergistic prediction that high levels of both traits confer increased risk of cardiovascular disease and other adverse health outcomes. In practice, this predicted interaction has rarely been tested directly. Instead, Type Ds have been compared to all other groups, a form of statistical test that makes it impossible to distinguish the effects of the specific Type D combination from the simple effects of either NA or SI alone (Smith, 2011). Although a recent meta-analysis suggests that Type Ds are indeed at higher risk, this effect seems to be weakening over time (Grande, Romppel, & Barth, 2012) and direct tests of the predicted interaction between negative affectivity and the social introversion have not been significant (Coyne et al., 2011). Thus, it is possible that much of the Type D literature is best seen as reflecting the effects of high N/NA and/or low extraversion.

Mechanisms Linking Personality and Health

Identification of robust associations between personality and subsequent health raises the question of mechanisms. Understanding how personality influences the development and course of physical
illness not only helps answer long-standing questions about psychological influences on disease, but also can identify targets for intervention.

**Stress Moderation**

In the hypothesis that personality influences health by way of its effects on physiological stress responses, personality is seen as altering appraisals and affective responses, which in turn impact physiological responses. Research emphasizes cardiovascular, neuroendocrine, and immunological aspects of the stress responses, mediated by the sympathetic adrenomedullary (SAM) and hypothalamic-pituitary-adrenal cortical systems (HPA axis) (see Chapters 5 and 16). Other components of the stress response have received growing attention, such as inflammatory aspects of the immune system and the parasympathetic nervous system (PNS), as measured by high frequency heart rate variability (hHfHRV) or respiratory sinus arrhythmia (RSA). Generally, heightened reactivity (i.e., larger responses) is presumed to confer risk of disease, although blunted reactivity has been identified as an indicator of unhealthy regulation (Lovallo, 2011).

Among traits that predict disease risk, anger and hostility are associated with larger SAM and HPA system responses to relevant stressors, as indicated in cardiovascular and cortisol reactivity (Chida & Hamer, 2008; Smith, Glazer, Ruiz, & Gallo, 2004), and trait dominance has similar effects (Newton, 2009). Although trait NA or neuroticism is often associated with less cardiovascular reactivity (Chida & Hamer, 2008), it is associated with heightened inflammation and other indications of altered immune system reactivity (Segerstrom & Smith, 2006).

The prevailing emphasis on stress reactivity has been elaborated in more comprehensive views of overall physiological burden or allostatic load (McEwen, 1998) linking personality and disease (Williams, Smith, Gunn, & Uchino, 2011). For example, personality influences stress exposure. Yet, the basic design of reactivity studies precludes capturing effects of personality on exposure to stress, because standardized stressors are presented in an identical manner to all participants. Although quite useful, this approach likely underestimates personality effects (Williams et al., 2011), because it relies on what has been called the implacable experimenter (Wachtel, 1973). To identify personality factors that predict individual differences in reactivity to stressors, it is essential that all research participants encounter precisely the same stressor—the experimenter’s behavior and other aspects of the task cannot vary at all in response to the participant’s actions.

But one important reflection or consequence of personality is its effect on the social environment. For example, hostile or antagonistic persons may experience more frequent and severe interpersonal conflicts, because of their cognitive (e.g., mistrust, perceptions of hostile intent in others), emotional (e.g., anger, contempt), and behavioral (e.g., quarrelsome, blame, criticism) reactions during everyday life (Smith et al., 2004). Because interaction partners are not restrained to be implacable, hostile persons often evoke hostile responses from others. Through such transactions, they create environments that include more frequent, severe, and prolonged difficulties with others, which in turn promote more frequent, severe, and prolonged episodes of physiological activation. They also reduce the frequency, magnitude, and duration of beneficial physiological responses, such as the parasympathetic correlates of felt safety and pleasant social engagement (Thayer & Lane, 2009). Beyond these external events, personality also alters exposure to the internal stressors of anticipated or recalled events (i.e., worry, rumination), an important covert source of overall activation (Ottaviani et al., 2016).

