HHS Public Access

Author manuscript

Circ Heart Fail. Author manuscript; available in PMC 2015 October 16.

Published in final edited form as:

Circ Heart Fail. 2014 May ; 7(3): 394–400. doi:10.1161/CIRCHEARTFAILURE.113.000644.

A Prospective Study of the Association Between Dispositional Optimism and Incident Heart Failure

Eric S. Kim, MS, **Jacqui Smith, PhD**, and **Laura D. Kubzansky, PhD**

Department of Psychology (E.S.K., J.S.), University of Michigan, Ann Arbor; Institute for Social Research (J.S.), University of Michigan, Ann Arbor; and the Department of Social and Behavioral Sciences (L.D.K.), Harvard School of Public Health, Boston, Massachusetts

Abstract

Background—Although higher optimism has been linked with an array of positive health behaviors, biological processes, and cardiovascular outcomes, the relationship between optimism and heart failure has not been examined. In the United States, 80% of heart failures occur in adults aged 65+. Therefore, we examined whether higher optimism was linked with a reduced incidence of heart failure among older adults.

Methods and Results—Prospective data were from the Health and Retirement Study, a nationally representative study of older U.S adults. Our sample included 6,808 participants who were followed for four years. Multiple logistic regression models were used to assess if optimism was independently associated with incident heart failure. We adjusted for sociodemographic, behavioral, biological, and psychological covariates. Higher optimism was associated with a lower risk of incident heart failure over the follow-up period. In a model that adjusted for sociodemographic factors, each standard deviation increase in optimism had an odds ratio of 0.74 (95% CI, 0.63–0.85) for heart failure. Effects of optimism persisted even after adjusting for a wide range of covariates. There was also evidence of a dose-response relationship. As optimism increased, risk of developing heart failure decreased monotonically, with a 48% reduced odds among people with the highest versus lowest optimism.

Conclusions—This is the first study to suggest that optimism is associated with a lower risk of heart failure. If future studies confirm these findings, they may be used to inform new strategies for preventing or delaying the onset of heart failure.

Keywords

optimism; heart failure; epidemiology; public health; psych & behavior

Heart failure is an emerging epidemic.[1] In the United States alone, over 5.8 million people have the condition and it costs the nation $39 billion annually.[2] Due in part to an aging population, recent reports have projected that the increasing prevalence of heart failure will

Correspondence and reprint requests to: Eric S. Kim, Department of Psychology, 530 Church Street, University of Michigan, Ann Arbor, MI 48109-1043, USA; Phone; 914) 826-4477; Fax: (734) 615-0573; kimeric@umich.edu.

Disclosures

There are no conflicts of interest.

translate into significantly rising healthcare costs.[3] Given that the risk of heart failure rapidly increases with age, and the number of adults over the age of 65 is estimated to double by 2050,[4] identifying new targets for prevention of heart failure is increasingly urgent.

Despite a robust literature examining the clinical, socioeconomic, and lifestyle risk factors for heart failure,[5,6] links between psychological factors and heart failure have rarely been examined. However, psychological factors may play an important role in the development of heart failure. For example, dispositional optimism – the generalized expectation that good things will happen – has been linked to an array of cardiovascular benefits which range from lower risk of cardiovascular disease, to lowered risk of stroke, and lower risk of hospitalization after bypass surgery.[7–11] Moreover, optimism is associated with important health behaviors, which in turn are strongly linked with a decreased risk of developing heart failure. For example, optimists are more likely to engage in health-promoting behaviors such as eating healthier diets, exercising more, managing stress better, and abstaining from smoking.[11–14] Optimism is an individual attribute that is about 25% heritable,[15] but can also be shaped by social influences and learned.[16–19] Thus, it may provide a point of intervention for improving health outcomes. To date, however, no research has examined the relationship between optimism and heart failure.

To fill this gap, we investigated the association between dispositional optimism and incident heart failure. Considering that 80% of heart failures in the United States occur in adults over the age of 65,[20] we used data from the Health and Retirement Study, a longitudinal and nationally representative sample of older adults in the United States.

Based on prior research examining the relationship between optimism and other cardiovascular outcomes, we hypothesized that higher optimism would be associated with a lower risk of developing heart failure. To test the hypothesis, we examined optimism's association with incident heart failure while controlling for a wide range of covariates (e.g., sociodemographic, biological, and behavioral factors) that are related to cardiovascular risk. We also considered whether some of these factors (e.g., smoking, physical activity) might be on the pathway as potential variables linking higher optimism to a lower risk of heart failure. While formal tests of mediation were not possible due to data limitations, we assessed whether findings might be consistent with this interpretation. In addition, because several studies have found a link between psychological ill-being and increased risk of cardiovascular events,[21] we controlled for anxiety, cynical hostility, and depression. Evidence that optimism is associated with heart failure even after adjusting for these factors would reduce concerns that a relationship between optimism and heart failure was primarily attributable to the mere absence of psychological ill-being.

