

## The Oxford Handbook of Integrative Health Science

Carol D. Ryff (ed.), Robert F. Krueger (ed.)

<https://doi.org/10.1093/oxfordhb/9780190676384.001.0001>

**Published:** 2018

**Online ISBN:** 9780190676407

**Print ISBN:** 9780190676384

Search in this book

### CHAPTER

## 24 The Road to Positive Health: Behavioral and Biological Pathways Linking Positive Psychological Functioning With Health Outcomes

Julia K. Boehm

<https://doi.org/10.1093/oxfordhb/9780190676384.013.22> Pages 333–342

**Published:** 09 October 2018

### Abstract

Evidence suggests that positive psychological functioning is related to health and longevity. The underlying pathways that link positive psychological functioning with health and longevity are less clear, but behavioral and biological processes may be likely candidates. Well-characterized measures of positive psychological functioning, combined with assessments of health behaviors and biological markers, make data from the MIDUS study particularly well suited for investigating these topics. This chapter reviews evidence from MIDUS linking positive psychological functioning with health outcomes and longevity, focused particularly on cardiovascular disease, a leading cause of death. Mechanistic pathways related to stress buffering, biological processes, and health behaviors are explored. Both restorative and deteriorative processes are considered so as to provide a comprehensive understanding of what health entails. The chapter concludes with suggested directions for future research.

**Keywords:** [psychological functioning](#), [optimism](#), [life satisfaction](#), [positive emotions](#), [health](#), [longevity](#), [health outcomes](#), [health behaviors](#), [cardiovascular disease](#), [stress buffering](#)

**Subject:** [Health Psychology](#), [Psychology](#)

**Series:** [Oxford Library of Psychology](#)

**Collection:** [Oxford Handbooks Online](#)

## Introduction

---

Being happy and healthy are two goals that most people wish to achieve. Although both happiness and health are beneficial on their own, they are also closely intertwined. Indeed, empirical evidence suggests that positive psychological functioning—a broad term that includes indicators such as happiness, purpose in life, optimism, and life satisfaction—is related to improved health and longevity (Boehm & Kubzansky, 2012; Chida & Steptoe, 2008; Cohen, Bavishi, & Rozanski, 2016; Pressman & Cohen, 2005). Because of well-characterized assessments of both positive psychological functioning and health-related outcomes, data from the Midlife in the United States (MIDUS) study—a national longitudinal sample of more than 7,000 US men and women across midlife—provide unique opportunities to explore the relationships between happiness and health.

To that end, this chapter reviews evidence that links positive psychological functioning with health and longevity, focusing particularly on cardiovascular disease and related conditions (e.g., metabolic syndrome, diabetes) that contribute to the burden of disease and early death in older age. Three routes through which happiness and health may be connected are then considered, including indirect effects via stress buffering and direct effects on biological and behavioral functioning. Both restorative and deteriorative processes are included to provide a comprehensive understanding of health as more than the absence of disease or deficiency; health also includes the presence of excellent functioning and well-being (Ryff & Singer, 1998; Seeman, 1989). ↪ The chapter concludes with consideration of gaps in the extant literature, as well as future directions for advancing knowledge of positive health. Findings from MIDUS are emphasized alongside relevant findings from other epidemiological cohorts. Due to space constraints, the evidence described is not all-encompassing, but instead emphasizes research I conducted, as well as other high-quality and illustrative research studies.

## Positive Psychological Functioning's Association With Health and Longevity

---

Research from MIDUS has helped to establish that positive psychological functioning is associated with health and longevity. For example, in one study of approximately 5,000 MIDUS participants followed across 9–10 years, those individuals who had consistently low levels of psychological well-being across time (where psychological well-being was defined as having autonomy, environmental mastery, personal growth, positive relations, purpose in life, and self-acceptance) self-reported worse physical health, more chronic conditions, more physical symptoms, and more functional limitations than individuals who had consistently high levels of psychological well-being across time (Ryff, Radler, & Friedman, 2015). Other work has reported similar associations between positive emotions and self-reported physical health and disorders within the MIDUS cohort (Dainese et al., 2011; Weiser, 2012). Moreover, flourishing individuals—as defined by the presence of emotional, psychological, and social well-being plus the absence of mental illness—tended to miss fewer days of work and have fewer limitations to their activity than individuals who lacked well-being or had a mental illness (Keyes, 2005).

Although suggestive, these previous studies are limited by their self-reported health outcomes, which may be correlated with self-reported well-being due to common assessment methods. However, other studies have reached similar conclusions using objective biological markers assessed in a subset of MIDUS participants 9–10 years after baseline. In one cross-sectional study with 1,205 MIDUS participants, positive emotions, life satisfaction, and personal growth were each related to an approximately 15% reduced risk of having the metabolic syndrome, which is defined by an increased waist circumference and unhealthy levels of systolic and diastolic blood pressure, triglycerides, high-density lipoprotein cholesterol, and fasting

plasma glucose (Boylan & Ryff, 2015). These findings held when taking account of sociodemographic factors (e.g., race, gender, and education); health behaviors (e.g., cigarette smoking, physical activity, and medication use); and depressive symptoms.

However, cross-sectional associations between positive psychological functioning and clinically assessed cardiometabolic risk cannot provide information about the direction of the relationship—that is, whether positive psychological functioning comes before better physical health or whether better physical health comes before positive psychological functioning. A second study addressed this issue by measuring positive psychological functioning nearly a decade before measuring biological markers and, even more important, taking into account health status at that earlier time period (Boehm, Chen, Williams, Ryff, & Kubzansky, 2016). Although an even stronger design would measure biological markers repeatedly across time, such data are difficult to come by because indicators of positive psychological functioning are rarely assessed in cohorts that also have multiple assessments of biological markers. Thus, in this study, MIDUS participants who reported heart problems or stroke at the start of the study were excluded, yielding a sample of up to 854 people.