Among traits linked to health, neuroticism is broadly associated with greater stress exposure, spanning the range from major life events (e.g., divorce) to minor daily stressors or hassles to chronic stressors such as marital and family conflict to heightened rumination (Bolger & Zuckerman, 1995; Suls, Martin, & David, 1998). Trait hostility and anger are also broadly associated with greater stress exposure (Smith et al., 2004). In contrast, traits associated with better health are associated with less stress exposure; conscientiousness and optimism are associated with reduced...
exposure to difficulties in intimate relationships (Roberts & Bogg, 2004; Smith, Ruiz, Cundiff, Baron, & Nealey-Moore, 2013).

After encounters with stressors, individuals vary in the rate and degree of stress recovery, or the return of physiological systems to the prior resting state (Brosschot, Gerin, & Thayer, 2006). Hence, poor stress recovery is another way personality contributes to physiological burden. Both trait hostility and neuroticism have been linked to poor recovery (Anderson, Linden, & Habia, 2005; Chida & Hamer, 2008). Finally, personality traits are also linked to stress restoration, or the degree to which individuals display processes that “refresh, buttress, and repair various forms of cellular damage” (Cacioppo & Berntson, 2007). Sleep is a central source of such restoration, as when blood pressure falls below daytime levels during “nocturnal dipping.” Neuroticism and hostility predict poor sleep, whereas conscientiousness and optimism are associated with better sleep (Brissette & Cohen, 2002; Gray & Watson, 2002; Uchino et al., 2017; Williams & Moroz, 2009).

Figure 14.1 depicts the overall response across these four sources of activation, as related to personality. In the three panels reflecting varying degrees of risky versus resilient personality traits, the vertical axis represents the degree of physiological activation (e.g., rising and falling blood pressure); the horizontal axis reflects stress exposure over the course of a day. In response to the first stressor, which has the same magnitude and duration for all three individuals (e.g., traffic congestion during the morning commute), the high risk/vulnerable personality shows greater physiological reactivity and delayed recovery, resulting in more physiological burden (i.e., area under the curve), compared to the typical personality. The low risk/resilient personality shows lower reactivity and more rapid recovery. These differences in physiological response to objectively identical stressors are augmented across the day by the degree of stress exposure, where the high-risk personality experiences more frequent, severe, and prolonged stressors. These greater exposures include external events (e.g., conflicts with others) due to transactional processes, and the mental rehearsal of such events (i.e., worry,
In contrast, the low-risk personality experiences fewer, less severe, and briefer stressors. The resulting differences in overall daytime physiological activation are augmented further by differences in the degree of nighttime physiological restoration (e.g., nocturnal blood pressure dipping). The three panels reflect quite distinct levels of overall physiological activation or burden from the combined differences in reactivity, recovery, exposure, and restoration associated with personality.

**Health Behavior**

Personality factors are consistently related to health habits that are well-established predictors of morbidity and mortality (Sutin et al., 2016). For example, (low) conscientiousness is associated with greater smoking, alcohol use, behaviors related to obesity, and medication adherence (Bogg & Roberts, 2004; Molloy, O’Carroll, & Ferguson, 2014), and in mediational analyses these health behaviors contribute to the association of this trait with mortality risk (Hampson, Goldberg, Vogt, & Dubanoski, 2007; Turiano et al., 2015). Health behavior may play a similar role in the health effects of negative affect and hostility (Appleton et al., 2016).

**Constitutional Predisposition: Personality and Health as Co-Effects**

Third variables could account for associations between personality and health. A unique class of third variables are neurobiological substrates of the emotional, cognitive, and behavior processes comprising personality and overlapping brain substrates of reactivity. Quantitative genetic studies demonstrate substantial heritable variance in these processes and their covariation (Plomin, DeFries, Knopik, & Neiderhiser, 2016; Wu, Snieder, & de Geus, 2010), and molecular genetics and neuroscience are continually refining our understanding of biological underpinnings of personality (Canli, 2006). Hence, it is possible that personality and subsequent health are co-effects of underlying biological predispositions, rather than personality exerting a causal influence over health. Specific brain structures and circuits have been identified as the possible bases of such vulnerabilities (e.g., Gianaros et al., 2017). However, through transactional processes, genetically based biological vulnerabilities can become correlated with environments that potentiate health impacts. That is, individuals with biological vulnerabilities that include heightened stress reactivity may be more likely to behave in ways that increase their exposure to internal and external stressors, exposures to which they are particularly vulnerable given their reactive tendencies.

