Personality, Well-being and Health

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Abstract. A life-span perspective on personality and health uncovers new causal pathways and provides a deeper, more nuanced approach to interventions. It is unproven that happiness is a direct cause of good health or that negative emotion, worry, and depression are significant direct causes of disease. Instead, depression-related characteristics are likely often reflective of an already-deteriorating trajectory. It is also unproven that challenging work in a demanding environment usually brings long-term health risks; on the contrary, individual strivings for accomplishment and persistent dedication to one's career or community often are associated with sizeable health benefits. Overall, a substantial body of recent research reveals that Conscientiousness plays a very significant role in health, with implications across the lifespan. Much more caution is warranted before policy-makers offer narrow health recommendations based on short-term or correlational findings. Attention should be shifted to individual *trajectories and pathways* to health and well-being.

Although the relationships among personality, well-being and health have been studied for millennia—since the days of the bodily humors proposed by Hippocrates and Galen—the field remains riddled with conceptual confusion, method artifacts, and misleading conclusions. When inferences drawn from this field are based on incomplete models, they lead to wasteful and even harmful interventions and treatments. Scientists and laypersons alike may over-generalize from short-term personality correlates of health, and overlook long-term causal processes.

There is nevertheless excellent evidence that individual characteristics from earlier in life are reliable predictors and likely causal elements of health later in life. An especially striking finding to emerge in recent years is that a host of characteristics and behaviors associated with the broad personality dimension of *conscientiousness* is predictive of health and longevity, from childhood through old age. The reasons for these associations are complex and sometimes appear paradoxical, as there are multiple simultaneous causal links to health. The modern study of personality, however, provides many of the concepts, tools, and models necessary for a deeper and more accurate understanding of health, well-being, and long life.

In particular, there is considerable misapprehension concerning the *pathways* to good health. In this article, we review many of the causes and consequences of the associations among personality, behavior, well-being, and health and longevity. We do this in the context of expanded models and perspectives. Because much of the confusion in the area of personality and health arises from ambiguous definitions, weak measurement, and overlapping constructs of health, we begin with health outcomes. We then review and scrutinize the connections among happiness and health, and among depression, worry, and disease, which likely are not what they first appear to be. Finally, we explain and evaluate the emerging consensus on the

significance of conscientiousness across the lifespan, and offer suggestions for health interventions.

<u>OUTCOMES</u>

Study of personality—an individual's relatively stable predispositions and patterns of thinking, feeling, and acting—and its relationships to well-being and health continues to be plagued by an over-reliance on self-report measures. This is a special problem because many of the questions (or items) used to assess personality are the same questions used to assess health and well-being. Much better assessment strategies are needed.

Outcome measures of well-being may ask people how good they feel, how well they cope, and how satisfied they are with life. These are very similar to personality measures of low neuroticism ("Am relaxed most of the time"; "Am calm"; "Am not angry or depressed") and high agreeableness ("Am on good terms with others"; "Am warm and sympathetic"). Thus it is not surprising that people who report having a joyful, cheerful, relaxed, and agreeable personality also report life satisfaction, emotional thriving and well-being. Such correlations have little to say about *achieving* well-being. Relatedly, studies of patient populations often suffer from personality selection artifacts (biases), as neurotic individuals are more likely to report symptoms (like chest pain) and to seek medical care than non-neurotics, even when there is little or no discernable organic disease. Although such serious measurement artifacts have been recognized for decades (Watson & Pennebaker 1989), erroneous causal deductions are still common.

Analogous issues plague self-report measures of physical health. The commonly used SF-36 (a multi-purpose health survey), or the closely-related RAND-36, can be very useful for assessing overall disease burden but explicitly includes multiple dimensions including

behavioral dysfunction, objective reports, subjective rating, *and* distress and well-being (Ware 2004). So employing the full SF-36—without sufficient attention to its components—as an outcome measure of health in studies of personality and health again confounds the predictor with the outcome, as individuals who report a neurotic, distressed personality also report pain, feeling sick, and a poor sense of well-being. Sometimes this flaw is obfuscated by invoking the important, well-established finding that self-rated health predicts mortality risk (Idler & Benyamini 1997). That is, the argument asserts that self-reported personality predicts self-reported health, and self-reported health predicts mortality, and so therefore a study of self-reported personality and self-reported health is really a study of personality and physical health. A valuable scientific approach, however, necessitates multi-method assessments of personality and behavior, coupled with more objective measures of health outcomes.

Longevity. Longevity is, for most purposes, the single best measure of health. First, it is highly reliable and valid. Although there is some unreliability of public records like birth certificates and death certificates, it is generally the case that if a death certificate shows that a man died on April 15, 2013 at age 80 from septicemia, it is very likely that he lived eight decades. It is also very likely that he is currently in terrible "health," and so health validity is very strong. Life expectancy is thus one of the key measures of public health used worldwide.

Second, using longevity as the outcome helps avoid what we call the "all-cause dilemma" artifact. These are the common cases in which a person has a disease such as cancer, and the prostate or breast is removed, but the individual does not die of cancer but dies soon after of something else instead. If the focus of the study is on cancer survival (as a function of personality, coping and treatment), the death may not be picked up by the study. That is, the cancer did not progress and/or the person did not die of cancer. It is considered a success if you

are "cured" of cancer, even if you soon die of something else. In other words, much research on personality and health is limited and even distorted by the still-common focus on single disease conditions with insufficient inattention to overall outcomes, especially overall mortality risk.

Relatedly, it is misleading to speak of personality traits or coping styles that predict cancer risk or heart disease risk (e.g. Type A personality) if such factors equally predict (are equally relevant to) other diseases. And, in fact, the basic five-factor personality dimensions (especially Conscientiousness, Neuroticism, and Extraversion, but also often Agreeableness and Openness) do predict multiple diseases (Friedman, 2007; Goodwin & Friedman 2006). This issue too was noted many years ago (Friedman & Booth-Kewley 1987) but studies of personality predictors of particular diseases are still common, without sufficient regard for the broader context. Rigorous research programs on personality, well-being and health would do better to employ multi-dimensional assessment of both personality and health, and, whenever possible, include follow-ups to measure all-cause mortality, or multiple hard disease outcomes.

Quality of Life. General health is well-captured by longevity because the people who live the longest are usually not those who have been struggling with diabetes, cancer, heart disease, and other chronic disorders. But measures that also directly consider the quality of life—such as the number of years that one lives without significant impairment—are of increasing interest. The World Health Organization uses healthy life expectancy (HALE), defined as years lived without significant impairment from disease or injury. The European Union has developed an indicator of disability–adjusted life expectancy ("Healthy Life Years"). Health psychologists such as Robert Kaplan (2002) have advocated such health-related quality of life measures that take into account years of life and the amount of disability, while

minimizing the value of any "benefits" that come from curing one disease only to have it be replaced by another. Such robust measures include rigorous definitions of disability—such as inability to work, walk, dress, converse, remember, and so on—rather than simply self-report measures of how one feels.

Multiple Outcomes. Consistent with the World Health Organization's definition of health as comprised of physical, mental, and social components, we have found (in our own research) that it is empirically and heuristically useful to distinguish and use at least five core health outcomes in addition to longevity (Friedman et al. 2010; Friedman & Martin 2011; see also Aldwin et al. 2006; Baltes & Baltes 1990; Rowe & Kahn 1987). In brief, they encompass the following:

a) **Physical Health** (ability and energy to complete a range of daily tasks; diagnosed/no-diagnosed organic disease like heart disease or cancer). Physical health is defined by a health professional evaluation, such as might be used to qualify for medical treatment or disability payments; b) **Subjective Well-being** (positive mood; life satisfaction). Subjective well-being is often seen as having both an emotional component (frequency of positive and negative emotions) and a cognitive component of self-perceived life satisfaction (Diener et al. 2012); c) **Social Competence** (successful engagement in activities with others). Social Competence includes ability to maintain close relationships, have a supportive social and/or community network, and to support others; d) **Productivity** (continued achievement; contributing to society). Productivity involves work that has potentially monetary/economic (paid) value, or contributions of recognizable artistic or intellectual or humanitarian value. With an aging population in many countries, productivity is taking on new meanings and importance (Fried, 2012); e) **Cognitive function** (ability to think clearly and remember) is defined in

terms of mental processes involved in symbolic operations, such as memory, perception, language, spatial ability, decision making, and reasoning; and finally f) **Longevity** (see Longevity section above). As needed and when possible, some of these outcomes can be multiplied by years to produce quality-of-life-years measures.

These different outcomes are usually correlated (and sometimes highly correlated) with each other. However, ascertaining the *causes* of these outcomes and the causal roles, if any, played by each of these factors in the others is a key research challenge, whose answers will depend on both independent, multi-method assessment and appropriate research designs.

Limits of Biomarkers as Outcomes. A related conundrum that often bedevils research on personality, well-being, and health involves screening, bio-markers, and overdiagnosis (Welch et al. 2011). Many examples exist of interventions that affect a biomarker of disease risk (sometimes termed a "surrogate endpoint") but that do not improve quality of life or mortality risk, because the causal links are not as expected. In fact, many medical interventions *decrease* quality of life for many while improving it for only a few, even though short-term biomarkers look better. For such reasons, the U.S. Food and Drug Administration (FDA) now requires that any new class of drug today *must have studies with hard disease or mortality outcomes*, because evaluating only the intermediate outcomes such as blood biomarkers have led to problematic or dangerous treatments (cf. DeMets 2013). For example, lipid levels (especially cholesterol) are very good predictors of cardiovascular-relevant mortality risk, and niacin improves lipid levels, but taking niacin does not decrease mortality risk. Homocysteine (an amino acid) is a good predictor of heart disease, and B-vitamins lower homocysteine levels, but B-vitamins do not in turn lower disease risk (see Micheel & Ball 2010 for a report on surrogate endpoints from the Institute of Medicine). For cancer, screening for prostate cancer

with the Prostate-Specific Antigen (PSA) biomarker is probably the most notorious case of causing significant harm to patients, as most men with elevated PSA levels will never develop symptoms of prostate cancer but many will face morbidity if treated; overdiagnosis is common in other cancer screens as well (Welch & Black 2010; Welch et al. 2011). What all this means for research on personality and health is that limited-time measurement of outcomes like cortisol level, vagal tone, immune markers, and others are not necessarily indicators of future long-term health and longevity, especially since biomarkers naturally fluctuate as the body maintains or re-establishes homeostasis.

