# OPTIMISM AND DEPRESSION AS PREDICTORS OF PHYSICAL AND MENTAL HEALTH FUNCTIONING: THE NORMATIVE AGING STUDY<sup>1</sup>

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# ABSTRACT

Dispositional optimism has been linked in previous studies to better health outcomes. We sought to examine the independent associations of dispositional optimism and depressive symptoms with physical and mental functioning in a cohort of healthy middle-aged and older men. The study was conducted among 659 subjects in the Veterans Administration (VA) Normative Aging Study. Dispositional optimism and depressive symptomatology were measured in 1991 and 1990, respectively, by the Life Orientation Test and the Center for Epidemiologic Studies-Depression Scale (CES-D). The dependent variables, functioning and well-being, were measured in 1992 by the Medical Outcomes Study Short-Form Health Survey (SF-36). In multivariate regression models, optimism was associated with higher levels of general health perceptions, vitality, and mental health, and lower levels of bodily pain, but not to physical functioning, social functioning, or role limitations due to physical or emotional problems. Depressive symptomatology was associated with reduced levels of functioning across all SF-36 domains. The findings for optimism and depression were statistically significant after mutual adjustment in multivariate regression models. Optimism and depression are independent predictors of functional status among aging men.

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# **INTRODUCTION**

A growing body of evidence suggests that optimism, or a positive orientation toward life, is associated with better health outcomes (1). An optimistic explanatory style is characterized by a belief that the future will be pleasant because one can control important outcomes. Optimistic individuals are more likely to engage in planning and problem-solving, thereby enhancing the ability to deal with adversity and stressful life events. Past research

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has documented that optimistic patients have a faster rate of postoperative recovery following cardiac bypass surgery (2) and are less likely to be rehospitalized for secondary events 6 months later (3). Optimism has also been linked to higher psychological well-being in groups at risk of mental disorders (4), as well as positive mental outcomes among cancer survivors (5). Dispositional optimism may also be associated with the uptake of positive health practices (1), which may in turn lead to prevention of chronic diseases.

Despite suggestive evidence, however, prospective studies linking optimism to health outcomes remain relatively sparse. In particular, few studies have examined the role of optimism in the maintenance of functional health status across the life course. We hypothesized that an optimistic explanatory style would predict better maintenance of functional health status in an aging cohort of men across a range of domains, both physical and mental.

Some investigators have argued that optimism is a marker for the lack of neuroticism and negative emotions more generally (6). According to this view, optimism may be associated with health status simply because it reflects a disposition to be free of negative emotions and cognitions, which have themselves been linked to poor health status. To address this issue, we also simultaneously considered the relationship of depressive symptoms to the maintenance of functional health status. Previous studies have reported deleterious effects of depression on multiple aspects of functioning and well-being (7). We therefore sought to examine the independent contributions of optimism and depressive symptoms on functional health status in the VA Normative Aging Study (NAS) cohort.

# MATERIALS AND METHODOLOGY

# The Normative Aging Study

Study subjects were participants in the Normative Aging Study, a longitudinal study of aging established by the Veterans Administration in 1961 (8). The study cohort consists of community-dwelling men from the Greater Boston area who were 21 to 80 years of age upon enrollment in the study in 1961. Volunteers were screened at entry according to specific health criteria (8) and were free of known chronic medical conditions at the outset. Specifically, men with heart disease, hypertension, diabetes, cancer, peptic ulcer, gout, recurrent asthma, bronchitis, or sinusitis were excluded from the study. Since entry, subjects have returned for medical examinations every 3 to 5 years. These examinations have been supplemented by other periodic data collection.

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### **Measurement of Predictor Variables**

*Optimism:* We assessed optimism by the Life Orientation Test (LOT) (9), which was administered to the cohort in 1991. The LOT consists of 12 statements—4 positively oriented, 4 negatively oriented, and 4 filler items included to disguise the purpose of the test. Scores on the scale can range from 0 to 32.

Cronbach's alpha for the entire eight-item scale has been reported to be 0.76 (9). The test-retest reliability of the LOT has been reported to be 0.79 over a 4-week period and 0.69 over a 3-year period, supporting the notion that dispositional optimism is relatively stable across time.

Depression: Depressive symptoms were assessed by the Center for Epidemiologic Studies–Depression (CES-D) Scale (10), administered to the cohort in 1990. The CES-D is a 20-item self-report symptom rating scale. Scores can range from 0 to 60. Internal consistency has been reported to be 0.85 in the general population and 0.90 in a patient sample. Test–retest correlations range from 0.51 (for a 2-week interval) to 0.67 (for a 4-week interval) (10).