Findings suggested that those who were more satisfied with their lives and experienced greater positive emotions had a reduced risk of developing heart problems, hypertension, diabetes, stroke, and cholesterol across a decade (Boehm et al., 2016). In addition, higher levels of life satisfaction (but not positive emotions) were significantly associated with lower cardiometabolic risk, as indicated by eight clinically assessed biological markers including blood pressure, lipids, waist circumference, blood sugar regulation, and the inflammatory marker of C-reactive protein. These findings controlled for confounding variables like age, gender, race, and education. Notably, however, associations were attenuated when health behaviors such as physical activity were included in the model, which suggests that a behavioral pathway may underlie the association. Nonetheless, such work from MIDUS is consistent with other work suggesting that positive psychological functioning is associated with reduced risk of cardiovascular disease, as reviewed in a comprehensive summary of the literature (Boehm & Kubzansky, 2012).

p. 335 In addition to cardiovascular disease, findings from MIDUS have added to knowledge regarding the association of positive psychological functioning with diabetes, which is a risk factor for and often co-occurs with cardiovascular disease. In one study where diabetes was defined by clinically assessed glycosylated hemoglobin, fasting glucose, and use of diabetes-related medication, positive emotions were not significantly related to risk of diabetes (Tsenkova, Karlamangla, & Ryff, 2016). However, among individuals with a family history of the disease, which increases risk for developing diabetes, those who had relatively high levels of positive emotions showed a reduced risk of diabetes, suggesting a protective effect. These findings held after controlling for socioeconomic status, health behaviors, presence of chronic conditions, and negative emotions (Tsenkova et al., 2016).

Such findings corroborate other results suggesting that positive psychological functioning is related to diabetes, but reinforce that moderating factors—whether family history or method of diabetes assessment—are important to consider. For example, one prospective study of 7,800 middle-aged British men and women examined how life satisfaction, emotional vitality, and optimism were each independently associated with incident diabetes across an average of 10 years (Boehm, Trudel-Fitzgerald, Kivimaki, & Kubzansky, 2015). Findings revealed that higher levels of both life satisfaction and emotional vitality were associated with reduced risk of physician-diagnosed diabetes. However, associations were not evident when diagnoses of incident diabetes were determined by clinically assessed glucose tolerance tests or fasting glucose levels. Moreover, optimism was not associated with any diabetes outcome, suggesting that some aspects of positive psychological functioning may be more or less relevant for particular health outcomes.

Findings from MIDUS also confirmed early work regarding the association that positive psychological functioning has with mortality. In a meta-analysis of 35 studies with initially healthy people, those with

higher levels of positive emotions tended to have reduced risk of mortality compared with their less positive peers (Chida & Steptoe, 2008). However, the meta-analysis included mostly indicators of hedonic well-being (e.g., positive emotions, life satisfaction), which capture only one aspect of positive psychological functioning related to pleasure or joy. Positive psychological functioning also encompasses eudaimonic well-being (including life purpose, autonomy, and personal growth), which, together with hedonic well-being, contributes to a richer, more comprehensive understanding of what it means to thrive psychologically (Ryan & Deci, 2001; Ryff, 1989; Ryff & Singer, 2008). Limited research to date has examined whether eudaimonic well-being is associated with mortality, probably because the prospective longitudinal data that are needed for such analyses rarely include assessments of eudaimonic well-being.

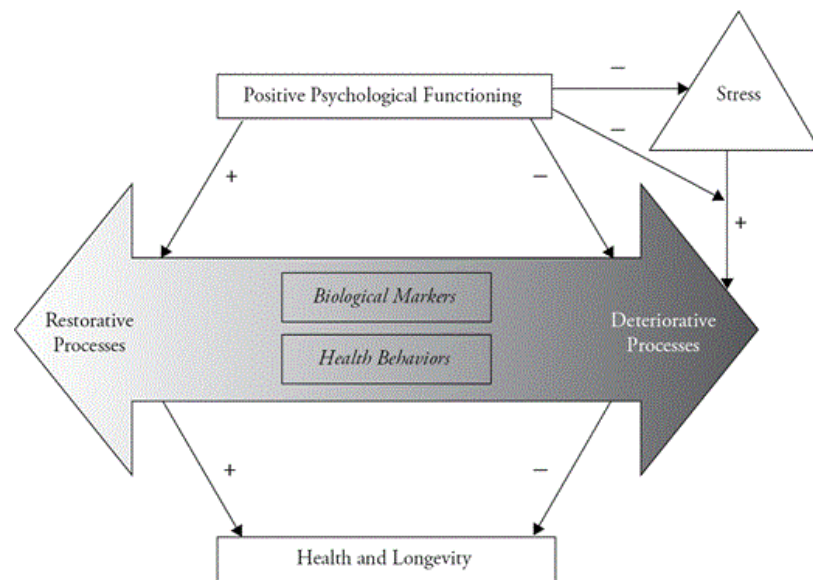
MIDUS, however, is noteworthy for its measurement of eudaimonic well-being. Indeed, one study reported that across 14 years, MIDUS respondents with higher baseline levels of purpose in life tended to live longer than their less purposeful counterparts, even after statistically controlling for sociodemographic characteristics, positive emotions, and negative emotions (Hill & Turiano, 2014). Similarly, in MIDUS analyses that used a composite of hedonic well-being, eudaimonic well-being, and absence of mental illness, those whose composite profiles showed a lack of flourishing had significantly greater odds of mortality compared to those who were flourishing (Keyes & Simoes, 2012). In sum, positive psychological functioning appears to be linked with longer lives.