**Conceptual and Methodological Considerations**

For most of the traits linked to health, the accumulating evidence includes at least some inconsistent results, creating a need for methodologically compelling replication attempts and quantitative integration of existing studies that summarize the overall evidence and examine sources of inconsistency. Further, within the growing proliferation of traits studied as predictors of health outcomes, specific characteristics are typically studied separately, posing a challenge in the identification of the key dimensions that predict health. Much of this inconsistency and lack of integration can be addressed through greater incorporation of current personality science in the conceptualization and measurement of personality and other aspects of methodology.

**Personality and Other Aspects of Psychosocial Risk: An Interpersonal Integration**

Personality and health research often proceeds independently of other psychosocial influences on health. Notable among these is the literature demonstrating that personal relationships (e.g., social...
support, conflict in close relationships, social isolation) are robust predictors of health (Holt-Lunstad, Robles, & Sbarra, 2017). In most models, personality characteristics are distinct from social functioning. Yet, virtually all personality traits that predict health are associated with health-relevant aspects of social functioning, including support, conflict, isolation, and disruption (i.e., separation, divorce) (Smith, Baron, & Grove, 2014; Smith & Baucom, 2017). Conversely, aspects of social functioning known to influence health have robust associations with personality. Hence, integration across psychosocial domains is clearly needed.

The interpersonal perspective in personality, social, and clinical psychology (Pincus & Ansel, 2013) provides an integrative framework (Smith et al., 2004; Smith, Traupman, Uchino, & Berg, 2010). The interpersonal circumplex (IPC) depicted in Figure 14.2 is a key component of this integrative approach. In this structural model, individual differences in social behavior can be described as blends of two dimensions, affiliation and control, which are rotational variants of the two traits in the five-factor model of personality (Digman, 1990) most closely related to social behavior. Specifically, extraversion (vs. introversion) is characterized by warm dominance in the IPC (i.e., high affiliation and high control), whereas agreeableness (vs. antagonism) reflects warm submissiveness (i.e., high affiliation, low control) (Traupman et al., 2009). Because the IPC dimensions can describe stable individual differences in social behavior (i.e., personality traits) and both momentary and stable aspects of social situations and relationships, the same set of conceptual coordinates and assessment procedures can be used to describe, measure, and ultimately integrate a wide range of psychosocial factors (Smith et al., 2010, 2014). Generally, personality traits, characteristics of social environments, and qualities of personal relationships that confer health risk are located on the left (hostile) side of the IPC, and those that confer protection or resilience are on the right (warm) side. The IPC sheds light on specific personality risk factors. For example, hostility (i.e., low affiliation) and dominance describe two distinct unhealthy elements within the original conceptualization of the broader Type A pattern.

Two other aspects of the interpersonal perspective describe mechanisms underlying the association of personality risk and resilience factors with aspects of social environments. First, the principle
of complementarity (Pincus & Ansell, 2013) describes consequences of expressive behavior. In general, warmth invites and tends to evoke warm responses from others. In contrast, expressions of hostility invite and tend to evoke hostility. Expressions of dominance invite deference or submission, and submissiveness invites dominance. However, dominance sometimes evokes dominance, as when status and control are contested by others (e.g., competitiveness) rather than granted (e.g., deference) (Cundiff, Smith, Butner, Critchfield, & Nealey-Moore, 2015. From this perspective, associations of personality traits such as hostility and aspects of neuroticism or negative affectivity (e.g., anxiety, anger, and depression) with the well-established psychosocial risk factors of low social support and high levels of interpersonal conflict are expected, given their robust association with a cold or hostile expressive style (Smith et al., 2010). In understanding health risk and protective factors, personality characteristics might be important at least in part because they are consistently associated with health-relevant aspects of social environments and relationships. Those social or interpersonal risk factors might be sufficiently pervasive and stable to influence the development and course of chronic disease because the individual's personality ensures exposure over long periods of time.