#### **Assessment of Functional Health Status**

Our outcome variable, functional status, was measured by the Medical Outcome Study Short-Form Health Survey (SF-36) questionnaire (11) administered to the cohort in 1992. The eight domains of health functioning assessed by the SF-36 comprise:

- physical functioning—10 items measuring the ability to perform a variety of daily activities and tasks which require physical effort, such as climbing stairs;
- role limitations due to physical problems—4 items assessing the limitations a person has in performing work and other usual activities as a result of physical health problems;
- freedom from bodily pain—2 items assessing self-reported bodily pain and discomfort;
- vitality—4 items measuring the perceived level of energy and fatigue;
- role limitations due to emotional problems—3 items measuring the limitations a person has performing work and usual activities as a result of emotional problems;
- social functioning—2 items assessing the quantity and quality of social activities with others;
- mental health—5 items assessing both negative and positive mental states; and
- general health perceptions—a 5-item summary measure of self-rated general health.

All subscales range from 0 (*worst health*) to 100 (*perfect health*). A number of studies have examined the psychometric properties of the SF-36 and have provided support for its reliability and validity (e.g. 12,13). Studies have reported acceptable internal consistency reliability (ranging from 0.65 to 0.94) for all dimensions, although the two-item social functioning subscale performs less well (12,14,15). Test-retest reliability over a 2-week period showed that the mean of the differences did not exceed 1 point on a 100-point scale (12). Support for the construct validity of the SF-36 derives from its ability to predict medical care utilization, as well as the ability to distinguish groups differing in severity of chronic medical conditions and psychiatric disorders (13).

#### Covariates

Age, as well as baseline body mass index (BMI, kg/m<sup>2</sup>), systolic and diastolic blood pressure (mmHg), and serum cholesterol (mg%), were measured at physical examination and modeled as continuous variables. We also assessed marital status (married versus not married), presence of children (yes/no), alcohol consumption (less than two versus two or more drinks per day), and history of diabetes mellitus. Diabetes was defined as a fasting serum glucose level greater than or equal to 140 mg% or a 2-hour (post 75 g glucose load) serum level greater than or equal to 200 mg%. Smoking status was categorized as never, current, and former smoker, while educational attainment was categorized as <high school graduate,  $\geq$ high school graduate but <college graduate, and  $\geq$ college graduate.

# **Study Population**

The LOT was administered to all active cohort members in 1991 (N = 1,329), of whom 1,237 answered all of the items (93.1% response). Of these 1,237 men, 987 completed the SF-36 health status survey 1 year later (74.3% response). Three hundred twenty-eight men were excluded from further analysis because of incomplete information on life-style or comorbid conditions (196 subjects no longer coming in for physical exam, 132 subjects with one or more missing covariates). The final study population thus consisted of 659 men in whom we had complete information on optimism, depressive symptoms, SF-36 scores, and relevant covariates. In comparing the 328 excluded subjects against the 659 included, we found no significant differences in LOT or CES-D scores.

# **Statistical Analysis**

Based on univariate analyses which identified the presence of ceiling effects, five of the eight SF-36 scales—role/physical function (55% subjects scored 100), role/emotional (82% subjects scored 100), social functioning (73% subjects scored 100), mental health (47% subjects scored  $\geq$  90), and physical functioning (63% subjects scored  $\geq$  90)—were log<sub>10</sub> transformed to better approximate normality. The three remaining scales of the SF-36—vitality, general health perception, and pain—were more normally distributed and were not log transformed. All SF-36 subscales were modeled as continuous outcomes. Both optimism and depressive symptoms were included in all regression models as continuous predictors.

We used multiple linear regression to estimate the effects of optimism and depressive symptoms on functional health status. We chose the two-tailed *p*-value of <0.05 as the cutoff for statistical significance.

#### RESULTS

We checked for any differences on the LOT and CES-D scores according to selected sociodemographic and health-related characteristics (Table 1). We found that LOT scores differed significantly among groups of educational attainment with the more educated groups expressing more optimism. In addition, CES-D scores were significantly different according to marital status with the not married group expressing more depressive symptoms.

The LOT Optimism scale and the CES-D Depression scale were moderately negatively correlated with each other (r = -0.44, p < 0.001).