Taken together, evidence has accumulated from MIDUS and other epidemiological cohorts indicating that various aspects of positive psychological functioning are linked with better health outcomes in both cross-sectional and prospective studies, as well as with both self-reported and clinically assessed outcomes. Moreover, these associations are evident when controlling for confounding variables such as socioeconomic status and psychological distress. Nonetheless, an important outstanding question remains regarding the mechanistic processes that explain how or why positive psychological functioning leads to better health and longevity. Some evidence hints that health behaviors may play a role, but the next section addresses this issue in detail.

## Pathways Linking Positive Psychological Functioning With Better Health

---

Theory and empirical evidence suggests that there are three primary routes by which positive psychological functioning may be linked with improved health and longevity (Figure 24.1; Boehm & Kubzansky, 2012). First, positive indicators of psychological functioning may serve to buffer against the damaging effects of stress. In other words, the presence of positive psychological functioning may both reduce the amount of stress that a person experiences and minimize the effects that stress has on subsequent health-related outcomes. Second, positive psychological functioning may directly influence biological processes from varied bodily systems, such as the cardiovascular, metabolic, and immune systems. Third, positive psychological functioning may influence behavioral processes that are relevant for health, including consuming fruits and vegetables, engaging in moderate amounts of exercise regularly, and avoiding cigarette smoking.



**Figure 24.1** Model showing how positive psychological functioning is related to health and longevity. Although many health behaviors and biological markers lie on a continuum from restorative to deteriorative, some may be nonlinear or exclusively restorative or deteriorative. Nonlinear and bidirectional relationships are not depicted in the model. The absence of arrows does not indicate that pathways do not exist, but that they are not the focus here.

Adapted with permission from Boehm, J., and Kubzansky, L. (2012) The heart's content: The association between positive psychological well-being and cardiovascular health. *Psychological Bulletin*, 138, 655–691.

It is through these biological and behavioral processes that positive psychological functioning is expected to shape downstream effects on health and longevity. Moreover, these biological and behavioral pathways can be characterized as restorative (i.e., promoting rest, regeneration, or growth) or deteriorative (i.e., leading to damage or harm) or range between the two (Boehm & Kubzansky, 2012; Robles & Carroll, 2011; Smith & Baum, 2003). Positive psychological functioning is expected to be associated with more restorative function and less deteriorative function, which in turn are associated with better health and longevity. Most research to date has focused on deteriorative processes and disease. However, to fully conceptualize what it means to be healthy, researchers need to consider both deteriorative and restorative processes. MIDUS is uniquely suited for pursuing these objectives given the richness of its measures.

## Stress Buffering

Stress is a natural part of life, but having resources—be they psychological, social, or financial—can mitigate the harmful effects of stress (Gallo & Matthews, 2003; Schneiderman, Ironson, & Siegel, 2005). In particular, positive psychological functioning is one resource that can buffer people against the sequelae of stress. For example, in one study of 253 MIDUS participants exposed to distressing images, those with more purpose in their lives showed better emotional recovery than those with less purpose, as evidenced by their eyeblink startle response (Schaefer et al., 2013). In MIDUS, another stressful condition that has been frequently examined in the context of health is low socioeconomic status. A large literature has documented that lower social status is associated with worse health outcomes (Adler & Ostrove, 1999; Gallo & Matthews, 2003), in part because of the increased stress endured by individuals with lower social status. Compared with more advantaged individuals, those with fewer socioeconomic resources may encounter more hassles, threats, and traumas in their lives, as well as perceive ambiguous situations as more stressful (Gallo, 2009). However, evidence is emerging to suggest that positive psychological functioning may moderate the association between social status and health (Gallo, de los Monteros, & Shivpuri, 2009).

A recent study from MIDUS illustrated these possibilities. Participants with low socioeconomic backgrounds combined with high levels of life satisfaction had healthier cortisol patterns that closely resembled patterns of participants with high socioeconomic backgrounds (i.e., steep declines in cortisol throughout the day). In contrast, individuals with low socioeconomic backgrounds and low levels of life satisfaction showed less healthy patterns of cortisol (i.e., less steep declines in cortisol throughout the day; Zilioli, Imami, & Slatcher, 2015). In a related study, MIDUS participants with low levels of education showed higher levels of the inflammatory marker of interleukin 6, which is implicated in multiple disease outcomes (e.g., cancer, heart disease, Alzheimer disease, osteoporosis). However, both hedonic and eudaimonic well-being interacted with education such that people with lower levels of education and higher levels of well-being tended to have lower levels of interleukin 6 that were on par with more highly educated people (Morozink, Friedman, Coe, & Ryff, 2010).

Another study replicated these findings by considering two inflammatory markers that are relevant to disease: interleukin 6 and C-reactive protein (Elliot & Chapman, 2016). Optimism (along with other psychological resources) buffered men with low socioeconomic status against an unhealthy inflammatory profile. However, psychological resources did not buffer women against inflammation. The authors suspected this may be because men tend to prioritize individual social status more so than women, and psychosocial resources can help to mitigate the feelings of diminished status that may be associated with low socioeconomic status (Elliot & Chapman, 2016). Taken together, this evidence suggests that positive psychological functioning may help safeguard against stress especially related to having limited socioeconomic resources.

## Biological Processes

In addition to buffering against the physiological consequences of stress, positive psychological functioning may directly shape biological processes. Objectively assessed biological markers can have both deteriorative and restorative properties, with the former signaling worsening bodily function and the latter signaling flourishing bodily function. Researchers have historically investigated deteriorative biological markers most often, and findings from MIDUS show that positive psychological functioning tends to be inversely correlated with such biological processes. For example, adults with multiple health conditions who had high levels of life purpose showed better biological profiles (more specifically, lower levels of interleukin 6 and C-reactive protein) than individuals with low levels of well-being (Friedman & Ryff, 2012).