Biomarkers (especially aggregations of biomarkers as an indication of chronic physiological dysfunction) become very important when they are studied as mediators of relations in fully specified models, such as if the progression of cancer can be shown to have slowed as a function of a psychosocial intervention that boosts the immune system. Such longitudinal mediation studies are quite rare, especially over the long-term. In other words, biomarkers can best serve to elucidate the mediating mechanisms of personality-to-disease processes discovered in longer-term studies.

HAPPINESS, SUBJECTIVE WELL-BEING, AND HEALTH

Some people thrive, stay generally healthy, recover quickly from illness, and live long, while other individuals of the same age, sex, and social class are miserable, often ill, and at higher risk of premature death. Personality, well-being, and physical health are intimately connected, but not necessarily simply connected. The core question is sometimes thought to be "Why do people become sick?" when it is really "*Who* becomes sick and *who* stays well?"

Despite the fact that an individual's sense of well-being is fairly stable across time, a number of clever positive psychology interventions have been developed that increase

happiness and sense of well-being, even in depressed populations (Lyubomirsky & Layous 2013; Sin & Lyubomirsky 2009). But will such interventions also make people healthier? This is a very important issue for both conceptual and practical reasons. On the conceptual side, it matters how we think about the nature of psychological and physical health and the causal models we endorse (often implicitly) or construct. On the practical side, the true causal links between health and happiness impact what scientists, doctors, patients, public health programs, and societies can and should do to promote health. If happiness *causes* health, then positivity interventions will result in health and long life, and thus have public health importance. However, health is highly complex, and as it turns out, multiple causal processes are simultaneously at work in preserving health or promoting disease, not in the ways often assumed.

<u>Power of Positive Emotion?</u>

A popular model is the one made famous several decades ago by Norman Cousins, commentator and editor of the influential *Saturday Review* (Cousins 1979). Diagnosed with a paralyzing degenerative disease, Cousins checked himself out of the hospital and into a hotel room, and treated himself with laughter. Against the odds, he recovered, and thereafter publicized creativity and humor as being essential to medical treatment; this was a cultural turning point that spurred greater attention to how the mind could heal the body. An upshot of this work was the popular re-emergence in health care of the idea that distress, grief, and psychological tension play a key and direct role in illness, and that laughter and good cheer could and should be a core part of a cure. Watching films that you find funny, as Cousins did, will indeed make you feel happier, but should this be a central ingredient of medical care and health promotion?

This development was followed by a number of best-selling popular books, such as Bernie Siegel's *Love, Medicine and Miracles* (1986), and *Peace, Love and Healing* (1990), advertised as full of inspiring true stories of healing, gratitude and love. At their best, such books provide help in relieving the distress of coping with serious illness and can encourage some patients and their families to follow prescribed treatment regimens and try to live healthier lives. At worst, they provide quack treatments for wishing away one's cancer, or they blame illness upon personality defects. Despite years of published rebuttals of feel-good "cures," these errant beliefs still permeate discussions of personality and health.

Richard Sloan (2011) has traced this mind-over-matter, virtue-over-disease argument throughout twentieth century American thought, from unconscious hostile impulses (supposedly causing ulcers, asthma, and more) right up to the best-selling book "The Secret," (Byrne 2006), which teaches that you can "think" your way to health and wealth through cosmic energy. He notes, "Negative characteristics—anger, resentment, fear—were always associated with poorer health outcomes. One can search the literature in vain for diseases associated with positive characteristics" (Sloan 2011, p. 896). Whereas in Freud's time and thereafter, the ill were said to be repressed, conflicted and hostile, today they are viewed as lacking joy, compassion, spirituality, and forgiveness. Despite such warnings as Sloan's, there is recurrent popular advice that a "be happy" mindset is a key to good health.

There is no doubt that subjective well-being and related concepts like positive emotions are associated with better self-reported health, lower morbidity, less pain, and longevity (Chida & Steptoe 2008; Diener & Chan 2011; Howell et al., 2007; Lyubomirsky et al. 2005; Pressman & Cohen 2005; Veenhoven, 2008). And, an analysis across 142 nations found that positive emotions predict better self-rated health around the world, with positive emotion trumping

hunger, shelter, and safety in predictive value (Pressman et al 2013). A premature conclusion is that by shifting the population to greater levels of happiness, health will thereby improve. Diener and Chan (2011) propose that there is good evidence "that subjective well-being causally influences health and longevity" (p. 21), but this is an empirical question that has not yet been resolved. We believe the truth is much more complex and that more inclusive models need to be specified. Progress in this field will depend on construction of a complete nomological net and the testing of more elaborate causal pathways.

Actions or interventions that improve well-being might indirectly improve a person's physical function but not act directly. This is an important distinction. To take some obvious examples, people can feel happier by watching TV comedies, eating sugary foods, riding a Ferris wheel, taking cocaine, or partying. But they would not be healthier. On the other hand, long walks through the park each day, thriving at work, and maintaining high-quality intimate relationships with loved ones probably will have long-term impacts on both happiness and physical health. But these are much more difficult patterns to establish and maintain. Personality often underlies such broader lifestyle patterns, in concert with genetic predispositions, environmental influences, and social relations. Further, as noted in the "Outcomes" section above, shifting people's perceptions of their health from "very good" to "excellent" is an analysis of subjective well-being, not health. We need broader causal models of the relevant relationships, such as the one shown in Figure 1.

[Figure 1 about here   **Correlated Outcomes Model**]

General "life satisfaction" offers a more stable, cognitive evaluation of life than positive emotion alone. Satisfaction items have been answered by millions of people around the world over the past two decades. As with the simple [emotional well-being → health] model, life

satisfaction predicts health and longevity, lower suicide risk, college and job retention, and marital success (Diener et al. 2012). But deeper analyses reveal that a simple causal model is incomplete. For example, in an eight-year study with over 900 individuals, cross-lagged relations between health and life satisfaction found that poor health predicted subsequent life dissatisfaction, but satisfaction did not prospectively predict changes in health (Gana et al. 2013). Moreover, it is now well documented that subjective well-being or happiness is adaptive in some contexts, but maladaptive in others (see Ford & Mauss in press; Gruber et al. 2011; Hershfield et al. 2013).

Meaning and Purpose

Beginning in the early 1960s, work by Viktor Frankl and others proposed that people function best when they have a sense of life purpose (cf. Steger 2009; see also Antonovsky 1979). From a "eudaimonic" perspective (which originated in debates about Aristotelian ethics), well-being comes not from positive emotion or happiness, but from fulfilling one's potential, having a sense of meaning or purpose in life, mastery over one's environment, spirituality, engaging in life, and maintaining positive relationships with others. Many scholars have argued persuasively that a meaningful life is not necessarily a happy one (Baumeister et al. 2013; King, 2001; Ryff & Singer 2009). For example, holocaust survivor and Nobel prize winner Elie Wiesel has written dozens of books and won dozens of distinguished humanitarian awards but his is not a life of happiness, laughter, and positive emotion.

Considerable cross-sectional evidence links sense of purpose to various subjective well-being measures, including life satisfaction, self-esteem, ego resilience, and positive perceptions of the world (Steger 2012). It is correlated with higher levels of agreeableness, extraversion, conscientiousness, and openness to experience, and lower levels of neuroticism, depression and

psychoticism. Having a sense of purpose facilitates active life engagement, goal-setting, and goal pursuit, and so it is not surprising that there is some evidence suggesting links between greater meaning/greater purpose and better physical health. For example, over a five-year period, purpose in life was associated with reduced mortality risk (Boyle et al. 2009; see also Ryff et al. 2004). But here again, fuller causal models are needed. That is, although some researchers propose that eudaimonic well-being enables optimal physiological functioning (Ryff & Singer 1998), a limited [well-being → health] model is typically applied, and almost all evidence is correlational or short-term in nature. Further, Steger (2012) notes that "there have been no tests of whether the way the brain strives to restore meaning in low-stakes lab experiments is sufficient to account for the kind of meaning and purpose in life that Frankl argued inspired his survival of Nazi concentration camps" (p. 380).

Some theories include meaning as a critical component of well-being and flourishing (e.g., Ryff & Keyes 1995; Seligman, 2011), while others see sense of meaning as a motivating factor that leads to greater well-being. Ryan and colleagues (2006) note that rather than focusing on the outcome of feeling good, "eudaimonic conceptions focus on the *content* of one's life, and the *processes* involved in living well" (p. 140). Overall, although strong empirical support is currently lacking for sense of meaning as a vital factor in future health, it is a promising direction, especially because there is considerable evidence that persistent, planful striving for meaningful accomplishment is indeed a key pathway to health and longevity (see sections below on challenge at work and on conscientiousness).

Optimism

Optimism—characterized by a tendency toward positive expectations for the future and confidence in one's ability to cope with challenges—has been consistently linked to better

health (Boehm & Kubzansky 2013; Carver & Connor-Smith 2010). Here again, caution is needed: when full models are spelled out, there is no good evidence for the healing power of positive thought (as a causal relationship). That is, there is little evidence that optimistic thinking will mobilize your immune system and cause your tumors to shrink and your longevity to increase (Coyne & Tennan 2010). However, optimistic individuals set goals, and persist longer, despite challenges and setbacks (Carver et al. 2010; Lench, 2011). Optimism can function as a self-regulating mechanism, with optimistic people more likely to persevere and engage toward a goal (Carver et al. 2010). Behavioral change programs that include goal-setting strategies can build self-efficacy and confidence for future challenges, creating resilience through challenge. Optimism can provide the motivation to move forward, if tempered by a realistic assessment of when to let go. And, optimism can help in facing some of the challenges of recuperation from disease.