The optimism scores ranged from 7 to 32. The mean score was 21.5 (standard deviation 4.33). In multiple linear regression mutually adjusting for depressive symptoms, higher levels of

optimism were associated with higher vitality scores ( $\beta = 0.60$ , p < 0.01), freedom from bodily pain ( $\beta = 0.40$ , p < 0.05), general health perception ( $\beta = 0.97$ , p < 0.01), and mental health (log<sub>10</sub> transformed) ( $\beta = 0.007$ , p < 0.01) (Table 2). On the other hand, we found little evidence for an association of optimism with physical functioning, social functioning, or role limitations due to physical or emotional problems.

We also estimated effect of a 1 standard deviation difference in optimism on the outcomes holding all other variables in the model constant. We estimated that a 4.33 point increment in optimism was associated with a 2.6 point higher vitality score, a 1.7 point higher freedom from bodily pain score, a 4.2 point higher general health perception score, and a 0.03  $\log_{10}$  unit higher score on the mental health scale (Table 2).

Depressive symptoms as measured by the CES-D was a significant predictor of limitations in all functional domains (Table 2). In multiple linear regressions mutually adjusting for LOT score, depressive symptoms predicted reductions in scores for vitality ( $\beta = -0.82$ , p < 0.01), general health perception ( $\beta = -0.65$ , p < 0.01), freedom from bodily pain ( $\beta = -0.30$ , p < 0.05),  $\log_{10}$  physical functioning ( $\beta = -0.004$ , p < 0.01),  $\log_{10}$  role functioning ( $\beta = -0.004$ , p < 0.01),  $\log_{10}$  social functioning ( $\beta = -0.004$ , p < 0.01),  $\log_{10}$  social functioning ( $\beta = -0.024$ , p < 0.01) (Table 2). Just as we did for optimism, we estimated the effect of a 1 standard deviation change in depression (5.90) on each outcome.

### **Other Predictors of Functional Limitations**

Among the life-style variables, BMI, age, and education were statistically significant predictors of physical functioning. BMI was a significant predictor of reduced vitality ( $\beta = -0.45$ , p = 0.01), increased bodily pain ( $\beta = -0.91$ , p = 0.0001), lower general health perception ( $\beta = -0.71$ , p = 0.0001), lower physical functioning ( $\beta = -0.007$  [log<sub>10</sub> units], p = 0.003), and lower role functioning/physical ( $\beta = -0.046$  [log<sub>10</sub> units], p = 0.002). Compared to never smokers, both current and former smokers had reduced general health perception scores ( $\beta = -9.03$ , p = 0.0006;  $\beta = -4.77$ , p = 0.0004) respectively, while former smokers had a 3-point reduction in their freedom from bodily pain score ( $\beta = -3.11$ , p = 0.04).

## DISCUSSION

Our study adds to the growing body of evidence linking optimistic explanatory style to the preservation and maintenance of good health. While our data, as well as others (6), suggest that optimism is inversely correlated with depressive symptoms, our findings support an independent effect of optimism on the maintenance of functional health status in an aging population. Contrary to our hypothesis, however, optimism was not associated with the preservation of physical functioning, social functioning, or role functioning. The beneficial effects of optimism were mostly evident in the domains of psychological well-being (mental health, vitality), self-rated health (general health perceptions), and freedom from bodily pain.

In contrast to optimism, and consistent with previous reports (7), we found strong and consistent deleterious impacts of depressive symptoms across all domains of functional health status. The magnitude of the associations found between optimism and SF-36 subscale scores were rather modest—effect sizes were all under 5 points for a 1 standard deviation increment in the LOT score. This may have been a function of the limited prospective follow-up duration (1-year interval between assessment of LOT and func-

TABLE 1	
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Mean Scores on LOT and CES-D According to Selected Sociodemographic and Health-Related Characteristics

	LOT	CES-D
Marital Status:		
Married	21.5	6.2
Not married	21.4	7.7*
Children:		
Yes	21.6	6.4
No	21.1	7.2
Educational attainment:		
<high school<="" td=""><td>20.0</td><td>7.7</td></high>	20.0	7.7
High school graduate	21.0	6.7
College graduate	22.1†	6.1
Smoking status:		
Never	21.4	6.4
Current	21.3	7.7
Former	21.6	6.3
Alcohol intake:		
<2 drinks/day	21.5	6.3
$\geq 2 \text{ drinks/day}$	21.5	6.9
History of diabetes mellitus:		
Yes	21.5	6.5
No	21.5	5.6

\* p < 0.05 by *t*-test.

p < 0.001 by analysis of variance.

tional health status). More pronounced differences may have emerged with longer follow-up.