Those cross-sectional findings from MIDUS participants are similar to those from another group of researchers who used life purpose from the baseline MIDUS assessment to predict allostatic load approximately 10 years later. Allostatic load is a measure that incorporates biological markers from multiple physiological systems (e.g., cardiovascular, lipid, metabolic, and inflammatory markers) into a single composite that is designed to indicate dysregulation. Findings demonstrated that individuals with greater initial purpose in life had lower levels of allostatic load a decade later, even when taking into account socioeconomic status and positive and negative emotions (Zilioli, Slatcher, Ong, & Gruenewald, 2015). Other work from MIDUS has indicated that purpose in life may be linked with the body's hormonal stress response (specifically daily cortisol output) via specific patterns of neural activity. In 64 MIDUS participants who underwent functional magnetic resonance imaging while viewing positive images, prolonged activation in the striatum and dorsolateral prefrontal cortex was associated with greater life purpose and lower cortisol, suggesting the possibility of a neurobiological mediator between positive psychological functioning and biological processes (Heller et al., 2013).

Much less research has examined restorative biological processes, although this area of study is expanding, and findings from the MIDUS cohort exemplify this growth. For example, in one investigation, 982 MIDUS participants reported how optimistic they felt about the future (Boehm, Williams, Rimm, Ryff, &

Kubzansky, 2013a). In addition, participants provided fasting blood samples that were processed to obtain two classes of antioxidants, carotenoids and vitamin E, that work to prevent free radicals in the body from damaging cells and fostering disease. Carotenoids are typically found in brightly colored fruits and vegetables like carrots and sweet potatoes; vitamin E is typically found in greens, nuts, and vegetable-based oils. Consuming more of these types of foods is related to higher serum concentrations of antioxidants and presumably better biological health. Results from MIDUS indicated that compared with their less optimistic peers, optimistic participants showed higher (i.e., healthier) levels of serum carotenoids (Boehm et al., 2013a). In other words, people with optimism levels that were a standard deviation above the mean tended to have 3–13% higher carotenoid concentrations in age-adjusted models. These associations were somewhat attenuated when sociodemographic characteristics and chronic conditions were taken into account. Moreover, optimism was not related to vitamin E in this cross-sectional study, perhaps because it tends to be dependent on other factors (e.g., lipids) to a greater extent than carotenoids.

Optimism has also been investigated in relation to the restorative biological marker of high-density lipoprotein cholesterol. High-density lipoprotein cholesterol is often called the “good” cholesterol because it helps to keep harmful types of cholesterol from accumulating in the bloodstream. Among nearly 1,000 MIDUS participants, greater versus lower levels of optimism were associated with higher levels of high-density lipoprotein in cross-sectional analyses (Boehm, Williams, Rimm, Ryff, & Kubzansky, 2013b). These associations were maintained when adjusting for socioeconomic status, existing chronic health conditions, and use of blood pressure medication. Beyond associations with the restorative marker of high-density lipoprotein cholesterol, optimism was also related to lower levels of triglycerides, which is consistent with a healthy lipid profile. However, optimism was not related to total cholesterol or low-density lipoprotein cholesterol.

In sum, results from the MIDUS study support cross-sectional associations between both deteriorative and restorative biological processes. However, a major limitation of the work published to date is that it is cross-sectional evidence, which cannot disentangle the direction of the relationship between positive psychological functioning and biological processes. This is partly due to the fact that clinical assessment of biological markers was initially assessed only once (i.e., during the second wave of data collection, which occurred approximately 10 years after the study baseline). Importantly, longitudinal assessments of biomarkers are currently under way in MIDUS, which will facilitate future inquiries regarding the nature and direction of the relationship between positive psychological functioning and biological processes.

## Behavioral Processes

For behavioral processes to serve as pathways linking positive psychological functioning with improved health outcomes, health behaviors must be assessed after positive psychological functioning, ideally in the context of a prospective longitudinal or experimental design. However, to date, such evidence has been lacking, and most studies have examined cross-sectional associations between positive psychological functioning and health behaviors. Much of the cross-sectional evidence does indeed suggest that higher levels of happiness, optimism, and life satisfaction are associated with both restorative health behaviors like exercising frequently and eating fruits and vegetables, as well as deteriorative behaviors like avoiding cigarette smoking (Boehm, Vie, & Kubzansky, 2012).

For example, findings from MIDUS suggest that poor sleeping patterns (as indicated by self-reported symptoms of sleep quality and actigraphy-assessed variability in sleep duration) were associated with a diminished sense of hedonic well-being, eudaimonic well-being, and optimism (Hamilton et al., 2007; Lemola, Ledermann, & Friedman, 2013; Lemola, Raikkonen, Gomez, & Allemand, 2013; Ong et al., 2013). In an extension of this work, insomnia symptoms measured during the baseline MIDUS assessment did not significantly predict either hedonic or eudaimonic well-being approximately 10 years later, although the

presence of insomnia symptoms at both assessment periods was related to lower levels of hedonic and eudaimonic well-being (Karlson, Gallagher, Olson, & Hamilton, 2013). Unfortunately, these studies did not investigate whether baseline levels of well-being were associated with subsequent sleep patterns, which would have been informative for the question at hand, that is, whether positive psychological functioning precedes and leads to healthier behaviors.

Researchers have also examined how positive psychological functioning is related to physical activity in 63 monozygotic twin pairs drawn from MIDUS. Members of twin pairs with higher versus lower levels of positive psychological functioning (as indicated by a latent variable comprising factors like positive mood, optimism, and personal control) tended to engage in more vigorous exercise (Johnson & Krueger, 2007). However, this cross-sectional evidence could also be interpreted in the opposite direction such that individuals who participate in vigorous exercise are more likely to experience greater positive psychological functioning. Although using data from twin pairs is beneficial in that it controls for some potentially extraneous variables (e.g., age), following this work with longitudinal or experimental studies would allow further conclusions to be made about the temporal order.