All in all, although there are many ways to increase one's sense of well-being, only some of them will increase health. This is a critical distinction, one that becomes clearer with an examination of neuroticism, depression, and disease.

NEUROTICISM, DEPRESSION, WORRY, AND DISEASE

Are individuals who are worrying, tense, anxious, depressed, and emotionally labile more likely to face serious illness and premature death? Overall, the mixed findings concerning neuroticism and health are so striking and jumbled as to call into doubt the viability of further simple studies of these relationships. Instead more sophisticated causal models are needed that include personality facets, multiple causal mechanisms, interactions with other variables, and consideration of biopsychosocial contexts.

Assumptions that neuroticism leads to disease have existed since ancient medicine, with excessive melancholic and phlegmatic humors believed to cause depression, cancer, rheumatism, fevers, and other disease (Friedman 2007). In reality, the ancients were simply (but insightfully) observing the same correlations seen today. With the discovery of hormones and the introduction of Walter Cannon's (1932) fight or flight model, the focus shifted towards physiological reactions to stress (hormonal instead of humoral explanations), but the hypothesized causal model did not much change.

According to this model, neuroticism leads to or facilitates chronic over-activation of the autonomic nervous system, disturbing homeostatic balance, in turn leading to pathological breakdown, chronic illness, and early mortality (Graham et al. 2006; McEwen, 1993). The problem is that advice is then given to stop worrying, slow down, and relax. But a "healthy neuroticism" (Friedman, 2000) is often a good thing, as an individual is vigilant about his or her health. For example, in the Terman Life Cycle Study, neuroticism (measured decades earlier) was protective against mortality risk for bereaved men (Taga et al. 2009). A study of over 11,000 Germans compared expected and actual life satisfaction across an 11-year period (Lang et al. 2013), finding that many individuals grew more pessimistic about their future satisfaction with increasing age, and this pessimism was associated with lower morbidity and mortality risk. Such pessimism may reflect a flexible, realistic adaptation to older age loss (Baltes & Smith 2004).

Neuroticism is highly correlated with negative feelings (DeNeve & Cooper, 1998) and, as noted, with health complaints and lower *perceptions* of health, but its causal role in health and well-being is complex and far from understood (Yap et al. 2012). Most importantly, neuroticism inconsistently predicts mortality risk, with some studies finding higher risk (Abas

et al. 2002; Denollet et al. 1996; Schulz et al. 1996; Wilson et al. 2004), and many other studies

finding null (Almada et al. 1991; Huppert & Whittington 1995; Iwasa et al. 2008; Mosing et al.

2012) or protective effects (Korten et al. 1999; Taga et al. 2009; Weiss & Costa 2005). Across

four decades of adulthood in the Terman Life Cycle study, neuroticism was most predictive of

subjective well-being but *least* predictive of longevity (the most objective measure of health)

(Friedman et al. 2010). Why is this? Personality trajectories and personality interactions with

life events also matter, strongly suggesting that a simple neuroticism-to-poor-health model is

incomplete (Chapman et al. 2010; Lochkenhoff et al. 2009; Mroczek & Spiro, 2007).

Depression. In a meta-analysis of psychological factors in heart disease published over

25 years ago, Booth-Kewley and Friedman (1987) uncovered the then-surprising fact that

depression, rather than the then-current focus on Type A behavior, was an excellent predictor

of cardiovascular disease. Subsequent research has confirmed this discovery (Grippo &

Johnson, 2002; Miller et al., 1996; Rugulies, 2002; Smith & Gallo, 2001; Suls & Bundy, 2005;

Wulsin & Singal, 2003), but it has also launched a series of efforts to treat depression in an

effort to prevent disease—the model represented in Figure 2.

[Figure 2 about here-- **Simple Depression and Disease Model**]

The American Heart Association recommends screening of patients for depression in

cardiovascular care. Depressed patients with heart disease do indeed often have high levels of

biomarkers associated with atherosclerosis (Lichtman et al 2008), but claims that depression

causes illness can confound predictors and outcomes if a full causal model is not specified. In a

very important randomized study, treating depression in recent heart attack patients did not

reduce the risk of death or second heart attack (Berkman et al., 2003; see also Friedman 2011;

Thombs et al. 2013). A Cochrane database review of randomized trials of psychological

interventions in adults with coronary heart disease found effects on depression, supporting the success of treating psychological symptoms (Whalley et al. 2011). But there was little evidence that the interventions affected the disease process, with no reduction in the total occurrence of non-fatal infarction or death. A recent meta-analysis of mental health treatments (antidepressants and psychotherapies) for improving secondary event risk and depression among patients with coronary heart disease again showed mental health treatments did not reduce total mortality (absolute risk reduction = -0.00), although there was a minor influence on coronary heart disease events (Rutledge et al., 2013). A French study with over 14,000 individuals found that although depression and mortality risk were strongly related (over the subsequent 15 years), this association was confounded by hostility (hostile ways of thinking), which is known to be relevant to injury (suicide, homicide, accidents) and to a host of unhealthy behaviors (Lemogne et al. 2010). Although there is no doubt that many diseases are associated with higher levels of anxiety and depression, the causal pathways have never been fully elucidated.

A lifespan perspective offers a better way of thinking about these matters, by focusing attention on processes that develop over time, with predictors, pathways, and outcomes fully specified. For example, common symptoms in the days or weeks following a serious concussion (traumatic brain injury) are irritability, concentration difficulties, sleep disturbances, and depression. These are also core symptoms of posttraumatic stress disorder. It is also the case that these same symptoms can result from infections and other sources of immune system disruptions with increases of pro-inflammatory cytokines—as happens when you contract the flu and suffer irritability, disordered sleep, anhedonia and lethargy (Kemeny, 2011). In post-menopausal women, not only odds of heart disease but also odds of depression rise

significantly (Bromberger et al. 2011). In all of these cases, depression and/or anxiety are not only significant correlates of illness, but are significant *results* of illness or of challenges to homeostasis.

The National Institute of Mental Health states that depression and anxiety are serious illnesses—that is, they are outcomes. In the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) classification of major depressive disorder, symptoms fall into categories of unhealthy thoughts (persistent sadness or empty feelings, worthlessness, helplessness, difficulty concentrating, thoughts of suicide), unhealthy behaviors (over or under eating, insomnia or excessive sleeping), unhealthy social relations (loss of interest in activities or hobbies, including sex, withdrawal from others), and somatic symptoms (aches and pains, digestive problems, fatigue and decreased energy). Adding in the fact that there are genetic influences on depression and that many anxious or depressed individuals self-medicate with cigarettes, mood-altering drugs or alcohol, we have almost the full panoply of biopsychosocial factors in health and illness. Just as the typical [well-being → health] model is incomplete, the simple [depression → disease] model is likely wrong or at least incomplete. The depression-mortality relationship is confounded by personality, social environments, unhealthy behaviors, and genetic predispositions. It is not justified to conclude that depression is a direct cause of disease. See an example of a more comprehensive model in Figure 3.

[Insert Figure 3 about here—**Elaborated Model of Depression and Disease**]

Advice or therapy to cheer up will not stop the progression of cancer or cardiovascular disease (Coyne & Tennan 2010; Thombs et al. 2013), but if a psychosocial treatment helps the person eat better, get out of bed, attend medical appointments, and connect with other people, it may indeed improve health. The precise causal links are very important because if the

associations are not a function of mood-induction, then interventions to improve positive mood or subjective well-being may be useless. There are no well-controlled studies showing that interventions to improve the chronic mood of neurotics result in direct physiological changes and consequent improvements in progression of cancer or risk of death. To the extent that depression is a *result* of the disruption of homeostasis rather than the *cause* of the disruption, many interventions to treat depression in an attempt to improve later health will be futile. Such weak approaches will also undermine the promise of positive psychology to encourage better ways of thinking about depression, subjective well-being, and health.

Of course, if an intervention happens to affect the underlying causes of both health and depression for an individual, health will be improved. Increasing physical activity—changing someone from an inactive to an active person—is a likely candidate in this realm (Carek, et al. 2011; Pedersen & Saltin 2006; Ströhle, 2009).

Challenge and Health

Despite the common perception that very hard workers ("workaholics") put their health at risk through nervous tension, work and health are intricately related, often in a positive way. Work can provide a sense of identity and purpose, stable social connections with others, and of course a source of income for meeting needs for good food, safe shelter and competent health care. Unemployment is a well-established correlate of disability, illness, depression, health care utilization, and mortality risk, often in vicious cycles (Roelfs et al. 2011). For example, data from the U.S. Panel Study of Income Dynamics showed that job loss predicted increased risk of a new health condition over the next year, with significantly higher risk if no re-employment occurred (Strully 2009). And in England during the 2008-2010 recession, suicides and injury rates rose (Barr et al. 2012). Not surprisingly, deteriorating health also influences work, with

the U.S. Panel study finding that poor health predicted subsequently being fired or leaving a job voluntarily. Negative cycles often occur, in which the sick or injured worker loses his or her job, forfeits income for self-care, and faces further deteriorating health; absence from work is a good predictor of subsequent long-term disability and unemployment.

Since the Type A behavior pattern was proposed (during the 1950's economic boom) as a cause of heart disease—with its warnings against trying to accomplish more and more in less and less time (Chesney & Rosenman 1985), there has been concern that busy workplaces are unhealthy. Certainly, a workplace can be excessively challenging, with unreasonably heavy physical work, chemical exposure, violence, or psychological overload (World Health Organization 1994). But health psychologists have long recognized that challenge is not necessarily harmful (McEwen 2000). Stress properly refers to significant physiological disruption that compromises the internal regulatory processes that maintain physiological balance within an organism. The human body is adept at responding to internal and external change. However, when the physiological system is chronically disturbed, resources become depleted and regulatory processes are often affected (Cacioppo & Berntson 2011). It is usually *chronic processes*, over time, by which negative psycho-emotional *and* behavioral reaction patterns play a role in disrupting metabolism, immune function, and physiological rhythms (including sleep), thereby increasing susceptibility to illness and general breakdown (Kemeny 2011; McEwen 2006). Such disruption is a long-term process that occurs through an interaction of internal and external forces, part of an individual's long-term trajectory, and cannot be captured in a single measurement or experiment. Challenge and a heavy workload can be healthy or unhealthy, depending on the person, the context, and the person-situation interaction. In a longitudinal study of elderly participants in the Terman Life Cycle study, the continually

motivated, productive men and women (who were still working for pay, pursuing new educational opportunities, or seeking new achievements) went on to live much longer than their more laid-back comrades, and this productive orientation mattered much more to longevity than their sense of happiness and well-being (Friedman et al. 2010).