The processes underlying stable associations between the domains of personality and social relationship factors are described in the Transactional Cycle, another key element of the interpersonal perspective (see Figure 14.3). Internal or covert elements of personality (e.g., beliefs, appraisals, goals, etc.) guide an individual's expressive behavior, varying along the affiliation and control IPC dimensions. Such expressions alter the internal experience of interaction partners, making some responses more or less likely, as in the complementarity principle. In this way, individuals shape and maintain recurring patterns of interpersonal experience (i.e., aspects of social contexts and relationships) that are consistent with their personalities (Pincus & Ansel, 2013). The elements of the transactional cycle are similar to elements of the social cognitive perspective in personality (Mischel, 2004). These active elements or personality processes, as opposed to more stable or static traits, are essential in understanding how personality comes to influence important life outcomes such as health and well-being (Hampson, 2012).

**Personality Measurement**

A common problem is that measures of a given personality trait vary across studies examining its association with health. In some cases, item content and measure labels are the primary basis on which statistical associations with health (or the absence of associations) are presumed to reflect the construct of interest. This creates what Block (1995) labeled the “jingle” and “jangle” fallacies. In the former, measures that “sound alike” (i.e., “jingle”) are interpreted as reflecting the same construct, even if they in fact are weakly correlated, if at all. The jingle fallacy can lead to a false inconsistency in statistical associations of a given characteristic with health outcomes across studies; disparate results might indicate that the personality measures used do not assess the same risk factor, despite the scale labels. Use of structured interviews with behavioral ratings as well as several different self-report methods to assess Type A behavior was a likely contributor to the inconsistent associations of this risk factors with CHD.

In the jangle fallacy, scales with distinct-sounding labels are presumed to assess distinct constructs, creating the possibility that a previously studied trait will be unintentionally rediscovered as a “new” and presumably independent predictor of health, under a novel trait label (Holroyd & Coyne, 1987; Smith, 2013). Whereas the jingle fallacy can contribute to inconsistent results, the jangle fallacy can contribute to the field’s unwieldy lack of integration. As a previously noted example, effects of Type D personality might simply reflect neuroticism.

The solution to these problems is more consistent utilization of well-established aspects of personality science. Formal studies of convergent and discriminant validity as key elements of a general
emphasis on construct validity (Strauss & Smith, 2009) identify jingle and jangle errors. Also, tests of associations with well-validated measures of established traits facilitate identification of core aspects of personality that predict health. The most widely utilized taxonomy of personality traits—the five-factor model (FFM) (Digman, 1990)—is useful in this regard. These broad traits, conscientiousness, agreeableness, neuroticism, openness to experience, and extraversion, and their components or facets can be used to evaluate the construct validity of measures used in health research, as points of integration across studies, and in direct tests of their associations with subsequent health (Smith & Williams, 1992).

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**Figure 14.3** The Transactional Cycle
By far, most studies utilize self-report measures of personality, much of it providing essential evidence. But across a wide variety of endpoints including specific behaviors and important life outcomes, ratings of personality provided by others (i.e., informant ratings) often have better predictive utility (Connelly & Ones, 2010). The few studies that have directly compared self-report and rating measures of personality as predictors of health suggest that self-reports may underestimate the magnitude of association (Newman, Davidson, et al., 2011; Smith et al., 2008), perhaps because individuals are sometimes unable or unwilling to provide fully accurate self-reports, especially for traits that are clearly socially desirable or undesirable.

Recent personality science includes a growing emphasis on daily experience (Fleeson & Nofte, 2012). Daily experience or ecological momentary assessment studies can explicate the ways in which personality alters the individual’s health behavior, mood, experience of stress, physiology, and other influences on physical health. Such approaches may also be useful in the assessment of personality risk and resilience factors themselves. For example, after adjusting for measurement error, the largest component of variance in daily ratings of trait anxiety and anger reflect stable traits, rather than state fluctuations. These trait-like components of daily experience measures of elements of negative affectivity or neuroticism are quite stable over time (Edmondson, Shaffer, et al., 2013). Importantly, traditional questionnaire measures, despite their well-established reliability and validity, are only modestly related to the stable trait variance derived from ecological momentary assessments. Hence, like informant ratings, measuring personality intensively over time may provide more accurate tests of the effects of personality on health. For example, assessments of heightened negative affective responses to daily stressors predict subsequent mortality risk (Chiang, Turiano, Mroczek, & Miller, 2018).