Evidence also suggests that body mass index, which is partially determined by the health behaviors of dietary intake and physical activity, is linked with positive psychological functioning. In a study of MIDUS participants, individuals who were severely obese (i.e., body mass indices greater than 35) reported reduced levels of positive emotions compared with individuals with normal weights (Carr, Friedman, & Jaffe, 2007). Other work has found that older women with low levels of life satisfaction were more likely to gain weight across 6 years than those women with higher levels of life satisfaction (Korkeila, Kaprio, Rissanen, Koshenvuo, & Sorensen, 1998).

Additional research suggests that links between optimism and two biological markers mentioned in the previous section (serum antioxidants and lipids) may be partially explained via a behavioral pathway. For example, optimism's association with healthier levels of carotenoids was attenuated by 25% or more when the health behaviors of cigarette smoking and fruit and vegetable consumption were individually added to regression models as potential pathway variables (Boehm et al., 2013a). When cigarette smoking, fruit and vegetable consumption, and exercise were all included together, almost half of optimism's association with carotenoid concentrations was accounted for by the behavioral factors. A similar pattern was evident in the case of optimism's association with high-density lipoprotein cholesterol and triglycerides. Eating a prudent diet, exercising, not smoking cigarettes, consuming alcohol moderately, and having a healthy body mass index were together associated with approximately 50% of the relationship between optimism and each of the lipids (Boehm et al., 2013b). Thus, a picture is starting to emerge suggesting that various health behaviors may link positive psychological functioning with biological markers and possibly downstream health outcomes.



## Conclusion and Future Directions

---

Findings from MIDUS and other cohorts have accumulated in support of associations between positive psychological functioning and health and longevity. Moreover, preliminary research is gaining insight into possible mechanistic pathways, including the role of positive psychological functioning in buffering against stress, as well as underlying biological and behavioral processes. However, testing the overall model linking positive psychological functioning with health and longevity (Figure 24.1) has not been done. Instead, researchers have taken a somewhat piecemeal approach investigating links between individual components. For example, evidence suggests that different facets of positive psychological functioning are linked with healthier cardiovascular outcomes, and separately, evidence suggests that positive psychological functioning is linked with healthier behaviors important for preventing disease. However, research to date has not demonstrated that positive psychological functioning is linked to cardiovascular health via mediating health behaviors. The overall model has not been tested in an integrated analysis, which would require repeated assessments across time and with the correct temporal and causal order.

Thus, additional work remains to be done to comprehensively understand associations between positive psychological functioning and health, especially with study designs that move beyond cross-sectional observations so the direction of effects can be determined. The MIDUS study is quite appropriate for study designs that are prospective in nature, that is, longitudinal research that concurrently takes into account baseline levels of both positive psychological functioning and health status and then assesses health-related outcomes years or decades later. This type of prospective evidence is one of the strongest ways to establish a temporal relationship confirming that the presence of positive psychological functioning precedes healthy outcomes. Of course, experimental work in which positive psychological functioning is targeted for improvement is the strongest evidence for causal effects. A burgeoning literature suggests that experiments designed specifically to increase levels of positive psychological functioning do successfully enhance positive emotions, optimism, and feelings of satisfaction (Bolier et al., 2013; Malouff & Schutte, 2017; Weiss, Westerhof, & Bohlmeijer, 2016). What remains unclear, however, is whether relatively short-term improvements in positive psychological functioning actually translate into better downstream health outcomes. Preliminary research—often with individuals diagnosed with chronic conditions—has begun to investigate this possibility with promising implications for health (e.g., Friedman et al., 2017; Huffman et al., 2015; Jaser, Patel, Rothman, Choi, & Whittemore, 2014).

p. 340 Besides the value in its long-term perspective, MIDUS has also enabled researchers to consider a more comprehensive definition of what it means to be psychologically and physically healthy (e.g., Keyes & Grzywacz, 2002). With regard to the psychological domain, MIDUS is one of the few cohorts to assess a range of indicators of positive psychological functioning, including markers from the hedonic well-being domain (e.g., life satisfaction, positive emotions) and eudaimonic well-being domain (e.g., purpose in life, personal growth). Although most research to date has not explicitly examined whether one aspect of positive psychological functioning is more strongly associated with health compared with others (for an exception, see Boylan & Ryff, 2015), the potential exists in the context of the MIDUS data. Identifying which specific aspect of positive psychological functioning is most relevant for health is important because then mechanistic processes may become more clear, and interventions to improve psychological functioning may be better targeted. Furthermore, examining how different facets of positive psychological functioning combine to predict various health outcomes may provide insight. For example, individuals with low levels of hedonic well-being but high levels of eudaimonic well-being tend to be younger and more highly educated than individuals with high levels of hedonic well-being but low levels of eudaimonic well-being (Keyes, Shmotkin, & Ryff, 2002). In addition, the third wave of MIDUS survey data provides an opportunity to examine how changes in positive psychological functioning across time are related to long-term health and longevity. Past work suggests that substantial variability in life satisfaction across nearly a decade,

combined with low levels of life satisfaction, is detrimental to longevity (Boehm, Winning, Segerstrom, & Kubzansky, 2015). Thus, paying greater attention to specific types of positive psychological functioning and how they might work in concert or change over time could be useful for further understanding health.

The “positive” conceptualizations of health evident in MIDUS extend to acknowledgment of the role of restorative processes (e.g., antioxidants, high-density lipoprotein cholesterol, physical activity, and quality sleep patterns) that may counteract deteriorative processes and bolster health. No other work has investigated how the restorative markers of antioxidants are tied to psychosocial factors, but that innovative investigation was possible because of the comprehensive clinical assessment that MIDUS participants underwent. As more and more biological markers are identified as indicators of positive health and successful aging (e.g., Jove et al., 2017), the clinical data available in MIDUS may become even more important. Furthermore, when the second wave of biomarker data in MIDUS is collected and available for analysis, researchers will be able to more closely examine the direction of the relationship between positive psychological functioning and biological processes.