It has long been recognized that challenge is a key precursor of well-being. For example, flow—very high levels of psychological engagement—emerges when challenge and skill meet (Csikszentmihalyi 1997). Engaged workers approach their jobs with vigor, interest, and absorption, and are enthusiastic both to the task at hand and the organization as a whole (Lepine et al. 2005; Schaufeli et al. 2006). Many studies of "hardiness" show strong beneficial effects of challenge, especially when the individual has a sense of self-control and a commitment to something meaningful (Maddi, 2002). In global areas with high concentrations of centenarians (Buettner 2012), most long-lived individuals have remained physically and socially active, embracing rather than avoiding challenge. Much research shows an association between early retirement and increased mortality risk, even after adjusting for various selection artifacts (Bamia 2008; Carlsson et al. 2012).

Outside of the formal work environment, psychological engagement and productivity are again important components of health and successful aging. Individuals who are involved and maintain a sense of personal control sustain a better quality of life (Bambrick & Bonder 2005; Brown et al. 2009; Pruchno et al 2010; Schaie & Willis 2011). On the other hand, seeking emotional happiness per se may impede well-being by setting oneself up for disappointment or narcissism (Mauss et al. 2011; Twenge 2006). Modern personality theories help explain how these enduring trajectories emerge. Personality influences the events that are experienced (i.e., situation selection), the elicitation (or provocation) of responses by others,

cognitive interpretations of challenges, emotional reactions to experiences, coping responses, and resulting actions. Personality predicts risk exposure to key life stressors such as marriage and divorce, career success and failure, and crime and safety (Bolger & Zuckerman, 1995; Caspi et al. 2005; Magnus et al. 1993; Shanahan et al. 2013; Vollrath, 2001). About a third of all crimes happen to the same (repeat) victims, while most people face no criminal victimization at all, even after controlling for neighborhood risks (Tseloni, 2000; Tseloni & Pease 2003; Tseloni et al. 2004). Children who are both low on Conscientiousness and high on Neuroticism (that is, who are impulsive and emotional) are more likely to react with distress and anger during peer conflict, reactions which in turn are related to higher levels of victimization (Bollmer et al. 2006; see also De Bolle & Tackett 2013). As we will see, it is not the emotional lability (neuroticism) itself that is crucial, but rather the impulsivity (unconscientiousness).

Overall, we believe that it is a misdirection of resources and attention to focus on positive moods as direct causes of good health, or on worrying, hard work, and depression as significant causes of poor health. There is, instead, a remarkable body of new research suggesting that certain aspects of personality do indeed play a significant, and likely causal, role in patterns of living that lead to thriving, health, and longevity. The core trait is usually termed *conscientiousness*.

CONSCIENTIOUSNESS, MATURITY AND LONGEVITY

Perhaps the most exciting recent discovery to emerge in the area of personality, well-being, and health is the lifelong importance of conscientiousness. Individuals who are conscientious—that is, prudent, dependable, well-organized and persistent—stay healthier,

thrive, and live longer. The size of this effect is equal to or greater than that of many known biomedical risk factors.

Although it has long been known in the social sciences that individuals who are impulsive and low on self-control are prone to face troubles and failures on many fronts, such matters were mostly overlooked in the vast research on personality and health of the past half century. Fortunately, it has also long been known that children, teenagers, and young adults can age out of or be drawn away from "delinquent" patterns (Steinberg & Morris 2001), often through the development of increased self-control, better social relationships, and more benign environments.

Extensive research following up the initial startling finding of two decades ago (Friedman et al. 1993) that childhood conscientiousness is a strong predictor of longevity has revealed that conscientiousness is a very strong and reliable lifelong predictor of healthy pathways and of health and longevity (Friedman et al. 2013; Goodwin & Friedman 2006; Shanahan et al. 2013). Meta-analysis (of 20 independent samples of almost 9,000 participants) clearly links higher levels of conscientiousness to the key outcome of lower mortality risk (Kern & Friedman 2008). This finding has been repeatedly confirmed in more recent studies as well (Chapman et al. 2010; Fry & Debats 2009; Hill et al. 2011; Iwasa et al. 2008; Taylor et al. 2009; Terracciano et al. 2008). For example, in a 17 year follow-up in the Whitehall II cohort study (N=6800), low conscientiousness in midlife was an important risk factor for all-cause mortality, an association that was partly but not fully accounted for by health behaviors and certain other disease risks (Hagger-Johnson et al., 2012).

Conscientiousness predicts reduced disease development (Chapman et al. 2007; Goodwin & Friedman, 2006), better coping (Connor-Smith & Flachsbart 2007), fewer

symptoms, and various sorts of social competence and productivity (Bogg & Roberts, 2013).

Finally, low conscientiousness also predicts Alzheimer's and related cognitive problems (see

Wilson et al. 2007 for a prospective study). It is thus relevant to the full range of core health

outcomes we described at the beginning of this article.

Given the multiplicity of influences on health and well-being, how could one

personality dimension be so important across so many years? A variety of emerging evidence

suggests the relevance of conscientiousness to a number of core biopsychosocial processes.

First, conscientious individuals engage in a variety of important healthier behaviors—for

example, they smoke less, eat healthier foods, wear seat belts, and more (Bogg & Roberts,

2004; Lodi-Smith et al., 2010; Sutin et al., 2011). Second, conscientiousness affects situation

selection. That is, conscientious individuals choose healthier environments, create or evoke

healthier situations, and select and maintain healthier friendships and more stable marriages

(Kern & Friedman, 2011; Lüdtke et al. 2011; Shiner & Masten 2012; Taylor et al 1997). Third

and relatedly, conscientious individuals are more likely to have more successful, meaningful

careers, better educations, and higher incomes, all of which are known to be relevant to health,

well-being, and longer life (Hampson et al., 2007; Ozer & Benet-Martinez, 2006; Poropat,

2009; Roberts et al. 2003). For example, rank in high school class (N= 10,317 Wisconsin high

school graduates), which depends heavily not only on intelligence but also on

conscientiousness, is a much better predictor of longevity than is IQ (Hauser & Palloni 2011).

Fourth, conscientiousness often interacts with unhealthy stressors and with other

unhealthy personality traits, moderating their detrimental effects. For example,

conscientiousness can attenuate the health risk of career failures (Kern et al. 2009). And,

although being low on conscientiousness and high on neuroticism appears to be a particularly

dangerous combination (with individuals who are impulsive, disorganized, anxious, and emotional at very high risk), detrimental effects of anxiety and emotionality are reduced in individuals who are also conscientious (Chapman et al. 2010; Parkes 1984; Terracciano & Costa 2004; Turiano et al. 2013; Vollrath & Torgersen 2002). One reason for this pattern may involve better emotional regulation ability; for example, one study of middle-aged adults found conscientiousness predicted better recovery from negative emotional challenges (Javaras et al. 2012).

Fifth, conscientiousness may be encouraged by certain genetic patterns—and gene-by-environment interactions—which are also related to subsequent health. Serotonin levels in the central nervous system are known to have a genetic basis, change with new circumstances, affect personality (especially including conscientiousness), and work to regulate core bodily functions (including sleep) necessary for good health (Carver et al. 2011; Caspi et al. 2010; Cicchetti et al. 2012; see also Mottus et al. 2013 re inflammation).

Models of conscientiousness, well-being and health are conceptually simple at their core, but become quite complex in practice, as human lives across time are quite complex. For example, at a young age, conscientious children face fewer self-control and school problems; in adolescence, conscientious individuals are less likely to try smoking, alcohol, and illegal drugs; and in adulthood, conscientious people are more likely to connect with other conscientious people, both personally, socially, and at work, and to place themselves in healthier social and physical environments (Hampson 2012). Conscientious individuals are more likely to achieve a good education (Poropat 2009), which in turn is helpful in creating more prudent, better-organized, and forward-thinking adults (Vaillant, 2012).

Another way that conscientiousness likely operates to promote health is through reduction of very small risks. Prudent, persistent, planful individuals make a myriad of decisions each day that minimize risk. Whether it is carrying a raincoat, packing an extra set of medications, double locking their doors, minimizing germ exposure (through hand-washing or other sanitary practices) or staying off the golf course when thunderstorms are predicted, conscientious individuals slightly lower their risks of injury and disease each day. By themselves, the effect of each behavior is tiny (and hard to document), but taken together and compounded over the decades, a substantial effect may emerge. For example, the odds of being struck by lightning in one's lifetime is only 1 in 10,000 for Americans (National Weather Service; http://www.lightningsafety.noaa.gov/medical.htm), but for every 10,000 highly conscientious individuals, one likely avoids this fate. Substantial effects may arise when hundreds of such small risks are taken into account, but there is little research evaluating the overall cumulative impact of such factors. Much more such research is needed.

A number of studies suggest that high neuroticism combined with low conscientiousness is particularly risky for poor health outcomes (Chapman et al. 2007; Chapman et al. 2010; Terraciano & Costa 2004; Vollrath & Torgersen 2002). On the other hand, a high degree of self-control and grit, coupled with prudent planning and thinking ahead is especially healthy (Duckworth 2011; Moffitt et al. 2011). This pattern, together with a general cluster of conscientiousness-relevant characteristics is sometimes termed *maturity* (cf. Vaillant 1971, 2012).