METHODS

Participants

The Health and Retirement Study (HRS) is a nationally representative panel study that has surveyed more than 22,000 Americans aged 50 and older biannually since 1992.[22,23] In 2006, the HRS added a detailed module that assessed several psychological factors for the first time. Thus, we considered 2006 (the eighth wave) as the baseline for the present study

and used psychological and covariate data collected in that wave. Incident heart failure was assessed in follow-up waves: the ninth (2008), tenth (2010), and exit interviews. For respondents who died during the follow-up period, exit interviews were completed by knowledgeable informants (see supplemental material for more detail). The University of Michigan's Institute for Social Research is responsible for the study and provides extensive documentation about the protocol, instrumentation, sampling strategy, and statistical weighting procedures.[22] Because the present study used de-identified, publicly available data, the Institutional Review Board at the University of Michigan exempted it from review.

Procedure

In 2006, approximately half of the HRS respondents were visited for an enhanced face-to-face interview. At that time respondents were also asked to complete a leave behind self-report psychological questionnaire, which they then returned by mail. Among people who were interviewed, the response rate for the leave-behind questionnaire was 90%. While HRS interviewed all couples in a household, only data for respondents aged 50 and older is made available through HRS. Therefore, among those who were interviewed face-to-face, 7,168 respondents were eligible for HRS. We excluded 360 participants who self-reported a history of heart failure at the 2006 baseline, resulting in a final sample of 6,808 respondents.

Measures

Heart Failure Outcome Measurement—Using data from the 2008, 2010 and exit surveys, we defined heart failure incidence as a first fatal or non-fatal heart failure based on self or proxy report of a physician's diagnosis. HRS did not obtain information about subtypes of heart failure, so we could not consider effects separately by subtype. All health conditions in HRS are assessed via self-report of a doctor's diagnosis. Researchers have rigorously assessed these self-reported health measures, demonstrating their validity and reliability.[22] Furthermore, concordance studies comparing self-reports of heart failure with physical measures and medical records have been conducted across diverse populations.[24–29] Across these studies, agreement between self-reported heart failure and medical records ranged from 87.7–96.3%, sensitivity ranged from 47%–68.6%, and specificity ranged from 95% to 97.7% (see Supplemental Methods for more details).[24–29]

Optimism—Optimism was assessed using the six-item Life Orientation Test-Revised (LOT-R).[30] Studies have demonstrated the revised LOT-R has good reliability.[8] The measure has also been demonstrated to have good discriminant and convergent validity.[30] Respondents were asked to rate each item on a 6-point Likert scale indicating the degree to which they endorsed such items as, "In uncertain times, I usually expect the best." Three negatively worded items were reverse scored. Then, all six items were averaged together, with higher scores reflecting higher optimism (Cronbach's $\alpha = 0.78$). The overall scores were then standardized ($\mu = 0$, $\sigma = 1$) to facilitate interpretation and comparisons of effect size across optimism studies. In our study, all results can be interpreted as the change in odds of developing heart failure as a function of a one standard deviation increase in optimism. In addition, we created quartiles of optimism based on the score distribution in this sample, in order to consider the possibility of threshold or discontinuous effects. Quartiles of optimism were created because naturally occurring or clinically meaningful thresholds have not yet

been established for this construct. The mean optimism scores by quartile were: 3.21 (low), 4.07 (low-moderate), 4.81 (moderate-high), and 5.68 (high).

Researchers sometimes split the LOT-R into two subscales—one consisting of only positively valenced items and the other consisting of only negatively valenced items. We chose not to create subscales for theoretical and methodological reasons.[31,32] Optimism is most accurately captured by a scale that combines positively worded items that are endorsed and negatively worded items that are rejected.[31] Furthermore, it is increasingly apparent that this separation into subscales may be at odds with the goal of controlling for acquiescence response bias in the measurement of psychological constructs. Thus, following recent theorizing and work in this area, we used the six-item composite, rather than creating two 3-item subscales.[13,32]

Covariates Measurement—Potential covariates included sociodemographic, behavioral, biological, and psychological factors that prior work suggests are relevant to heart failure risk.[5,6,21] All of the covariates described below were collected at baseline in 2006.

Sociodemographic covariates include: age, gender, race/ethnicity (Caucasian-American, African-American, Hispanic, Other) which was dummy coded with Caucasian-American as the reference group, marital status (married/not married), educational attainment (no degree, GED or high school diploma, college degree or higher), and total wealth (<25,000; 25,000–124,999; 125,000–299,999; 300,000–649,999; >650,000—based on quintiles of the score distribution in this sample).

Psychological covariates were assessed using measures that have been rigorously evaluated and shown good reliability and validity in previous studies. Depression was measured using the Center for Epidemiological Studies Depression Scale (CES-D)[33] (in HRS, M = 1.59, SD = 2.03, Cronbach $\alpha = 0.88$), anxiety was measured using the Beck Anxiety Inventory (in HRS, M = 1.60, SD = 0.59, Cronbach $\alpha = 0.80$),[34] and cynical hostility was measured using the cynicism subscale of the Cook-Medley Hostility Inventory (in HRS, M = 3.97, SD = 1.15, Cronbach $\alpha = 0.79$).[35] The correlations between optimism and the psychological factors were moderate but significant −0.30 (depression), −0.33 (anxiety), and 0.36 (cynical hostility).