In addition, the MIDUS study is well suited for investigating moderators and mediators in the context of health. In fact, research from MIDUS suggests that positive psychological functioning itself can act as both a moderator and a mediator of the relationship between social disparities and health. For example, positive psychological functioning buffers individuals from lower socioeconomic classes against poor health outcomes (Morozink et al., 2010; Zilioli, Imami, et al., 2015) and may act as a pathway by which social status is linked with health (Kan et al., 2014). With the MIDUS Refresher sample, which includes more than 3,500 participants with the same age and gender characteristics as the original MIDUS sample, the opportunity exists not only to replicate previous findings regarding positive psychological functioning as a moderator and mediator, but also to investigate issues unique to the historical period in which the Refresher sample was assessed. For example, researchers could consider how major events like the Great Recession of the United States acted as a major stressor and whether people with higher levels of positive psychological functioning were buffered against some of the negative health consequences that might have ensued.

The MIDUS study is also valuable in that it captures data from participants who range in age from early adulthood to older adulthood, with many predominantly in the middle stage of their lives. Middle age is a particular noteworthy point in the life span because it is often prior to the development of many serious medical conditions, diseases, or disabilities. At the same time, health-related behaviors during middle age can set people on healthy versus unhealthy trajectories into older age. Indeed, evidence suggests that individuals who engage in healthy behaviors at midlife have better subsequent physical and cognitive function and generally age more successfully than those who engage in unhealthy behaviors at midlife (Britton, Shipley, Singh-Manoux, & Marmot, 2008; Sabia et al., 2009, 2012, 2014). Being able to identify characteristics that distinguish people who succumb to disease versus those who age successfully (i.e., maintaining cognitive and physical functioning, being actively engaged in life, and avoiding disease and disability; Rowe & Kahn, 1987) is a particular strength of MIDUS.

p. 341

In sum, with its well-characterized measurement of positive psychological functioning, as well as assessments of physical health and disease, MIDUS provides a unique opportunity to investigate relationships between positive psychological functioning and health during adulthood. Moreover, in line with recommendations to consider health from a variety of disciplines—including physiological, psychological, cultural, and social perspectives (Seeman, 1989)—data from MIDUS allow integration across several interdisciplinary lines of research, which may ultimately contribute to knowledge regarding how best to foster healthier and longer lives.

## References

---

- Adler, N. E., & Ostrove, J. M. (1999). Socioeconomic status and health: What we know and what we don't. *Annals of the New York Academy of Science*, 896, 3–15.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., Chen, Y., Williams, D. R., Ryff, C. D., & Kubzansky, L. D. (2016). Subjective well-being and cardiometabolic health: An 8–11 year study of midlife adults. *Journal of Psychosomatic Research*, 85, 1–8.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., & Kubzansky, L. D. (2012). The heart's content: The association between positive psychological well-being and cardiovascular health. *Psychological Bulletin*, 138, 655–691.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., Trudel-Fitzgerald, C., Kivimaki, M., & Kubzansky, L. D. (2015). The prospective association between positive psychological well-being and diabetes. *Health Psychology*, 34, 1013–1021.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., Vie, L. L., & Kubzansky, L. D. (2012). The promise of well-being interventions for improving health risk behaviors. *Current Cardiovascular Risk Reports*, 6, 511–519.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., Williams, D. R., Rimm, E. B., Ryff, C., & Kubzansky, L. D. (2013a). Association between optimism and serum antioxidants in the Midlife in the United States study. *Psychosomatic Medicine*, 75, 2–10.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., Williams, D. R., Rimm, E. B., Ryff, C., & Kubzansky, L. D. (2013b). Relation between optimism and lipids in midlife. *American Journal of Cardiology*, 111, 1425–1431.  
[Google Scholar](#) [WorldCat](#)
- Boehm, J. K., Winning, A., Segerstrom, S., & Kubzansky, L. D. (2015). Variability modifies life satisfaction's association with mortality risk in older adults. *Psychological Science*, 26, 1063–1070.  
[Google Scholar](#) [WorldCat](#)
- Bolier, L., Haverman, M., Westerhof, G. J., Riper, H., Smit, F., & Bohlmeijer, E. (2013). Positive psychology interventions: A meta-analysis of randomized controlled studies. *BMC Public Health*, 13, 119.  
[Google Scholar](#) [WorldCat](#)
- Boylan, J. M., & Ryff, C. D. (2015). Psychological well-being and metabolic syndrome: Findings from the Midlife in the United States national sample. *Psychosomatic Medicine*, 77, 548–558.  
[Google Scholar](#) [WorldCat](#)
- Britton, A., Shipley, M., Singh-Manoux, A., & Marmot, M. G. (2008). Successful aging: The contribution of early-life and midlife risk factors. *Journal of the American Geriatric Society*, 56, 1098–1105.  
[Google Scholar](#) [WorldCat](#)
- Carr, D., Friedman, M. A., & Jaffe, K. (2007). Understanding the relationship between obesity and positive and negative affect: The role of psychosocial mechanisms. *Body Image*, 4, 165–177.  
[Google Scholar](#) [WorldCat](#)
- Chida, Y., & Steptoe, A. (2008). Positive psychological well-being and mortality: A quantitative review of prospective observational studies. *Psychosomatic Medicine*, 70, 741–756.  
[Google Scholar](#) [WorldCat](#)

Cohen, R., Bavishi, C., & Rozanski, A. (2016). Purpose in life and its relationship to all-cause mortality and cardiovascular events: A meta-analysis. *Psychosomatic Medicine*, 78, 122–133.