Early Life Influences

When an association between conscientiousness and health is discovered, the usual tendency is to look for the mediators. For example, to what extent is the association between

conscientiousness and longevity mediated by health behaviors like smoking and drinking? A life course perspective, however, also encourages a looking back, at common predecessor influences. In particular, early life experiences and biological predispositions (including genes, in utero hormones, nutrition, toxins, and post-partum and early infant attachment and environmental challenge) can influence both personality and later health (McEwen 1993, 2006; Puig et al. 2013; Taylor et al. 1997). That is, personality traits, sense of well-being, and many diseases have some genetic or perinatal basis, thus leading to later associations between personality and health that are caused in part by underlying biosocial third variables.

Nevertheless, many of the influences of the genetic code and its expression result from alterations caused by the environment, sometimes in understandable ways and sometimes randomly. One study of large numbers of monozygotic twins found minimal predictive ability for individual health (Roberts et al. 2012), and even these may be over-estimates of direct biological effects, as genetic predispositions play a role in situation selection and evocation. For example, Swedish twin studies suggest that core health-relevant social relations like stable, happy marriages can be partly predicted by genetic variation (Walum et al 2008; see also Mosing et al. 2012). When the genetic code and early-life stress are viewed as an initial step in a long-term trajectory—in other words in terms of personality and development—then the model becomes much more powerful, as health risks cumulate. It would be a mistake to think of research on personality, well-being and health as a holding pattern that awaits definitive biological stress research. It may be better to conceive of genetic and peri-natal research as one of the developing pieces necessary for a more complete understanding of personality and health.

CONCLUSION: IMPLICATIONS FOR INTERVENTIONS

One of the primary reasons for studying personality and health is to understand ways to improve health and reduce mortality risk. We have argued that a more complete lifespan perspective (with expanded causal models) reveals that certain common assumptions about health and well-being are untenable, and some common interventions unjustified. Nonetheless, hints of effective interventions are emerging. Fuller models of personality and health help clarify causality and offer likely points for successful intervention.

Some elements of the pursuit of happiness may very well result in increased health, but oversimplification of the strong correlations between subjective well-being and physical health can lead to the "no worries" approach to life, with goals of seeking positive emotions and laughter, avoiding "stress," taking it easy, retiring from work, and avoiding commitment. And it also leads to the unconscionable blaming of victims of disease. Analogously, a misinterpretation of the correlations of depression with disease can result in the targeting of the wrong behavioral patterns for intervention. For example, there may be advice involving ways to "cheer up," or over-prescription of medication for mild anxiety or depression. Further, the misunderstanding of the role of worrying may lead to minimization of sober, thoughtful, conscientious life patterns now known to be health protective.

Personality is also highly relevant to who completes the research study. Individuals higher on positive emotions, agreeableness, and conscientiousness are much more likely to stay in ongoing studies, thus creating differential attrition and distorting the findings (Czajkowski et al. 2009; Friedman 2011). For example, in a study of medication after a myocardial infarction, being conscientious enough to fully cooperate with treatment (even if with a placebo) emerged as a more important predictor of mortality risk than the medication (Horwitz et al. 1990). A

fuller understanding and more comprehensive causal models of personality, health and well-being makes these sorts of artifacts less likely.

Some of the solutions to these research challenges are well-established in the fields of epidemiology and randomized clinical trials, but too often overlooked, or avoided as too complicated, in the study of personality, health and well-being: First, randomly sample from the full relevant population, preferably an initially healthy population. (Sometimes, use of a healthy control group is a reasonable and only feasible alternative in a study of patients.) Second, employ independent, valid, multi-dimensional measures of personality and personality change. Third, use the best possible experimental or quasi-experimental design with the proper control groups, including placebo control groups. Fourth, employ "intent-to-treat" analyses in which everyone is included in the data analyses (including those who did not complete or were not fully exposed to the "treatment"). And fifth, use multiple outcome measures, both subjective and objective, including all-cause mortality.

These recommendations are difficult to put into practice. Often, longitudinal observational studies and quasi-experimental research designs are necessary and informative, coupled with shorter-term experiments. Fortunately, with the increasing number of long-term data sets, more rigorous information is now emerging (Friedman et al. 2013). Further, new analytic techniques allow integration of extant studies to test lifespan models (Kern et al. 2013; Picinnin & Hofer 2008). There are multiple causal links to health, and models of the hypothesized *full long-term pathways s*hould be spelled out in all research in this field, even when the full model is not being investigated in a particular study (cf. Lee 2012 for a discussion of causal inference in personality psychology).

All in all, a key contribution of modern personality research to understanding health and well-being is the focus on healthy patterns, clusters of predictors, and what we like to call "pathways to health and longevity." One of the most striking and important surprise conclusions of the 8-decade "Longevity Project" studies of the Terman Life Cycle Study (Friedman & Martin, 2011) is the extent to which health risk factors and protective factors do not occur in isolation, but bunch together. For example, the unconscientious boys in the Terman sample—even though very bright — were more likely to grow up to achieve less education, have unstable marriages, drink and smoke more, and be unsuccessful at work, all of which were relevant to dying at younger ages. Such health risks and relationship challenges (e.g. divorce or job loss, loneliness and social isolation) are usually studied as independent health threats. But attention to personality can broaden and sharpen research approaches because it is both stable and slow-changing, and tied to a full range of biopsychosocial influences. Fundamental attention to the individual person across time draws consideration to the deeper causal processes.

Although the evidence for widely effective interventions is not yet available, more comprehensive models point towards core patterns that may indeed emerge as efficacious policies in promoting a well-organized, healthy, productive, long life. For example, the following three elements of healthy lifestyles all involve long-term patterns, are potentially modifiable, and are known to be highly relevant to good health and well-being and to re-establishing homeostasis in the face of environmental challenges. They are deserving of increased research attention.

First, individuals with good ties to social networks and who are well-integrated into their communities tend to be happier and healthier (Hawkley & Cacioppo 2010; Taylor 2011).

And, the degree and quality of such relations can be changed. Second, people who are physically active—doing things—tend to have better mental and physical health. Although physical activity levels (not formal "exercise" per se) are somewhat stable over time, they too can be modified, and increased activity usually produces beneficial effects (Bouchard et al. 2012; Mutrie & Faulkner 2004; Pedersen & Saltin 2006). Third, self-controlled, conscientious individuals, who live and work with purpose and are involved with helping others appear to thrive across the long-term (Friedman & Martin 2011). This third factor may be the most important, as it plays a role in the first two as well. One of the biggest but most promising challenges of health psychology, of positive psychology, and indeed of public health is to understand and develop interventions at the individual level, the social (interpersonal) level, the community level, and the societal level to help launch individuals on the these healthy pathways, to maintain and deepen adherence to these pathways, and to help individuals recover when they stumble or are forced off these roads to health and well-being.

Isn't this the same as promoting happiness, reducing work challenge, and treating depression? Not at all. One could argue that increasing physical activity, strengthening social ties, and developing a meaningful sense of purpose are all established elements of treating depression. The problem is that many other approaches to treating depression and subjective well-being are likely *not* very relevant to health. Further, such approaches often do not consider long-term lifespan trajectories and the understanding of context.

There is no longer a need for studies that simply correlate personality with health and subjective well-being, or that correlate happiness and health, or even that involve simple predictive studies of personality and later health outcomes. Instead the field is ready for longitudinal studies of mediators and moderators, and for intervention studies of *how, when* and

why changes in individual character affect health and well-being. Individual differences earlier in life are reliable predictors and likely causes of well-being and health later in life, and fuller understanding of the causal pathways and how they can be altered holds the promise of significant value to individuals and to society.

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Annual Review References

Abas M, Hotopf M, Prince M. 2002. Depression and mortality in a high-risk population. 11-Year follow-up of the Medical Research Council Elderly Hypertension Trial. *Br. J. Psychiatry*. 181: 123-8

Aldwin CM., Spiro A, Park CL. 2006. Health, behavior, and optimal aging: A life span developmental perspective. In JE Birren & KW Schaie (Eds), *Handbook of the psychology of aging* (6th ed. 85-104). NY: Elsevier.

Almada SJ, Zonderman AB, Shekelle RB, Dyer AR, Daviglus ML, Costa PT Jr, Stamler J. 1991. Neuroticism and cynicism and risk of death in middle-aged men: the Western Electric Study. *Psychosom. Med.* 53: 165-75

Antonovsky A. 1979. *Health, Stress, and Coping*. San Francisco: Jossey-Bass

Baltes PB, Baltes MM. 1990. *Successful Aging: Perspectives from the Behavioral Sciences.* New York: Cambridge University Press

Baltes PB, Smith J. 2004. Lifespan psychology: From developmental contextualism to developmental biocultural co-constructivism. *Res. Hum. Dev.* 1: 123-44

Bambrick P, Bonder B. 2005. Older adults' perceptions of work. *Work*. 24:77-84.

Bamia C, Trichopoulou A, Trichopoulos D. 2008. Age at retirement and mortality in a general population sample. The Greek epic study. *Am J Epidemiol*. 167:561–9.

Barr B, Taylor-Robinson D, Scott-Samuel A, McKee M, Stuckler D. 2012. Suicides associated with the 2008-10 economic recession in England: Time trend analysis. *Brit. Med. J.* 345: e5142-9

Baumeister RF, Vohs KD, Aaker JL, Garbinsky EN. 2013. Some key differences between a happy life and a meaningful life. *J. Posit. Psychol.*

Berkman LF, Blumenthal J, Burg M, Carney RM, Catellier D, Cowan MJ, et al. 2003. Effects of treating depression and low perceived social support on clinical events after myocardial infarction: the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD) Randomized Trial. *J. Am. Med. Assoc.* 289: 3106-16

Boehm JK, Kubzansky LD. 2012. The heart's content: The association between positive psychological well-being and cardiovascular health. *Psychol Bull.* 138: 655-91

Bogg T, Roberts BW. 2004. Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychol Bull.* 130: 887-919

Bogg T, Roberts BW. 2013. The case for conscientiousness: Evidence and implications for a personality trait marker of health and longevity *Ann. Behav. Med.* (2013) 45:278–288

Bolger N, Zuckerman A. 1995. A framework for studying personality in the stress process. *J. Person. Soc. Psychol.* 69: 890-902

Bollmer JM, Harris MJ, Milich R. 2006. Reactions to bullying and peer victimization: Narratives, physiological arousal, and personality. *J. Res. Personal.* 40:803-28

Booth-Kewley S, Friedman HS. 1987. Psychological predictors of heart disease: A quantitative review. *Psychol Bull.* 101: 343-62

Bouchard C, Blair SN, Haskell WL. 2012. *Physical Activity and Health.* Human Kinetics Press. 2nd ed.