Potential behavioral and biological covariates that might link optimism to heart failure were also considered. Behavioral covariates included smoking status (never, former, current), frequency of moderate (e.g., gardening, dancing, walking at a moderate pace) and vigorous exercise (e.g., running, swimming, aerobics) reported as never, 1–4 times per month, more than once a week), and frequency of alcohol consumption (abstinent, less than 1 or 2 days per month, 1 to 2 days per week, and more than 3 days per week) which was dummy coded with abstinent as the reference group.

Biological covariates included self-reported weight in pounds, converted into kilograms and height in inches, converted into meters (used to calculate body mass index [BMI] according to kg/m^2); hypertension and diabetes (each yes/no based on self-report of a doctor's diagnosis). BMI was categorized as <18.5 (underweight), 18.5–24.9 (normal), 25–29.9

(overweight), ≥30 (obese). Because the "underweight" category contained only 1.43% of the sample and was unstable in statistical analyses, it was collapsed with the "normal" category.

Statistical Analysis

We conducted multiple logistic regression analyses to test whether optimism was associated with a lower risk of heart failure. Logistic regression was used because we did not have detailed information on the date each heart failure occurred. Odds ratios provide a good approximation of hazards ratios in this study for four reasons: the follow-up time was short, the sample size was large, the risk ratio was moderate in size, and the outcome incidence ratio was low (probability of heart failure was 6.14% in our sample).[36] The impact of covariates on the relationship between optimism and heart failure was estimated by adjusting for blocks of covariates.

We first examined a minimally adjusted model and then considered the impact that adding demographic covariates had on the association between optimism and heart failure. We subsequently considered the impact of biological or behavioral covariates in a third and a fourth model. In models 3 and 4, an observed reduction in the association between optimism and heart failure, after adding either biological or behavioral covariates, may be consistent with the possibility that each block of variables represents a potential pathway linking optimism to risk of heart failure. Model 1 adjusted for only age and gender. Model 2, the core model, included: age, gender, race/ethnicity, marital status, educational degree, and total wealth. Three additional models were created; Model 3 – core model + health behaviors (smoking status, exercise, alcohol frequency); and Model 4 – core model + biological factors (hypertension, diabetes, BMI). Although doing so could overfit the model and raise multicollinearity issues, we also created a model 5, which included all covariates.

Several additional analyses were performed. First, we examined if associations found between optimism and heart failure were maintained even when controlling for depression, anxiety, and cynical hostility. Using the core model, we added each psychological factor one at a time. Second, we examined the data for a potential threshold effect by considering quartiles of optimism. Third, to assess the possibility that the associations found in our study might be due to reverse causality (i.e., having undiagnosed heart failure may lead to lower optimism), we re-examined the association between optimism and heart failure after excluding any cases of heart failure that developed within 2 years of baseline. While this analysis cannot fully rule out the possibility of reverse causality, it may provide evidence to reduce concerns that prodromal disease alters a person's generalized expectations for the future. In this analysis (n=6,549), we had to drop participants who self-identified themselves in a race/ethnicity category other than Caucasian, Black, or Hispanic because there were not enough cases of heart failure to power the analyses for this group. Fourth, we tested a potential interaction between optimism and gender to assess possible gender differences in the association of interest.

Logits were converted into odds ratios (ORs) for ease of interpretation. Given that the probability of heart failure was rare in our sample (6.14%), our reported ORs may be regarded as relative risks.[36] All reported results in this study were weighted, using HRS sampling weights to account for the complex multistage probability survey design, which

includes individual non-response, sample clustering, stratification, and further post-stratification using Stata (StataCorp. 2011. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP).

Missing Data Analysis

For all study variables, the overall item non-response rate was only 0.48%. However, the missing data were distributed across variables, resulting in a 4.22% loss of respondents when complete-case analyses were attempted. Therefore, to examine the impact of missing data on our results and to obtain less biased estimates, multiple imputation procedures were used to impute missing data. Results were largely the same between the original and imputed datasets. We therefore used the dataset with multiple imputation for all analyses reported here because this technique provides a more accurate estimate of association than other methods of handling missing data.[37]

RESULTS

Descriptive Analyses

The average age of respondents at baseline was 70 years (SD = 10.26). Respondents tended to be female (59%) and married (62%). Most had a high school degree (54%) or attended some college (22%). Respondents identified as being European-American (71%), African-American (17%), Hispanic (10%), or “Other” (2%). Among the 6,808 participants, 418 respondents developed heart failure over the four-year follow-up (196 women and 222 men). Table 1 describes the distribution of covariates across quartiles of optimism.

Optimism and Heart Failure Incidence

Associations between optimism and heart failure were highly consistent across all five models. For example, in the core model (Model 2), each standard deviation increase in optimism was associated with a multivariate-adjusted OR of 0.74 for heart failure (95% CI, 0.63–0.85), suggesting that people with higher optimism were at lower risk for incident heart failure. When considering each block of potential pathway covariates, the association between optimism and incident heart failure were somewhat attenuated, but remained significant in all the models (Models 3–5, Table 2). See Supplemental Table 1 for more detailed information about these results.