Measuring Health Outcomes

The modern era emphasizes objective health outcomes, such as longevity or total mortality, or morbidity and mortality from specific conditions. These “harder” outcomes, compared to some earlier research that utilized “softer” outcomes such as self-reported overall health, physical symptoms, level of functional activity versus disability, or health care utilization, are a central element of the stronger evidence base and greater impact of personality and health research. Softer outcomes reflect illness behavior—things that people say and do that usually but not always reflect underlying actual health. Measures capturing illness behavior predict longevity and objectively documented disease, and therefore clearly contain variance reflecting physical health (Idler & Benyamini, 1997). However, measures of illness behavior also contain systematic variance that is unrelated to disease, as evident in excessive somatic complaints and health care utilization in somatoform conditions (e.g., health anxiety, hypochondriasis). Thus, associations of personality with subjective or behavioral outcomes could reflect associations between two psychological domains, rather than psychological (i.e., personality) and physical domains.

Nonetheless, subjective and behavioral outcomes are important. Health care utilization has obvious economic importance, and symptoms, functional activity levels, self-reported health are important elements of comprehensive models of health (Ryff & Singer, 1998), and personality predicts these outcomes, as well (Huang et al., 2017). But it is essential to consider alternative interpretations related to specific health outcomes and measures.

Research Design Issues Linking Personality to Health

The most compelling evidence comes from prospective designs in which personality characteristics predict subsequent health. Cross-sectional designs are less informative, because concurrent associations could reflect either a psychobiological effect (i.e., personality influences health) or the effect of serious medical illness on personality or related aspects of psychological functioning. Cross-sectional...
Personality and Health

designs are more informative when the endpoint is the presence or severity of objectively assessed asymptomatic disease (e.g., CT scans of coronary artery disease). If participants with previously diagnosed disease are excluded, it is less likely that concurrent associations between personality and asymptomatic disease reflect causal effects of illness on psychological functioning. However, reverse causation (i.e., biological processes influencing psychological functioning) should nonetheless be considered carefully. For example, chronic systemic inflammation contributes to several adverse medical outcomes (Steptoe, Hamer, & Chida, 2007) and promotes negative affect and related sickness behavior (Dantzer, Castanon, Lestage, Moreau, & Capuron, 2007).

For both cross-sectional and prospective studies, observational designs require careful consideration of the “third variable problem” in non-experimental research. Given the many health-relevant factors correlated with personality, statistical associations of reliable and well-validated personality measures with health outcomes could reflect effects of an unmeasured confounding factor (e.g., education, social support). This problem is usually managed through measurement and statistical control of confounds. This approach is an essential tool in observational psychosocial research, but its limitations are often not fully acknowledged. For example, in such analyses variance in measures of confounds is statistically controlled, rather than the confound itself. Hence, low measurement reliability or validity results in under-correction and residual confounding (Phillips & Davey-Smith, 1991).

Statistical controls to evaluate personality characteristics as independent risk factors can also lead to models that misrepresent influences on health. For example, health behavior (e.g., smoking, physical activity, medication adherence) could be seen as a confound accounting for associations between conscientiousness and health. Statistical control of health behavior is used to determine whether conscientiousness is an “independent risk factor” in such cases. However, it may be more accurate to consider health behavior as a potential mediator of this association.

Statistical controls have additional limitations. For example, given large associations among aspects of trait negative affectivity or neuroticism, forcing anxiety, depression, and anger to be “independent” can result in effects that are dramatically different from their individual associations. In one such study, anxiety predicted worse health when considered in isolation, but when depression was controlled anxiety predicted better health (Grossardt, Bower, Geda, Colligan, & Rocca, 2009). After partialing, remaining variance in anxiety may have captured a different construct (e.g., caution, advance protective action) than the uncorrected scores (Lynam, Hoyle, & Newman, 2006).

Similarly, as in the interpersonal model of complementarity, trait hostility or antagonism is closely associated with (low) social support (Gallo & Smith, 1999; Smith et al., 2010). Tests of hostility and social support as independent predictors of health by forcing statistical separation of these inherently related constructs can result in measures that do not represent either construct adequately (Lynam et al., 2006; Sleep, Lynam, Hyatt, & Miller, 2017). That is, variance in trait hostility that is unrelated to social support likely captures a different construct than variance that includes the well-established and obvious fact that hostile people typically enjoy diminished support; the altered variance includes unusual representation of hostile people who somehow enjoy good relationships and very warm and agreeable people who somehow do not.