Boyle PA, Barnes LL, Buchman AS, Bennett DA. 2009. Purpose in life is associated with mortality among community-dwelling older persons. *Psychosom. Med.* 71: 574-9

Bromberger JT, Kravitz, HM. Chang Y-F, Cyranowski, JM, C. Brown C., Matthews KA. 2011. Major depression during and after the menopausal transition: Study of Women's Health Across the Nation (SWAN) *Psychol Med* 41: 1879-1888

Brown SL, Smith DM, Schulz R, Kabeto MU, Ubel PA, Poulin M, et al. 2009. Caregiving behavior is associated with decreased mortality risk. *Psychol. Sci.* 20: 488-94

Buettner D. 2012. *The Blue Zones: 9 Lessons for Living Longer from the People Who've Lived the Longest.* National Geographic Society. 2nd ed

Byrne R. 2006. *The Secret*. New York: Atria Books

Cacioppo JT, Berntson GG. 2011. The brain, homeostasis, and health: Balancing demands of the internal and extrernal milieu. Oxford Handbook of Health Psychology. ed. HS Friedman, 121-37. New York: Oxford University Press

Cannon WB. 1932. *Wisdom of the Body*. New York: W. W. Norton

Carek PJ, Laibstain SE, Clark SE. 2011. Exercise for the treatment of depression and anxiety. *Int. J. Psychiatr. Med.* 41: 15-28

Carlsson S, Andersson T, Michaëlsson K, Vågerö D, Ahlbom A. 2012. Late retirement is not associated with increased mortality, results based on all Swedish retirements 1991-2007. *Eur. J. Epidemiol*. 27:483-6

Carver CS, Connor-Smith J. 2010. Personality and coping. *Annu. Rev. of Psychol.* 61*:* 679-704

Carver CS, Johnson SL, Joormann J, Kim Y, Nam JY. 2011. Serotonin transporter polymorphism interacts with childhood adversity to predict aspects of impulsivity. *Psychol. Sci.* 22: 589-95

Carver CS, Scheier MF, Segerstrom SC. 2010. Optimism. *Clin. Psychol. Rev.* 30: 878-89

Caspi A, Roberts BW, Shiner RL. 2005. Personality development: Stability and change. *Annu. Rev. of Psychol*. 56: 453-84

Caspi A, Hariri AR, Holmes A, Uher R, Moffitt TE. 2010. Genetic sensitivity to the environment: The case of the serotonin transporter gene and its implications for studying complex diseases and traits. *Am. J. Psychiatry*. 167: 509-27

Chapman BP, Fiscella K, Kawachi I, Duberstein PB. 2010. Personality, socio-economic status, and all-cause mortality in the United States. *Am. J. Epidemio.* 171: 83-92

Chapman BP, Duberstein PR, Lyness JM. 2007. The distressed personality type: Replicability and general health associations. *Eur. J. Personal.* 21: 911-29

Chesney MA, Rosenman RH. 1985. *Anger and Hostility in Cardiovascular and Behavioral Disorders*. Washington: Hemisphere Publishing

Chida Y, Steptoe A. 2008. Positive psychological well-being and mortality: A quantitative review of prospective observational studies. *Psychosom. Med.* 70: 741-56

Cicchetti D, Rogosch FA, Thibodeau EL. 2012. The effects of child maltreatment on early signs of antisocial behavior: Genetic moderation by Tryptophan Hydroxylase, serotonin transporter, and monoamine oxidase-A-genes. *Dev. Psychopathol.* 24: 907-28.

Connor-Smith JK, Flachsbart C. 2007. Relations between personality and coping: A meta-analysis. *J Pers Soc Psychol*. 93:1080-1107.

Cousins N. 1979. *Anatomy of an Illness.* New York: WW Norton

Coyne JC, Tennen H. 2010. Positive psychology in cancer care: Bad science, exaggerated claims, and unproven medicine. *Ann. Behav. Med.* 39: 16-26

Csikszentmihalyi M. 1997. *Finding Flow: The Psychology of Engagement with Everyday Life.* New York: Basic Books

Czajkowski SM, Chesney MA, Smith AW. 2009. Adherence and placebo effect. In *The Handbook of Health Behavior Change*, ed. SA Shumaker, JK Ockene, KA Riekert, pp. 713-34. New York: Springer. 3rd ed.

De Bolle M, Tackett JL. 2013. Anchoring bullying and victimization in children within a five-factor model based person-centered framework. *Eur. J. Personal*. DOI: 10.1002/per.1901

DeMets DL. 2013 The role and potential of surrogate outcomes in clinical trials: Have we made any progress in the past decade*? Proceedings of the Fourth Seattle Symposium in Biostatistics: Clinical Trials Lecture Notes in Statistics*: 3-19

DeNeve KM, Cooper H. 1998. The happy personality: A meta-analysis of 137 personality traits and subjective well-being. *Psychol. Bull.* 124: 197–229

Denollet J, Sys SU, Stroobant N, Rombouts H, Gillebert TC, Brutsaert DL. 1996. Personality as independent predictor of long-term mortality in patients with coronary heart disease. *Lancet*. 347: 417-21

Diener E, Chan M. 2011. Happy people live longer: Subjective wellbeing contributes to health and longevity. *Appl. Psychol. Health and Wellbeing*. 3: 1-43

Diener E, Inglehart R, Tay L. 2012. Theory and validity of life satisfaction scales. *Soc. Indic. Res*. doi: 10.1007/s11205-012-0076-y

Duckworth AL. 2011. The significance of self-control. *Proc. Natl. Acad. Sci.* 108: 2639-40.

Ford BQ, Mauss IB. In press 2013 The paradoxical effects of pursuing positive emotion: When and why wanting to feel happy backfires. In *The Light and Dark Sides of Positive Emotion,* ed. J Gruber, J Moskowitz. Oxford University Press

Fried LP. 2012. What are the roles of public health in an aging society? In *Public Health for an Aging Society,* ed. TR Prohaska, LA Anderson, RH Binstock, pp. 26-52. Baltimore, MD: John Hopkins University Press

Friedman HS. 2000. Long-term relations of personality, health: Dynamisms, mechanisms, and tropisms. *J. Personal.* 68: 1089-107

Friedman HS. 2007. Personality, disease, and self-healing. In *Foundations of Health Psychology*, ed. HS Friedman, RC Silver, 172-99. NY: Oxford University Press

Friedman HS. 2011. Personality, disease, and self-healing. In *The Oxford Handbook of Health Psychology*, ed. HS Friedman, pp. 215-40, NY: Oxford University Press

Friedman HS, Booth-Kewley S. 1987. The "disease-prone personality": A meta-analytic view of the construct. *Am. Psychol.* 42: 539-55

Friedman HS, Martin LR. 2011. *The Longevity Project: Surprising Discoveries for Health and Long Life from the Landmark Eight-Decade Study*. New York: Hudson Street Press.

Friedman HS, Kern ML, Hampson SE, Duckworth AL. 2013. A new lifespan approach to conscientiousness and health: Combining the pieces of the causal puzzle. *Dev. Psychol.* doi: 10.1037/a0030373

Friedman HS, Kern ML, Reynolds CA. 2010. Personality and health, subjective well-being, and longevity as adults age. *J. Personal.* 78: 179-216

Friedman HS, Tucker JS, Tomlinson-Keasey C, Schwartz JE, Wingard DL, Criqui MH. 1993. Does childhood personality predict longevity? *J. Personal. Soc. Psychol*. 65: 176-85

Fry PS, Debats DL. 2009. Perfectionism and the five-factor personality traits as predictors of mortality in older adults. *J. Health Psychol.* 14: 513-24.

Gana K, Bailly N, Saada Y, Joulain M, Trouillet R, Herve C, Alaphilippe D. 2013. Relationship between life satisfaction and physical health: A longitudinal test of cross-lagged and simultaneous effects. *Health Psychol.* Doi: 10.1037/a0031656

Goodwin RG, Friedman HS. 2006. Health status and the five factor personality traits in a nationally representative sample. *J. Health Psychol.* 11: 643-54

Graham JE, Christian LM, Kiecolt-Glaser JK. 2006. Stress, age, and immune function: Toward a lifespan approach. *J. Behav. Med.* 29: 389-400

Grippo AJ, Johnson AK. 2002. Biological mechanisms in the relationship between depression and heart disease. *Neurosci Biobehav. Rev.* 26: 941-62

Gruber J, Mauss IB, Tamir M. 2011. A dark side of happiness? How, when, and why happiness is not always good. *Perspect. Psychol. Sci*. 6: 222-33

Hagger-Johnson G, Sabia S, Nabi H, Brunner E, Kivimaki M, Shipley M, et al. 2012. Low conscientiousness and risk of all-cause, cardiovascular and cancer mortality over 17 years: Whitehall II cohort study. *J. Psychosom. Res.* 73: 98-103.

Hampson SE. 2012. Personality processes: Mechanisms by which personality traits "get outside the skin". *Annu. Rev. of Psychol.* 63: 315-39

Hampson SE, Goldberg LR, Vogt TM, Dubanoski JP. 2007. Mechanisms by which childhood personality traits influence adult health status: Educational attainment and healthy behaviors. *Health* Psychol. 26:121-5.

Hauser RM, Palloni A. 2011. Adolescent IQ and survival in the Wisconsin Longitudinal Study. *J. Gerontol. B Psychol. Sci. Soc. Sci*. 66B(S1): i91-i101.

Hawkley LC, Cacioppo JT. 2010. Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Ann. Behav. Med.* 40: 218-27.