Considering Psychological Ill-Being

Each psychological factor, when added sequentially to the base model caused only a modest decrease in the association between optimism and heart failure. For example, when anxiety was added to the core model, the multivariate-adjusted OR for optimism was 0.79 (95% CI, 0.66–0.96). Overall, the relationship between optimism and heart failure remained significant in each of the analyses. When all three psychological factors were simultaneously added to the base model, the effect of optimism remained significant (OR = 0.83, 95% CI, 0.69–0.99). See Supplemental Table 2 for more detailed information about these results.

Additional Analyses

When examining quartiles of optimism, the findings suggested a dose-response relationship (Table 3). For example, in the core model (Model 2, Table 3) relative to those with the lowest optimism, people with moderately high optimism had a somewhat lower risk of heart failure (O.R. = 0.61, 95% CI, 0.44–0.86), while those with the highest optimism had the lowest risk of heart failure (O.R. = 0.42, 95% CI, 0.27–0.64). These findings were maintained even after adjusting for biological and behavioral covariates.

In a sensitivity analysis, we excluded individuals who developed heart failure in the first two years of follow-up (n=6,549). Although statistical power was substantially reduced, the association between optimism and heart failure risk remained significant in all the models (Table 4). Finally, a potential interaction between optimism and gender was formally tested and the result was not significant (p = .303).

DISCUSSION

To date, this is the first study to investigate the association between optimism and risk of developing heart failure. Over a four year follow-up period, optimism was associated with a reduced likelihood of developing heart failure in a nationally representative sample of older adults (over the age of 50). After adjusting for sociodemographic covariates each standard deviation increase in optimism was associated with a 26% lower risk of developing heart failure over the follow-up. Furthermore, we observed a dose-response relationship. As optimism levels increased, risk of developing heart failure decreased in a monotonic fashion. In addition, secondary analyses helped temper possible concerns that the optimism and heart failure association found in this study might be largely attributable to undiagnosed heart failure leading to reduced optimism, rather than optimism serving as an antecedent to heart failure. In analyses conducted only after excluding individuals who developed heart failure earlier in the follow-up period, results showed that the association between optimism and heart failure was maintained. While such findings cannot conclusively rule out the possibility that undiagnosed heart failure may influence optimism, these findings suggest that it is less likely.

The relationship between optimism and heart failure persisted even after adjusting for a range of risk factors including sociodemographic, behavioral, biological, and psychological covariates. These results are consistent with past studies that repeatedly show that the relationship between psychological well-being and cardiovascular outcomes is attenuated by risk-related behavior and biological conditions, but is not fully explained by these factors.[11] In fact the magnitude of attenuation in effect estimates after considering biologic and behavioral variables was quite modest. This suggests that other mechanisms may be at play.

A growing number of studies suggest that the protective nature of optimism may be attributable to both indirect and direct pathways. Optimists may engage in healthier lifestyles that minimize health risks and enhance health. For example, in one study, having higher optimism at the outset of a cardiac rehabilitation program predicted increased exercise and successful lowering of body fat, saturated fat, and an index of overall coronary risk.[38] Other studies have found that optimists are more likely to engage in health-promoting

behaviors such as eating healthier diets, exercising more, managing stress better, and abstaining from smoking.[11–14] While we took account of some of these factors, our measures may have been somewhat imprecise and therefore inexactly estimated the contribution of these factors to explaining how optimism might improve cardiovascular health. However, other pathways may be worthy of consideration. For example, direct biological effects of optimism have been hypothesized. Optimism has been linked with healthier levels of interleukin (IL)-6, C-reactive protein, fibrinogen, carotid intima medial thickness, lipids, and serum antioxidants.[13,39–41] Furthermore, social support has been identified as mediating the effect of optimism on stress and has been posited as a possible mediator between optimism and cardiovascular disease.[42] Further studies are necessary to identify the mechanisms that may underlie the observed protective effect of optimism on heart failure risk.

Past studies have shown that psychological ill-being, as measured by anxiety, hostility, or depression are associated with an increased risk of adverse cardiovascular events.[21] However, there was little evidence of confounding by these factors in our study, as the association between optimism and incident heart failure was minimally altered after adjusting for these psychological factors. This finding decreases concerns that optimism merely reflects an absence of psychological ill-being, and suggests that optimism may uniquely impact risk of heart failure. It also adds to the research that has begun to disentangle whether the biological benefits originating from psychological well-being are distinct from the physiological costs attributable to psychological ill-being.[43,44] In fact, prior work has suggested that psychological well-being and psychological ill-being show distinct biological correlates.[44]

Our study has several limitations and strengths. Limitations include relying on self-report of heart failure. Numerous studies, however, have shown that self-reported heart failure is a reasonable proxy for more objective measures.[24–29] Despite the limitations of using self-reported heart failure, our findings are consistent with a substantial body of research demonstrating that optimism is linked with healthier behaviors, healthier physiological profiles, and enhanced cardiovascular health.[7–14,38–41,45] This tempers the likelihood that findings from this study are spurious or due to misclassification of the heart failure outcome. Additionally, some risk factors, such as family history of cardiovascular disease and genetic vulnerability were not assessed, and as a result we could not take into account potential confounding due to these factors. Our data also lacked information about etiological subtypes of heart failure so we could not consider effects separately by subtype. Finally, it is possible that people had lower optimism because they suffered from the side-effects of undiagnosed heart failure. While sensitivity analyses did not suggest this was a significant problem, additional work is needed to confirm the direction of effects.