[Google Scholar](#) [WorldCat](#)

Dainese, S. M., Allemand, M., Ribeiro, N., Bayram, S., Martin, M., & Ehlert, U. (2011). Protective factors in midlife: How do people stay healthy? *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry*, 24, 19–29.

[Google Scholar](#) [WorldCat](#)

Elliot, A. J., & Chapman, B. P. (2016). Socioeconomic status, psychological resources, and inflammatory markers: Results from the MIDUS study. *Health Psychology*, 35, 1205–1213.

[Google Scholar](#) [WorldCat](#)

Friedman, E. M., Ruini, C., Foy, R., Jaros, L., Sampson, H., & Ryff, C. D. (2017). Lighten UP! A community-based group intervention to promote psychological well-being in older adults. *Aging Mental Health*, 21, 199–205.

[Google Scholar](#) [WorldCat](#)

Friedman, E. M., & Ryff, C. D. (2012). Living well with medical comorbidities: A biopsychosocial perspective. *Journal of Gerontology, Series B, Psychological Sciences and Social Sciences*, 67, 535–544.

[Google Scholar](#) [WorldCat](#)

Gallo, L. C. (2009). The reserve capacity model as a framework for understanding psychosocial factors in health disparities. *Applied Psychology: Health and Well-Being*, 1, 62–72.

[Google Scholar](#) [WorldCat](#)

Gallo, L. C., de los Monteros, K. E., & Shivpuri, S. (2009). Socioeconomic status and health: What is the role of reserve capacity? *Current Directions in Psychological Science*, 18, 269–274.

[Google Scholar](#) [WorldCat](#)

Gallo, L. C., & Matthews, K. A. (2003). Understanding the association between socioeconomic status and physical health: Do negative emotions play a role? *Psychological Bulletin*, 129, 10–51.

[Google Scholar](#) [WorldCat](#)

Hamilton, N. A., Gallagher, M. W., Preacher, K. J., Stevens, N., Nelson, C. A., Karlson, C., & McCurdy, D. (2007). Insomnia and well-being. *Journal of Consulting and Clinical Psychology*, 75, 939–946.

[Google Scholar](#) [WorldCat](#)

Heller, A. S., van Reekum, C. M., Schaefer, S. M., Lapate, R. C., Radler, B. T., Ryff, C. D., & Davidson, R. J. (2013). Sustained striatal activity predicts eudaimonic well-being and cortisol output. *Psychological Science*, 24, 2191–2200.

[Google Scholar](#) [WorldCat](#)

Hill, P. L., & Turiano, N. A. (2014). Purpose in life as a predictor of mortality across adulthood. *Psychological Science*, 25, 1482–1486.

[Google Scholar](#) [WorldCat](#)

Huffman, J. C., Millstein, R. A., Mastromauro, C. A., Moore, S. V., Celano, C. M., Bedoya, C. A., . . . Januzzi, J. L. (2015). A positive psychology intervention for patients with an acute coronary syndrome: Treatment development and proof-of-concept trial. *Journal of Happiness Studies*.

[Google Scholar](#) [WorldCat](#)

Jaser, S. S., Patel, N., Rothman, R. L., Choi, L., & Whittemore, R. (2014). Check it! A randomized pilot of a positive psychology intervention to improve adherence in adolescents with Type 1 diabetes. *Diabetes Education*, 40, 659–667.

[Google Scholar](#) [WorldCat](#)

Johnson, W., & Krueger, R. F. (2007). The psychological benefits of vigorous exercise: A study of discordant MZ twin pairs. *Twin Research and Human Genetics*, 10, 275–283.

p. 342 Jove, M., Naudi, A., Gambini, J., Borrás, C., Cabre, R., Portero-Otin, M., . . . Pamplona, R. (2017). A stress-resistant lipidomic signature confers extreme longevity to humans. *Journals of Gerontology, Series A, Biological Sciences and Medical Sciences*, 72, 30–37.

[Google Scholar](#)   [WorldCat](#)

Kan, C., Kawakami, N., Karasawa, M., Love, G. D., Coe, C. L., Miyamoto, Y., . . . Markus, H. R. (2014). Psychological resources as mediators of the association between social class and health: Comparative findings from Japan and the USA. *International Journal of Behavioral Medicine*, 21, 53–65.

[Google Scholar](#)   [WorldCat](#)

Karlson, C. W., Gallagher, M. W., Olson, C. A., & Hamilton, N. A. (2013). Insomnia symptoms and well-being: Longitudinal follow-up. *Health Psychology*, 32, 311–319.

[Google Scholar](#)   [WorldCat](#)

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology*, 73, 539–548.

[Google Scholar](#)   [WorldCat](#)

Keyes, C. L. M., & Grzywacz, J. G. (2002). Complete health: Prevalence and predictors among US adults in 1995. *American Journal of Health Promotion*, 17, 122–131.

[Google Scholar](#)   [WorldCat](#)

Keyes, C. L. M., Shmotkin, D., & Ryff, C. D. (2002). Optimizing well-being: The empirical encounter of two traditions. *Journal of Personality and Social Psychology*, 82, 1007–1022.

[Google Scholar](#)   [WorldCat](#)

Keyes, C. L. M., & Simoes, E. J. (2012). To flourish or not: Positive mental health and all-cause mortality. *American Journal of Public Health*, 102, 2164–2172.

[Google Scholar](#)   [WorldCat](#)

Korkeila, M., Kaprio, J., Rissanen, A., Koshenvuo, M., & Sorensen, T. I. (1998). Predictors of major weight gain in adult Finns: Stress, life satisfaction and personality traits. *International Journal of Obesity and Related Metabolic Disorders*, 22, 949–957.