Hershfield HE, Scheibe S, Sims TL, Carstensen LL. 2013. When feeling bad can be good: Mixed emotions benefit physical health across adulthood. *Soc. Psychol. Personal. Sci.* 4: 54-61.

Hill PL, Turiano NA, Hurd MD, Mroczek DK., Roberts BW. 2011. Conscientiousness and Longevity: An examination of possible mediators. *Health Psychol*. 30. Doi: 10.1037/a0023859

Horwitz RI, Viscoli CM, Berkman L, Donaldson RM Horwitz SM, Murray CJ, et al. 1990. Treatment adherence and risk of death after a myocardial infarction. *Lancet.* 336: 542-5

Howell R, Kern ML, Lyubomirsky S. 2007. Health benefits: Meta-analytically determining the impact of well-being on objective health outcomes. *J. Health Psychol*. 13: 1092-104

Huppert FA, Whittington JE. 1995. Symptoms of psychological distress predict 7-year mortality. *Psychol. Med.* 25: 1073-86

Idler EL, Benyamini Y. 1997. Self-rated health and mortality: A review of twenty-seven community studies. *J. Health Soc. Behav.* 38: 21-37

Iwasa H, Masui Y, Gondo Y, Inagaki H, Kawaai C, Suzuki T. 2008. Personality and all-cause mortality among older adults dwelling in a Japanese community: A five-year population-based prospective cohort study. *Am. J. Geriatr. Psychiatry.* 16: 399-405

Javaras KN, Schaefer SM, Van Reekum CM. 2012. Conscientiousness predicts greater recovery from negative emotion. *Emotion*, 12: 875-81.

Kaplan R. 2002. Quality of life: An outcomes perspective. *Arch. Phys. Med. Rehabil.* 83: S44-S50

Kemeny ME. 2011. Psychoneuroimmunology. In *The Oxford Handbook of Health Psychology*, ed. HS Friedman, pp. 138-61, NY: Oxford University Press

Kern ML, Friedman HS. 2011. Personality and pathways of influence on physical health. *Soc. Personal. Psychol. Compass.* 5: 76-87

Kern ML, Friedman HS. 2008. Do conscientious individuals live longer? A quantitative review. *Health Psychol.* 27: 505-12

Kern ML, Hampson SE, Goldberg LR, Friedman HS. 2013. Integrating prospective longitudinal data: Modeling personality and health in the Terman Life Cycle and Hawaii Longitudinal studies. *Dev. Psychol.* doi: 10.1037/a0030874

Kern ML, Friedman HS, Martin LR, Reynolds CA, Luong G. 2009. Conscientiousness, career success, and longevity: A lifespan analysis. *Ann. Behav. Med.* 37: 154-63

King LA 2001. The hard road to the good life: The happy, mature person. *J. of Humanistic Psych.* 41: 51-72

Korten AE, Jorm AF, Jiao Z, Letenneur L, Jacomb PA, Henderson AS, et al. 1999. Health, cognitive, and psychosocial factors as predictors of mortality in an elderly community sample. *J. Epidemiol. Community Health.* 53: 83-8

Lang FR, Weiss D, Gerstorf D, Wagner GG. 2013. Forecasting life satisfaction across adulthood: Benefits of seeing a dark future? *Psychol. Aging.* doi: 10.1037/a0030797

Lee JJ. 2012. Correlation and causation in the study of personality. *Europ J of Pers* 26: 372-90

Lemogne C, Nabi H, Zins M, Courdier S, Ducimetière P, Goldberg M, Consoli SM. 2010. Hostility may explain the association between depressive mood and mortality: evidence from the French GAZEL cohort study. *Psychother Psychosom.* 79: 164-171.

Lench HC. 2011. Personality and health outcomes: Making expectations a reality. *J. Happiness Stud.* 12: 493-507

Lepine JA, Podsakoff NP, Lepine MA. 2005. A meta-analytic test of the challenge stressor-hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Acad. Manag. J.* 48: 764-75

Lichtman JH, Bigger, T Jr, Blumenthal JA, Frasure-Smith N, Kaufmann PG, Lespérance F, et al. 2008. Depression and coronary heart disease: Recommendations for screening, referral, and treatment. *Circulation.* 118: 1768-75

Lockenhoff CE, Terracciana A, Patriciu NS, Eaton WW, Costa PT Jr. 2009. Self-reported extremely adverse life events and longitudinal changes in five-factor model personality traits in an urban sample. *J. Trauma. Stress.* 22: 53-9

Lodi-Smith JL, Jackson JJ, Bogg T, Walton K, Wood D, Harms PD, Roberts BW. 2010. Mechanisms of health: Education and health-related behaviors partially mediate the relationship between conscientiousness and self-reported physical health. *Psychol. Health.* 25: 305-19

Lüdtke O, Roberts BW, Trautwein U, Nagy G. 2011. A random walk down university avenue: Life paths, life events, and personality trait change at the transition to university life. *J Personal. Soc. Psychol.* 101: 620-37

Lyubomirsky S, Layous, K. 2013. How do simple positive activities increase well-being? *Curr. Dir. Psychol. Sci.* 22: 57-62

Lyubomirsky S, King LA, Diener E. 2005. The benefits of frequent positive affect: Does happiness lead to success? *Psychol. Bull.* 131: 803- 55

Maddi SR. 2002. The story of hardiness: Twenty years of theorizing, research, and practice. *Consult. Psychol. J.: Pract. Res.* 54: 173-85

Magnus K, Diener E, Fujita F, Pavot W. 1993. Extraversion and neuroticism as predictors of objective life events: A longitudinal analysis. *J. Personal. Soc. Psychol.* 65: 1046-53

Mauss, IB, Tamir, M, Anderson, CL, Savino, NS. 2011. Can seeking happiness make people unhappy? Paradoxical effects of valuing happiness. *Emotion*, 11: 807-815

McEwen BS. 1993. Stress, adaptation, and disease: Allostasis and allostatic load. *Ann. NY Acad. Sci.* 840: 33-44

McEwen BS. 2000. The neurobiology of stress: from serendipity to clinical relevance. *Brain Res.* 886: 172-89

McEwen BS. 2006. Protective and damaging effects of stress mediators: Central role of the brain. *Dialogues Clin. Neurosci.* 8: 283-93

Micheel C, Ball J. 2010. Institute of Medicine (U.S.). Committee on Qualification of Biomarkers and Surrogate Endpoints in Chronic Disease. Evaluation of Biomarkers and Surrogate Endpoints in Chronic Disease. Washington, DC: National Academies Press;.

Miller TQ, Smith TW, Turner CW, Guijarro ML, Hallet AJ. 1996. Meta-analytic review of research on hostility and physical health. *Psychol. Bull.* 119: 322-48

Moffitt TE, Arseneault L, Belsky D, Dickson N, Hancox RJ, Harrington H, et al. 2011. A gradient of childhood self-control predicts health, wealth, and public safety. *Proc. Natl. Acad. Sci.* 108: 2693-8

Mosing MA, Medland SE, McRae A, Landers JG, Wright MJ, Martin NG. 2012. Genetic influences on life span and its relationship to personality: A 16-year follow-up study of a sample of aging twins. *Psychosom. Med.* 74: 16-22

Mõttus R, Luciano M, Starr JM, Pollard MC, Deary IJ. 2013. Personality traits and inflammation in men and women in their early 70s: The Lothian Birth Cohort 1936 study of healthy aging. *Psychosom. Med.* 75: 11-9.

Mroczek DK, Spiro A III. 2007. Personality change influences mortality in older men. *Psychol. Sci.* 18: 371-6

Mutrie N, Faulkner G. 2004. Physical activity: Positive psychology in motion. In P. A. Linley & S. Joseph (Eds.), *Positive psychology in practice* (pp. 146-164). New Jersey: John Wiley & Sons.

Ozer DJ. Benet-Martinez V. 2006. Personality and the prediction of consequential outcomes. *Ann. Rev. Psychol.* 57: 401-21

Parkes KR. 1984. Smoking and the Eysenck personality dimensions: An interactive model. *Psychol. Med.* 14: 825–34

Pedersen BK, Saltin B. 2006. Evidence for prescribing exercise as therapy in chronic disease. *Scand. J. Med. Sci. Sports.* 16(S1) 3-63

Picinnin AM, Hofer SM. 2008. Integrative analysis of longitudinal studies on aging: Collaborative research networks, meta-analysis, and optimizing future studies. In *Handbook of Cognitive Aging: Interdisciplinary Perspectives*, eds. SM Hofer DF Aldwin, 446-76. Los Angeles: Sage

Poropat AE. 2009. A meta-analysis of the five-factor model of personality and academic performance. *Psychol. Bull.* 135: 322-38

Pressman SD, Cohen S. 2005. Does positive affect influence health? *Psychol. Bull.* 131: 925-71.

Pressman SD, Gallagher MW, Lopez SJ. 2013. Is the emotion-health connection a "first-world problem"? *Psychol. Sci.* doi: 10.1177/0956797612457382

Pruchno RA, Wilson-Genderson M, Rose M, Cartwright F. 2010. Successful aging: Early influences and contemporary characteristics. *Gerontologist*. 5:821-33

Puig J, Englund MM, Simpson JA, Collins WA. 2013. Predicting adult physical illness from infant attachment: A prospective longitudinal study. *Health Psychol.* 32: 409-17.

Roberts BW, Caspi A, Moffitt T. 2003. Work experiences and personality development in young adulthood. *J Personal. Soc. Psychol.* 84: 582-93

Roberts NJ, Vogelstein JT, Parmigiani G, Kinzler KW, Vogelstein B, Velculescu VE. 2012. The predictive capacity of personal genome sequencing. *Sci. Transl. Med.* DOI:10.1126/scitranslmed.3003380

Roelfs DJ, Shor, E., Davidson, KW, Schwartz JE 2011. Losing life and livelihood: A systematic review and meta-analysis of unemployment and all-cause mortality *Social Science & Medicine*. 72: 840–54

Rowe JW, Kahn RL. 1987. Human aging: Usual and successful. *Sci.* 237: 143–49.