Despite these limitations, this research has several considerable strengths. HRS is one of the few nationally representative studies to contain extensive information on both heart failure and potential risk factors, especially those that are psychological in nature. Thus, we were able to assess the association between optimism and heart failure after adjusting for a wide array of covariates. In addition, a widely used and validated measure of the primary exposure of interest was available. Further, the prospective nature of our data minimizes

concerns that the associations found in this study are due to retrospective reporting bias or reverse causality.

Heart failure is a leading cause of hospitalization among older adults in the United States and the population of older adults is projected to double by 2050.[4] Continued research in this domain may not only enhance our knowledge of optimism's effects on heart health, but also increase the conceptual and physiological understanding of how mental and physical health interact. Future longitudinal studies are necessary to examine in more detail how optimism might protect against heart failure. Since heart failure is an umbrella term for many varying forms of the disease including systolic heart failure, diastolic heart failure, and left-ventricular heart failure, additional research should evaluate if optimism has similar protective effects on each of these conditions. This knowledge may then contribute to the development of more specific heart failure prevention and intervention programs. Should future research corroborate our findings, supplementing psychological interventions and current heart failure protocol with interventions shown to reliably increase psychological well-being, such as optimism, may be warranted.[17,18,46–48]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

We would like to thank the editor, associate editors, and the anonymous reviewers for their valuable comments and suggestions. We also acknowledge the Health and Retirement Study, which is conducted by the Institute for Social Research at the University of Michigan, with grants from the National Institute on Aging (U01AG09740) and the Social Security Administration.

Funding Sources

Support for this publication is provided by the Robert Wood Johnson Foundation's Pioneer Portfolio, which supports innovative ideas that may lead to breakthroughs in the future of health and health care. The Pioneer Portfolio funding was administered through a Positive Health grant to the Positive Psychology Center of the University of Pennsylvania, Martin Seligman, director.

REFERENCES

1. McCullough PA, Philbin EF, Spertus JA, Kaatz S, Sandberg KR, Weaver WD. Confirmation of a heart failure epidemic: Findings from the Resource Utilization Among Congestive Heart Failure (REACH) Study. J Am Coll Cardiol. 2002; 39:60–69. [PubMed: 11755288]
2. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, Ferguson TB, Ford E, Furie K, Gillespie C, Go A, Greenlund K, Haase N, Hailpern S, Ho PM, Howard V, Kissela B, Kittner S, Lackland D, Lisabeth L, Marelli A, McDermott MM, Meigs J, Mozaffarian D, Mussolino M, Nichol G, Roger VL, Rosamond W, Sacco R, Sorlie P, Stafford R, Thom T, Wasserthiel-Smoller S, Wong ND, Wylie-Rosett J. Committee on behalf of the AHA, Stroke Statistics Subcommittee. Heart disease and stroke statistics—2010 update: A report from the American Heart Association. Circulation. 2010; 121:e46–e215. [PubMed: 20019324]
3. Bui AL, Horwich TB, Fonarow GC. Epidemiology and risk profile of heart failure. Nat Rev Cardiol. 2011; 8:30–41. [PubMed: 21060326]
4. Vincent, G.; Velkoff, V. The older population in the United States 2010 to 2050. Washington D.C.: US Census Bureau; 2010. The next four decades.