A limitation of our study was that both the predictor variables and the health outcomes were self-reported. It is possible that optimistic individuals may differ from pessimists only in terms of their reports of higher well-being, even if they are in fact at comparable levels of functioning. (The same limitation applies to our findings regarding the relationships found between depressive symptoms and reduced functional health status.) On the other hand, although self-reported, a strength of the SF-36 is that it directly incorporates the patient's perspective on functional status. One previous study did report the relationship of optimism to more objectively observable outcomes. Among a group of men undergoing coronary artery bypass surgery, more optimistic individuals had faster rates of postsurgical recovery, as assessed by how soon they managed to sit up in bed, ambulate, resume a normal life, and even engage in vigorous physical activity (2).

A further limitation of our study was the absence of assessment of functional health status at more than one time point. Hence, differences in baseline functional status may have affected the responses to the Life Orientation Test. On the other hand, the relative stability of responses to the LOT over a 3-year period in this cohort (correlation of 0.70 between two administrations of the questionnaire in 1988 and 1991) mitigate against this bias.

In terms of the generalizability of our findings, the optimism scores in the Normative Aging Study cohort were comparable to the only reported norms for the LOT. Scheier and Carver (16) reported norms based on a sample of 357 undergraduate men and 267 undergraduate women. The mean scores for the two groups were 21.03 and 21.41 (with standard deviations of 4.56 and 5.22), respectively. Despite the difference in the age group of our sample, both the mean and standard deviation were comparable to these reported norms.

Based on a twin study, the heritability of optimism has been estimated to be about 25% (17), leaving ample scope for the

### TABLE 2

Multivariate-Adjusted\* Linear Regression Coefficient Estimates and 95 Percent Confidence Intervals for LOT Optimism and CES-D on Dimensions of Functioning—Vitality, Pain, General Health Perception, Role-Physical, Role-Emotional, Social Functioning, Physical Functioning, and Mental Health (N = 659)

	Outcome Variables							
	Freedom– Bodily Pain	General Health Perception	Vitality	Physical Functioning‡	Role Physical Functioning‡	Social Functioning‡	Role– Emotional Functioning‡	Mental Health‡
Predictor Variables: Optimism Regression								
coefficient	0.40†	0.97††	0.60††	-0.002	0.002	0.001	0.008	0.007††
(95% CI) per 1 SD unit*	(0.06, 0.74) 1.72	(0.66, 1.28) 4.21	(0.28, 0.92) 2.61	(-0.006, 0.002) -0.010	(-0.023, 0.026) 0.007	(-0.001, 0.003) 0.005	(-0.005, 0.02) 0.033	(0.006, 0.008) 0.030
CES-D								
Regression coefficient	-0.30†	-0.65++	-0.82++	-0.004††	-0.045††	-0.004††	-0.024 + +	
(95% CI) per 1 SD unit*	(-0.55, -0.05) -1.80	(-0.88, -0.43) -3.86	(-1.05, -0.59) -4.84	(-0.007, -0.002) -0.026	(-0.062, -0.026) -0.263	) (-0.005, -0.003) -0.023	(-0.033, -0.014) -0.140	**

\* Adjusted for age, body mass index, alcohol consumption (<2 drinks/day,  $\geq 2$  drinks/day), smoking (never smoker, former smoker, current smoker), diastolic and systolic blood pressure, cholesterol, diabetes mellitus, marital status (not married, married), children (no children, children), and education (less than high school, high school, college or beyond).

 $\pm$  Log<sub>10</sub> transformed for linear regression.

p < 0.05.

 $\dagger \dagger p < 0.01.$ 

\* Estimated mean unit change in outcome for 1 standard deviation unit change in predictor, 4.33 for optimism and 5.90 for CES-D.

\*\* Coefficient for CES-D not estimated since constructs for CES-D and Mental Health overlap.

possibility of intervening to enhance and individuals' explanatory style. It has been suggested that optimism can be cultivated—by encouraging individuals to engage in behaviors such as planning for the future, or developing a positive outlook on life. Learning the skills of an optimistic explanatory style without sacrificing realism—for example, by disputing pessimistic beliefs and by focusing on ways to alter adverse situations to prevent them from turning catastrophic—may enable individuals to lead fuller and healthier lives (18).

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