Rugulies R. 2002. Depression as a predictor for coronary heart disease: A review and meta-analysis. *Am. J. Prev. Med.* 23: 51-61.

Rutledge T, Redwine LS, Linke SE, Mills PJ. 2013. A meta-analysis of mental health treatments and cardiac rehabilitation for improving clinical outcomes and depression among patients with coronary heart disease. *Psychosom Med*. 75:335-49.

Ryan RM, Huta V, Deci EL. 2006. Living well: A self-determination theory perspective on eudaimonia. *J. Happiness Stud.* 9: 139-70

Ryff CD, Keyes CLM. 1995. The structure of psychological well-being revisited. *J. Person. Soc. Psychol.* 69: 719-27

Ryff CD, Singer B. 1998. The contours of positive human health. *Psychol. Inq.* 9: 1-28

Ryff CD, Singer B. 2009. Understanding healthy aging: Key components and their integration. In *Handbook of Theories of Aging*, ed. VL Bengston, D Gans, NM Pulney, M Silverstein, 117-44. New York: Springer. 2nd ed.

Ryff CD, Singer BH, Love GD. 2004. Positive health: Connecting well-being with biology. *Phil. Trans. R. Soc. Lond.* 359: 1383-94

Schaie KW, Willis SL. Eds. 2011. *Handbook of the psychology of aging*. Elsevier Inc. 7th ed.

Schaufeli WB, Bakker AB, Salanova M. 2006. The measurement of work engagement with a short questionnaire: A cross-national study. *Educ. Psychol. Meas.* 66: 701-716.

Schulz R, Bookwala JB, Knapp JE, Scheier MF, Williamson GM. 1996. Pessimism, age, and cancer mortality. *Psychol. Aging, 11*, 304-9

Seligman MEP. 2011. *Flourish*. New York: Simon Schuster

Shanahan MJ, Hill PL, Roberts BW, Eccles J, Friedman HS. 2013. Conscientiousness, health, and aging: The life course of personality model. *Dev. Psychol*. doi: 10.1037/a0031130

Shiner RL, Masten AS. 2012. Childhood personality as a harbinger of competence and resilience in adulthood. *Dev. Psychopathol*. 24: 507-28

Siegel BS. 1986. *Love, Medicine, and Miracles: Lessons Learned about Self-Healing from a Surgeon's Experience with Exceptional Patients*. Quill

Siegel BS. 1990. *Peace, Love and Healing: Bodymind Communication & the Path to Self-Healing: An Exploration*. New York: HarperCollins Publishers

Sin NL, Lyubomirsky S. 2009. Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice friendly meta-analysis. *J. Clin. Psychol.* 65: 467-87

Sloan RP. 2011. Virtue and vice in health and illness: The idea that wouldn't die. *Lancet*. 377: 896-7

Smith TW, Gallo LC. 2001. Personality traits as risk factors for physical illness. In *Handbook of Health Psychology,* ed. A Baum, T Revenson, J Singer, 1:139-172. Hillsdale, NJ: Erlbaum

Steger MF. 2009. Meaning in life. In *Oxford Handbook of Positive Psychology,* ed. SJ Lopez, 679-87. Oxford, UK: Oxford University Press. 2nd ed.

Steger MF. 2012. Experiencing meaning in life: Optimal functioning at the nexus of spirituality, psychopathology, and wellbeing. In *The Human Quest for Meaning,* ed. PTP Wong, 165-84. New York: Routledge. 2nd ed.

Steinberg L, Morris AS. 2001. Adolescent development. *Annu. Rev. Psychol.* 52:83-101

Ströhle A. 2009. Physical activity, exercise, depression, and anxiety disorders. *J. Neur. Transm.* 116: 777-84

Strully KW. 2009. Job loss and health in the U.S. labor market. *Demography*. 46: 221-46.

Suls J, Bunde J. 2005. Anger, anxiety, and depression as risk factors for cardiovascular disease: The problems and implications of overlapping affective dispositions. *Psychol. Bull.* 131: 260-300

Sutin AR, Ferrucci L, Zonferman AB, Terracciano A. 2011. Personality and obesity across the adult lifespan. *J. Pers. Soc. Psychol.* 101: 579-92.

Taga KT, Friedman HS, Martin LR. 2009. Early personality predictors of mortality risk following conjugal bereavement. *J. Pers.* 77: 669-90

Taylor SE. 2011. Social support: A review. In *The Oxford Handbook of Health Psychology*, ed. HS Friedman, pp. 189-214. New York: Oxford University Press

Taylor SE, Repetti RL, Seeman T. 1997. Health psychology: what is an unhealthy environment and how does it get under the skin? *Annu. Rev. Psychol.* 48: 411–47

Taylor MD, Whiteman MC, Fowkes GR, Lee AJ, Allerhand M, Deary IJ. 2009. Five Factor Model personality traits and all cause mortality in the Edinburgh Artery Study cohort. *Psychosom. Med.* 71: 631-41

Terracciano A, Costa PT Jr. 2004. Smoking and the five-factor model of personality. *Addiction.* 99*:* 472–81

Terracciano A, Löckenhoff CE, Zonderman AB, Ferrucci L, Costa PT. 2008. Personality predictors of longevity: Activity, emotional stability, and conscientiousness. *Psychosom. Med*. 70: 621-7

Thombs BD, Roseman M, Coyne JC, de Jonge P, Delisle VS, Arthurs E, et al. 2013. Does evidence support the American Heart Association's recommendation to screen patients for depression in cardiovascular care? An updated systematic review. *PLos One.* 8: e52654. doi: 10.1371/journal.pone.0052654

Tseloni A. 2000. Personal criminal victimization in the United States: Fixed and random effects of individual and household characteristics. *J. Quant. Criminol*. 16: 415-42

Tseloni A, Pease K. 2003. Repeat personal victimization: Boosts or flags? *Brit. J. Criminol.* 43: 196-212

Tseloni A, Witterbrood K, Farrell G, Pease K. 2004. Burglary victimization in England and Wales, the United States, and the Netherlands: A cross-national comparative test of routine activities and lifestyle theories. *Brit. J. Criminol*. 44: 66-91

Turiano NA, Mroczek DK, Moynihan J, Chapman BP. 2013. Big 5 personality traits and interleukin-6: evidence for "healthy Neuroticism" in a US population sample. *Brain Behav. Immun*. 28: 83-9

Twenge JM. 2006. *Generation Me: Why today's young Americans are more confident, assertive, entitled—and more miserable than ever before*. NY: Free Press.

Vaillant GE. 1971. Theoretical hierarchy of adaptive ego mechanisms: A 30 year follow-up of 30 men selected for psychological health. *Arch. Gen. Psychiatry.* 24: 107-18

Vaillant GE. 2012. *Triumphs of Experience: The Men of the Harvard Grant Study*. Cambridge, MA: Belknap Press

Veenhoven R. 2008. Healthy happiness: Effects of happiness on physical health and the consequences for preventative health care. *J. Happiness Stud*. 9: 449-69

Vollrath M. 2001. Personality and stress. *Scand. J. Personal.* 42:335-47

Vollrath M, Torgersen S. 2002. Who takes health risks? A probe into eight personality types. *Personal. Ind. Diff.* 32: 1185–97.

Walum H, Westberg L, Henningsson S, Neiderhiser JM, Reiss D, Igl W, et al. 2008. Genetic variation in the vasopressin receptor 1a gene (AVPR1A) associates with pair-bonding behavior in humans. *Proc. Nat. Acad. Sci.* 105: 14153-6

Ware JE Jr. 2004. SF-36 health survey update. In *The use of psychological testing for treatment planning and outcomes assessment: Volume 3: Instruments for adults*, ed. ME Maurish, 693-718. Mahwah, NJ: Lawrence Erlbaum.

Watson D, Pennebaker JW. 1989. Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychol. Rev.* 96: 234-54

Weiss A, Costa PT. 2005. Domain and facet personality predictors of all-cause mortality among Medicare patients aged 65 to 100. *Psychosom. Med.* 67: 724-73

Welch HG, Black WC. 2010. Overdiagnosis in cancer. *J Natl Cancer Inst*. 102:605-13.

Welch HG, Schwartz L, Woloshin S. 2011. *Overdiagnosed: Making People Sick in the Pursuit of Health*. Boston, MA: Beacon Press

Whalley B, Rees K, Davies P, Bennett P, Ebrahim S, Liu Z, et al. 2011. Psychological interventions for coronary heart disease. *Cochrane Database Syst. Rev*. doi: 10.1002/14651858.CD002902.pub3

Wilson RS, Mendes de Leon CF, Bienias JL, Evans DA, Bennett DA. 2004. Personality and mortality in old age. *J. Geron. B: Psychol. Sci. Soc. Sci.* 59B: P110-6.

Wilson RS, Schneider JA, Arnold SE, Bienias JL, Bennett DA. 2007. Conscientiousness and the incidence of Alzheimer disease and mild cognitive impairment. *Arch Gen Psychiatry*; 64: 1204–1212.

World Health Organization. 1994. Global strategy on occupational health for all: The way to health at work. www.who.int/occupational_health/publications/globstrategy/en/index1.html

Wulsin LR, Singal BM. 2003. Do depressive symptoms increase the risk for the onset of coronary disease? A systematic quantitative review. *Psychosom. Med.* 65: 201-10

Yap SCY, Anusic I, Lucas RE. 2012. Does personality moderate reaction and adaptation to major life events? Evidence from the British Household Panel Survey. *J. Res. Pers.* 46: 477-88

Figure Captions

Figure 1: Correlated outcomes model. An example of a broader, more comprehensive causal model of relationships among personality, mediators and moderators, and correlated outcomes.

Figure 2: Simple depression and disease model. An overly-simple, and generally ineffective, approach to treatment based on the stable correlation between depression and cardiovascular disease.

Figure 3: Elaborated depression and disease model. An example of an evidence-based, more complete model that separates personality, social environment, genetics, behaviors, and disease, allowing for more comprehensive examination of causality. This figure is an example of promising directions, not a fully established inclusive model.