5. Gottdiener JS, Arnold AM, Aurigemma GP, Polak JF, Tracy RP, Kitzman DW, Gardin JM, Rutledge JE, Boineau RC. Predictors of congestive heart failure in the elderly: The Cardiovascular Health Study. J Am Coll Cardiol. 2000; 35:1628–1637. [PubMed: 10807470]
6. He J, Ogden LG, Bazzano LA, Vupputuri S, Loria C, Whelton PK. Risk factors for congestive heart failure in US men and women: NHANES I epidemiologic follow-up study. Arch Intern Med. 2001; 161:996–1002. [PubMed: 11295963]
7. Giltay EJ, Geleijnse JM, Zitman FG, Hoekstra T, Schouten EG. Dispositional optimism and all-cause and cardiovascular mortality in a prospective cohort of elderly Dutch men and women. Arch Gen Psychiatry. 2004; 61:1126–1135. [PubMed: 15520360]
8. Tindle HA, Chang YF, Kuller LH, Manson JE, Robinson JG, Rosal MC, Siegle GJ, Matthews KA. Optimism, cynical hostility, and incident coronary heart disease and mortality in the Women's Health Initiative. Circulation. 2009; 120:656–662. [PubMed: 19667234]
9. Kim ES, Park N, Peterson C. Dispositional optimism protects older adults from stroke: The Health and Retirement Study. Stroke. 2011; 42:2855–2859. [PubMed: 21778446]
10. Scheier MF, Matthews KA, Owens JF, Magovern SGJ, Lefebvre RC, Abbott RA, Carver CS. Dispositional optimism and recovery from coronary artery bypass surgery: The beneficial effects on physical and psychological well-being. J Pers Soc Psychol. 1989; 57:1024–1040. [PubMed: 2614656]
11. Boehm JK, Kubzansky LD. The heart's content: The association between positive psychological well-being and cardiovascular health. Psychol Bull. 2012; 138:655–691. [PubMed: 22506752]
12. Carver CS, Scheier MF, Segerstrom SC. Optimism. Clin Psychol Rev. 2010; 30:879–889. [PubMed: 20170998]
13. Boehm JK, Williams DR, Rimm EB, Ryff C, Kubzansky LD. Association between optimism and serum antioxidants in the Midlife in the United States Study. Psychosom Med. 2013; 75:2–10. [PubMed: 23257932]
14. Giltay EJ, Geleijnse JM, Zitman FG, Buijsse B, Kromhout D. Lifestyle and dietary correlates of dispositional optimism in men: The Zutphen Elderly Study. J Psychosom Res. 2007; 63:483–490. [PubMed: 17980220]
15. Plomin R, Scheier MF, Bergeman CS, Pedersen NL, Nesselroade JR, McClearn GE. Optimism, pessimism and mental health: A twin/adoption analysis. Pers Indiv Differ. 1992; 13:921–930.
16. Heinonen K, Räikkönen K, Matthews KA, Scheier MF, Raitakari OT, Pulkki L, Keltikangas-Järvinen L. Socioeconomic status in childhood and adulthood: Associations with dispositional optimism and pessimism over a 21-year follow-up. J Pers. 2006; 74:1111–1126. [PubMed: 16787430]
17. Peters ML, Flink IK, Boersma K, Linton SJ. Manipulating optimism: Can imagining a best possible self be used to increase positive future expectancies? J Posit Psychol. 2010; 5:204–211.
18. Meevissen YMC, Peters ML, Alberts HJEM. Become more optimistic by imagining a best possible self: Effects of a two week intervention. J Behav Ther Exp Psychiatry. 2011; 42:371–378. [PubMed: 21450262]
19. Seligman, ME. Learned optimism: How to change your mind and your life. New York, NY: Random House; 2011.
20. Rich MW. Heart failure in the 21st Century a cardiogeriatric syndrome. J Gerontol A Biol Sci Med Sci. 2001; 56:M88–M96. [PubMed: 11213282]
21. Rozanski A, Blumenthal JA, Davidson KW, Saab PG, Kubzansky L. The epidemiology, pathophysiology, and management of psychosocial risk factors in cardiac practice: The emerging field of behavioral cardiology. J Am Coll Cardiol. 2005; 45:637–651. [PubMed: 15734605]
22. Wallace RB, Herzog AR. Overview of the health measures in the Health and Retirement Study. J Hum Resour. 1995; 30:S84–S107.
23. Health and Retirement Study, (HRS Data Files; 2006, 2008, 2010) public use dataset. Produced and distributed by the University of Michigan with funding from the National Institute on Aging (grant number NIA U01AG009740). Ann Arbor, MI, (2013).
24. Djoussé L DJ. Relation between modifiable lifestyle factors and lifetime risk of heart failure. JAMA. 2009; 302:394–400. [PubMed: 19622818]