From these examples, overlapping psychosocial risks clearly pose challenges both within the domain of personality and between this domain and others. Determination of independent risk via statistical control has been a central tool in epidemiology for decades, although its limitations are increasingly recognized (Brotman, Walker, Lauer, & O’Brian, 2005). In personality and health research, the overlap or aggregation of risks is usually treated as a nuisance to be managed through statistical control, but in some instances the aggregation might reflect the structure of complex influences on health or mechanisms within pathways of risk (Christenfeld, Sloan, Carroll, & Greenland, 2004; Smith, 2010). Examining aggregated risks directly as predictors of health outcomes could be a valuable alternative or supplemental approach to this issue.
Future Directions

As noted previously, inconsistent research findings regarding personality and health create a need for rigorous replication attempts in individual studies and quantitative syntheses that summarize evidence and test sources of inconsistency. Further, specific characteristics are routinely studied separately, limiting the identification of more basic dimensions. Thus, one central aspect of personality and health research in the coming decade will be the application of state of the art assessments of personality, quantitative integration across multiple studies, and meta-analytic tests of moderating effects of those associations (e.g., Graham et al., 2017). For example, use of informant ratings and daily experience sampling methods would help refine answers about which traits confer risk and resilience and how that happens. More compelling identification of mechanisms requires carefully designed mediational studies, that will likely require innovative integration of the epidemiological and mechanism research traditions (Segerstrom & Smith, 2006). And the more general, grounding perspectives of the FFM and interpersonal tradition can encourage greater integration within the wide range of personality traits and other psychosocial factors studied as predictors of health, perhaps identifying a smaller number of key risks that could be the focus of intervention efforts.

The coming decade is also likely to witness a more integrated science of personality and health, specifically more integrated both “up and down” in the biopsychosocial model. As described previously, greater attention to how personality-related risk and resilience at the psychological level of individuals relates to interpersonal risk and resilience factors at the social level of analysis, and modeling jointly these two usually distinct classes might lead to more accurate and useful depiction of influences on health. In terms of integration with more basic biological processes, emerging work on personality, the physiology of stress, and their relation to underlying brain structures and circuits could go far in elucidating basic questions and articulating more specific targets for intervention. The genetic and epigenetic bases of these confluences of personality, stress physiology and brain structure and function is also likely to be an increasingly important aspect of research in the field.

The moderation of personality-related risk and protection by ethnic, cultural, and socioeconomic factors is also an important emerging focus, given well-documents health disparities related to these additional aspects of the broader biopsychosocial perspective.

Finally, health psychology and related fields have witnessed a rapid expansion of research on the effects of early adversity and other developmental experiences on health in adulthood (Basu, McLaughlin, Misra, & Koenen, 2017; S. Cohen, Janicki-Deverts, Chen, & Matthews, 2010). These experiences also alter the stress mechanisms linking personality and health (Beauchaine, Neuhaus, Zalewski, Crowell, & Potapova, 2011; Danese, Pariente, Caspi, Taylor, & Poulton, 2007) through a variety of biological and learning processes (Miller, Chen, & Cole, 2009) and can also alter health behavior mechanisms. This may represent an opportunity for further integration of personality science in the future of the research area, specifically the development and emerging structure of personality (Soto & Tackett, 2015). If personality risk factors and closely related interpersonal and biological risk factors could be identified earlier in life, the opportunities for preventive interventions would expand considerably (O’Connell, Boat, & Warner, 2009), along with the potential benefits for health and well-being.

Conclusions

The growing evidence of robust associations of several personality characteristics with important objective health outcomes supports the continuing place of this topic in current health psychology. The existing evidence strongly suggests that antagonistic interpersonal behavior and chronic negative
emotionality confer risk, whereas positive sociability and emotionality, conscientiousness, and several adaptive cognitive styles (e.g., optimism, openness) confer protection. Health behavior and several sources of overall physiological burden in response to stress are the leading candidates for underlying mechanisms. Perspectives in current personality science such as the FFM and the IPC provide integrative approaches to identifying who might be at risk for serious illness in the future, and other perspectives such as the social cognitive approach and the transactional elements of the interpersonal perspective describe how that risk unfolds. These more active elements or personality processes can in turn suggest targets for the prevention and management of disease, and for the promotion of health and well-being.

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Personality and Health


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Personality and Health