[Google Scholar](#)   [WorldCat](#)

Lemola, S., Ledermann, T., & Friedman, E. M. (2013). Variability of sleep duration is related to subjective sleep quality and subjective well-being: An actigraphy study. *PLoS One*, 8, e71292.

[Google Scholar](#)   [WorldCat](#)

Lemola, S., Raikkonen, K., Gomez, V., & Allemand, M. (2013). Optimism and self-esteem are related to sleep. Results from a large community-based sample. *International Journal of Behavioral Medicine*, 20, 567–571.

[Google Scholar](#)   [WorldCat](#)

Malouff, J. M., & Schutte, N. S. (2017). Can psychological interventions increase optimism? A meta-analysis. *The Journal of Positive Psychology*, 12, 594–604.

[Google Scholar](#)   [WorldCat](#)

Morozink, J. A., Friedman, E. M., Coe, C. L., & Ryff, C. D. (2010). Socioeconomic and psychosocial predictors of interleukin-6 in the MIDUS national sample. *Health Psychology*, 29, 626–635.

[Google Scholar](#)   [WorldCat](#)

Ong, A. D., Exner-Cortens, D., Riffin, C., Steptoe, A., Zautra, A., & Almeida, D. M. (2013). Linking stable and dynamic features of positive affect to sleep. *Annals of Behavioral Medicine*, 46, 52–61.

[Google Scholar](#)   [WorldCat](#)

Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin*, 131, 925–971.

[Google Scholar](#) [WorldCat](#)

Robles, T. F., & Carroll, J. E. (2011). Restorative biological processes and health. *Social and Personality Psychology Compass*, 5, 518–537.

[Google Scholar](#) [WorldCat](#)

Rowe, J. W., & Kahn, R. L. (1987). Human aging: Usual and successful. *Science*, 237, 143–149.

[Google Scholar](#) [WorldCat](#)

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, 52, 141–166.

[Google Scholar](#) [WorldCat](#)

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57, 1069–1081.

[Google Scholar](#) [WorldCat](#)

Ryff, C. D., Radler, B. T., & Friedman, E. M. (2015). Persistent psychological well-being predicts improved self-rated health over 9–10 years: Longitudinal evidence from MIDUS. *Health Psychology Open*, 2, pii: 2055102915601582.

[Google Scholar](#) [WorldCat](#)

Ryff, C. D., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry*, 9, 1–28.

[Google Scholar](#) [WorldCat](#)

Ryff, C. D., & Singer, B. H. (2008). Know thyself and become what you are: A eudaimonic approach to psychological well-being. *Journal of Happiness Studies*, 9, 13–39.

[Google Scholar](#) [WorldCat](#)

Sabia, S., Elbaz, A., Rouveau, N., Brunner, E. J., Kivimaki, M., & Singh-Manoux, A. (2014). Cumulative associations between midlife health behaviors and physical functioning in early old age: A 17-year prospective cohort study. *Journal of the American Geriatric Society*, 62, 1860–1868.

[Google Scholar](#) [WorldCat](#)

Sabia, S., Nabi, H., Kivimaki, M., Shipley, M. J., Marmot, M. G., & Singh-Manoux, A. (2009). Health behaviors from early to late midlife as predictors of cognitive function: The Whitehall II study. *American Journal of Epidemiology*, 170, 428–437.

[Google Scholar](#) [WorldCat](#)

Sabia, S., Singh-Manoux, A., Hagger-Johnson, G., Cambois, E., Brunner, E. J., & Kivimaki, M. (2012). Influence of individual and combined healthy behaviours on successful aging. *CMAJ*, 184, 1985–1992.

[Google Scholar](#) [WorldCat](#)

Schaefer, S. M., Morozink Boylan, J., van Reekum, C. M., Lapate, R. C., Norris, C. J., Ryff, C. D., & Davidson, R. J. (2013). Purpose in life predicts better emotional recovery from negative stimuli. *PLoS One*, 8, e80329.

[Google Scholar](#) [WorldCat](#)

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: Psychological, behavioral, and biological determinants. *Annual Review of Clinical Psychology*, 1, 607–628.

[Google Scholar](#) [WorldCat](#)

Seeman, J. (1989). Toward a model of positive health. *American Psychologist*, 44, 1099–1109.

[Google Scholar](#) [WorldCat](#)

Smith, A. W., & Baum, A. (2003). The influence of psychological factors on restorative function in health and illness. In J. Suls & K. A. Wallston (Eds.), *Social psychological foundations of health and illness* (pp. 432–457). Malden, MA: Blackwell.

Tsenkova, V. K., Karlamangla, A. S., & Ryff, C. D. (2016). Parental history of diabetes, positive affect, and diabetes risk in adults: Findings from MIDUS. *Annals of Behavioral Medicine*, 50, 836–843.

[Google Scholar](#)   [WorldCat](#)

Weiser, E. B. (2012). Associations between positive and negative affect and 12-month physical disorders in a national sample. *Journal of Clinical Psychology in Medical Settings*, 19, 197–210.

[Google Scholar](#)   [WorldCat](#)

Weiss, L. A., Westerhof, G. J., & Bohlmeijer, E. T. (2016). Can we increase psychological well-being? The effects of interventions on psychological well-being: A meta-analysis of randomized controlled trials. *PLoS One*, 11, e0158092.

[Google Scholar](#)   [WorldCat](#)

Zilioli, S., Imami, L., & Slatcher, R. B. (2015). Life satisfaction moderates the impact of socioeconomic status on diurnal cortisol slope. *Psychoneuroendocrinology*, 60, 91–95.

[Google Scholar](#)   [WorldCat](#)

Zilioli, S., Slatcher, R. B., Ong, A. D., & Gruenewald, T. L. (2015). Purpose in life predicts allostatic load ten years later. *Journal of Psychosomatic Research*, 79, 451–457.

[Google Scholar](#)   [WorldCat](#)