25. Dhingra R, Gaziano JM, Djoussé L. Chronic kidney disease and the risk of heart failure in men. Circ Heart Fail. 2011; 4:138–144. [PubMed: 21216838]
26. Heliövaara M, Aromaa A, Klaukka T, Knekt P, Joukamaa M, Impivaara O. Reliability and validity of interview data on chronic diseases. The Mini-Finland health survey. J Clin Epidemiol. 1993; 46:181–191. [PubMed: 8437034]
27. Simpson CF, Boyd CM, Carlson MC, Griswold ME, Guralnik JM, Fried LP. Agreement between self-report of disease diagnoses and medical record validation in disabled older women: Factors that modify agreement. J Am Geriatr Soc. 2004; 52:123–127. [PubMed: 14687326]
28. Englert H, Müller-Nordhorn J, Seewald S, Sonntag F, Völler H, Meyer-Sabellek W, Wegscheider K, Windler E, Katus H, Willich SN. Is patient self-report an adequate tool for monitoring cardiovascular conditions in patients with hypercholesterolemia? J Public Health. 2010; 32:387–394.
29. Okura Y, Urban LH, Mahoney DW, Jacobsen SJ, Rodeheffer RJ. Agreement between self-report questionnaires and medical record data was substantial for diabetes, hypertension, myocardial infarction and stroke but not for heart failure. J Clin Epidemiol. 2004; 57:1096–1103. [PubMed: 15528061]
30. Scheier MF, Carver CS, Bridges MW. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. J Pers Soc Psychol. 1994; 67:1063–1078. [PubMed: 7815302]
31. Ryff CD, Singer B. What to do about positive and negative items in studies of psychological well-being and ill-being? Psychother Psychosom. 2007; 76:61–62.
32. Segerstrom SC, Evans DR, Eisenlohr-Moul TA. Optimism and pessimism dimensions in the Life Orientation Test-Revised: Method and meaning. J Res Pers. 2011; 45:126–129.
33. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Appl Psychol Meas. 1977; 1:385–401.
34. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: Psychometric properties. J Consult Clin Psychol. 1988; 56:893–897. [PubMed: 3204199]
35. Costa PT, Zonderman AB, McCrae RR, Williams RB. Cynicism and paranoid alienation in the Cook and Medley HO Scale. Psychosom Med. 1986; 48:283–285. [PubMed: 3704090]
36. Van Belle, G. Statistical rules of thumb. Hoboken, NJ: Wiley; 2008.
37. Little, RJA.; Rubin, DB. Statistical analysis with missing data. Hoboken, NJ: Wiley; 2002.
38. Shepperd JA, Maroto JJ, Pbert LA. Dispositional optimism as a predictor of health changes among cardiac patients. J Res Pers. 1996; 30:517–534.
39. Boehm JK, Williams DR, Rimm EB, Ryff C, Kubzansky LD. Relation between optimism and lipids in midlife. Am J Cardiol. 2013; 111:1425–1431. [PubMed: 23433765]
40. Matthews KA, Raikkonen K, Sutton-Tyrrell K, Kuller LH. Optimistic attitudes protect against progression of carotid atherosclerosis in healthy middle-aged women. Psychosom Med. 2004; 66:640–644. [PubMed: 15385685]
41. Roy B, Diez-Roux AV, Seeman T, Ranjit N, Shea S, Cushman M. Association of optimism and pessimism with inflammation and hemostasis in the Multi-Ethnic Study of Atherosclerosis (MESA). Psychosom Med. 2010; 72:134–140. [PubMed: 20100888]
42. Vollmann M, Antoniw K, Hartung F-M, Renner B. Social support as mediator of the stress buffering effect of optimism: The importance of differentiating the recipients' and providers' perspective. Eur J Pers. 2011; 25:146–154.
43. Seligman MEP. Positive health. Appl Psychol Int Rev. 2008; 57:3–18.
44. Ryff CD, Love GD, Urry HL, Muller D, Rosenkranz MA, Friedman EM, Davidson RJ, Singer B. Psychological well-being and ill-being: Do they have distinct or mirrored biological correlates? Psychother Psychosom. 2006; 75:85–95. [PubMed: 16508343]
45. Peterson C, Park N, Kim ES. Can optimism decrease the risk of illness and disease among the elderly? Aging Health. 2012; 8:5–8.
46. Brunwasser SM, Gillham JE, Kim ES. A meta-analytic review of the Penn Resiliency Program's effect on depressive symptoms. J Consult Clin Psychol. 2009; 77:1042–1054. [PubMed: 19968381]

47. Peterson C, Kim ES. Psychological interventions and coronary heart disease. Int J Clin Health Psychol. 2011; 11:563–575.

48. Boehm J, Vie L, Kubzansky L. The promise of well-being interventions for improving health risk behaviors. Curr Cardiovasc Risk Rep. 2012; 6:511–519.

Table 1

Distribution of respondent characteristics by level of optimism*

Characteristic	Optimism			
	Low (n=1,892)	Low-Moderate (n=1,563)	Moderate-High (n=1,855)	High (n=1,498)
Mean Age (SD)	69.97 (10.63)	70.06 (10.04)	70.01 (10.44)	68.89 (9.71)
Female	1084 (57.29)	875 (56.00)	1066 (57.47)	978 (65.30)
Married Status	1120 (59.21)	932 (59.66)	1181 (63.69)	967 (64.54)
Race/Ethnicity				
Caucasian	1350 (71.37)	1090 (69.76)	1346 (72.56)	1112 (74.24)
African-American	317 (16.76)	260 (16.62)	320 (17.26)	244 (16.27)
Hispanic	194 (10.26)	178 (11.39)	174 (9.36)	126 (8.46)
Other	31 (1.62)	35 (2.23)	15 (0.82)	16 (1.04)
Education				
< High School	660 (34.88)	382 (24.42)	384 (20.70)	220 (14.66)
High School	970 (51.22)	897 (57.42)	1006 (54.24)	794 (53.00)
≥ College	262 (13.89)	284 (18.16)	465 (25.07)	484 (32.34)
Total Wealth				
1st Quintile	553 (29.25)	365 (23.38)	301 (16.22)	230 (15.33)
2nd Quintile	459 (24.24)	309 (19.77)	375 (20.20)	201 (13.44)
3rd Quintile	384 (20.30)	320 (20.45)	422 (22.73)	296 (19.78)
4th Quintile	291 (15.36)	281 (18.00)	383 (20.67)	382 (25.51)
5th Quintile	205 (10.86)	288 (18.39)	374 (20.20)	389 (25.94)
Smoking Status				
Never	785 (41.48)	616 (39.40)	849 (45.77)	690 (46.06)
Former Smoker	770 (40.72)	715 (45.74)	823 (44.36)	671 (44.82)
Current Smoker	337 (17.80)	232 (14.86)	183 (9.87)	137 (9.12)
Exercise				
Never	1431 (75.62)	1078 (68.99)	1147 (61.86)	881 (58.82)
1–4 times per month	196 (10.38)	181 (11.57)	289 (15.57)	215 (14.35)
More than 1× per week	265 (14.00)	304 (19.45)	419 (22.57)	402 (26.83)
Alcohol Frequency				
Never	1072 (56.67)	825 (52.77)	925 (49.85)	722 (48.19)
<1 per week	309 (16.35)	304 (19.46)	350 (18.88)	249 (16.62)
1–2 per week	245 (12.95)	198 (12.65)	290 (15.66)	248 (16.54)
3+ per week	266 (14.03)	236 (15.12)	290 (15.62)	279 (18.64)
Hypertension	1090 (57.61)	968 (61.96)	930 (57.67)	788 (52.59)
Diabetes	419 (22.13)	391 (25.04)	268 (19.86)	203 (13.54)
BMI, kg/m^2				
Underweight (<18.5)	510 (26.97)	452 (28.90)	528 (28.49)	481 (32.13)
Normal (25–29.9)	679 (35.86)	574 (36.72)	695 (37.45)	589 (39.34)
Overweight (≥30)	703 (37.17)	537 (34.38)	632 (34.06)	428 (28.53)

*Unless otherwise noted, values are number of participants (percentage)

Table 2

Odds ratios for the association between optimism and heart failure

Model	Covariates	Adjusted logistic regression (95% CI)
1	Age + gender	0.68* (0.59–0.77)
2	Demographic†	0.74* (0.63–0.85)
3	Demographic† + health behaviors‡	0.75* (0.66–0.87)
4	Demographic† + biological factors§	0.76* (0.66–0.89)
5	All covariates//	0.78* (0.68–0.90)

*p<.05

†Demographic factors: age, gender, race/ethnicity, marital status, education level, total wealth

‡Health behaviors: smoking, exercise, alcohol frequency

§Biological factors: hypertension, diabetes, BMI

//All covariates: age, gender, race/ethnicity, marital status, education level, total wealth, smoking, exercise, alcohol frequency, hypertension, diabetes, BMI

Table 3

Odds ratios for the association between optimism and heart failure by quartiles

Model	Quartile Group	Adjusted logistic regression (95% CI)
1	Low (Reference Group)	1.00
	Low-Moderate	0.64* (0.44–0.94)
	Moderate-High	0.52* (0.38–0.72)
	High	0.33* (0.22–0.51)
2†	Low (Reference Group)	1.00
	Low-Moderate	0.70* (0.48–1.03)
	Moderate-High	0.61* (0.44–0.86)
	High	0.42* (0.27–0.64)
3†‡	Low (Reference Group)	1.00
	Low-Moderate	0.71* (0.49–1.02)
	Moderate-High	0.66* (0.48–0.90)
	High	0.44* (0.29–0.68)
4‡§	Low (Reference Group)	1.00
	Low-Moderate	0.71* (0.48–1.03)
	Moderate-High	0.63* (0.45–0.88)
	High	0.47* (0.30–0.72)
5†//	Low (Reference Group)	1.00
	Low-Moderate	0.75* (0.51–1.08)
	Moderate-High	0.69* (0.49–0.95)
	High	0.52* (0.33–0.81)

*p<.05

†Demographic factors: age, gender, race/ethnicity, marital status, education level, total wealth

‡Health behaviors: smoking, exercise, alcohol frequency

§Biological factors: hypertension, diabetes, BMI

//All covariates: age, gender, race/ethnicity, marital status, education level, total wealth, smoking, exercise, alcohol frequency, hypertension, diabetes, BMI

Table 4

Odds ratios for the association between optimism and heart failure (excluding individuals with heart failure in the first 2 years of follow-up)

Model	Covariates	Adjusted logistic regression (95% CI)
1	Age + gender	0.74* (0.62–0.88)
2	Demographic†	0.78* (0.64–0.96)
3	Demographic† + health behaviors‡	0.78* (0.64–0.95)
4	Demographic† + biological factors§	0.81* (0.67–1.00)
5	All covariates//	0.81* (0.67–0.99)

*p<.05

†Demographic factors: age, gender, race/ethnicity, marital status, education level, total wealth

‡Health behaviors: smoking, exercise, alcohol frequency

§Biological factors: hypertension, diabetes, BMI

//All covariates: age, gender, race/ethnicity, marital status, education level, total wealth, smoking, exercise, alcohol frequency, hypertension, diabetes, BMI