Low pessimism protects against stroke: The HeSSup prospective cohort study

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Abstract

Background and Purpose: The association between optimism and pessimism and health outcomes has attracted increasing research interest. To date, the association between these psychological variables and risk of stroke remains unclear. We examined the relationship between pessimism and the 7-year incidence of stroke.

Methods: A random sample of 23 216 adults (9 480 men, 13 796 women) aged 20-54 years completed the pessimism scale in 1998, i.e., at study baseline. Fatal and first non-fatal stroke events during a mean follow-up of 7.0 years were documented by linkage to the National-hospital-discharge and mortality registers, leading to 105 events.

Results: Unadjusted hazard ratio was 0.44 (95% CI 0.25-0.77) for participants in the lowest quartile (a low pessimism level) when compared to those in the highest quartile (a high pessimism level). After serial adjustments for sociodemographic characteristics, cardiovascular biobehavioral risk factors, depression, general feeling of stressfulness, and ischemic-heart disease the fully-adjusted hazard ratio was 0.52 (95% CI 0.29-0.93).

Conclusions: In this population of adult men and women, low level of pessimism had a robust association with reduced incidence of stroke.

INTRODUCTION

There is a growing research interest in the relationship between dispositional optimism and pessimism, defined as a general tendency to exhibit positive and negative expectancies about future, and health outcomes.[1-3] Although findings from well-conducted prospective studies suggest an association between optimism and pessimism as separate constructs and the risk of incident coronary heart disease (CHD) and cardiovascular (CVD) mortality,[1, 4, 5] no evidence to date is available of an association with the incidence of stroke. We used prospective data from a large sample of the Finnish population to examine the association between dispositional pessimism and the incidence of stroke.

METHODS

Population

The Health and Social Support (HeSSup) study is a prospective cohort study on a population sample representative of the Finnish population of the following four age groups: 20-24, 30-34, 40-44, and 50-54 years at baseline in 1998, a total of 10,628 men and 15,267 women. The Turku University Central Hospital Ethics Committee approved the study.

Dispositional pessimism was assessed using the revised Life Orientation Test (LOT-R)[6, 7] (Cronbach's $\alpha = 0.74$). The measure includes six statements, of which three are worded positively for optimism, and three are worded negatively to indicate pessimism. We categorized pessimism mean scores into 4 groups based on the nearest approximate of the quartiles as in previous studies.[4] The highest quartile (high pessimism) was the reference category in the analysis.

Follow-up of stroke events

Linkage to the National Hospital Discharge Register and the Statistics Finland Mortality Register provided a virtually complete follow-up for hospitalizations and death for all participants who were treated in a hospital or died between January 1, 1999 and December 31, 2005. Stroke was determined by the International Classification of Disease (ICD)-10 codes I60 **(**subarachnoid haemorrhage**),** I61 **(**intracerebral haemorrhage) and I63 **(**cerebral infarction) as the main diagnosis of hospitalisation or death.

Cardiovascular risk factors

History of hypertension, CHD and diabetes mellitus at the time of questionnaire in 1998 (i.e. the survey year) were ascertained based on strict criteria [8]. We excluded all participants hospitalized for CHD or cerebrovascular disease and those with medication for CHD during or before 1998. Incident CHD events (ICD-10 codes I20-I25) that occurred during the follow up were used as a covariate in the analysis. Behaviour-related risk factors include current smoking status, alcohol consumption, physical activity and obesity. Depressive symptoms were assessed using the Beck Depression Inventory (BDI score <10 vs 10+). The general feeling of stressfulness in daily life was measured using the Reeder Stress Inventory [9].

Statistical Analysis

We examined the relationship between pessimism and subsequent stroke events using seven serially adjusted Cox regression models. We combined men and women in the analyses (p >0.05 for interaction with sex) and verified that the assumption of proportional hazards held (all p>0.05).

RESULTS

Data linkage to national health registers, on the basis of a written consent, was successful for 24 128 (93%) participants. A total of 23 216 participants had complete data on the pessimism scale and all covariates. Of them, 105 incident stroke events (fatal and non-fatal 25 subarachnoid haemorrhages, 23 intracerebral haemorrhages, and 57 cerebral infarctions) were documented during a mean follow-up of 7.0 (range, 0.02-7.01) years.

Table 2 presents the association of pessimism levels with incident stroke events. Compared with participants with a high level of pessimism (the highest quartile), those reporting a low level of pessimism (the lowest quartile) were at lower risk of stroke (HR= 0.44, 95% CI 0.25-0.77). After serial adjustments the fully adjusted hazard for stroke was 0.52 (95% CI, 0.29-0.93) among those with low pessimism.

The survival curve for stroke among participants with the lowest quartile of pessimism differed significantly (log-rank test, $p<0.05$) from those in the other quartiles and the difference between the groups grew as a function of time (Figure 1).

Further analyses were run examining the role of optimism (in quartiles) in the risk of stroke. We found no evidence to suggest an association between optimism and incidence of stroke (p=0.53), lending support to the idea that pessimism and optimism are separate constructs. We also examined the association between pessimism and stroke incidence in analysis adjusted for optimism in addition to age, sex, education and marital status. The adjustment did not alter the reduced incidence of stroke associated with low pessimism (HR=0.49, 95% CI 0.26-0.90).

DISCUSSION

We examined the prospective association between dispositional pessimism and subsequent stroke events in a large population of men and women with no history of ischemic heart disease or cerebrovascular disease. We found that participants with a low pessimism level had a 48% lower risk for incident stroke over the 7 years of follow-up, after controlling for many potential

confounders. We found no evidence to suggest that the association was attributable to depressive symptoms, a correlate of both pessimism and the risk of stroke,[10,11] It must be noted that we assessed depressive symptoms with the Beck Depression inventory, which is a validated survey instrument, but not a diagnostic tool for clinical depression

The present study was based on a representative sample of the Finnish population in four age groups, but did not include elderly participants which may limit the generalizability of our findings. Our findings are broadly consistent with previous studies on the associations between pessimism and optimism and the risk of CHD or death,[4,12,] Our results highlight the importance of pessimism in particular for the incidence of stroke, even in analyses adjusted for optimism. In agreement with the present results, a recent clinical study showed a lower survival rate for pessimistic cancer patients than their less pessimistic counterparts, but no difference between individuals with high levels of optimism and those with low levels of optimism.[13] The precise mechanisms underlying the link between pessimism and stroke remain unclear. Both behavioural (lifestyle behaviors) and biological (autonomic nervous system activity) mechanisms are plausible.[10,11,5, 14] Low pessimism may also be related to favorable trajectories of stroke risk factors over time. Further longitudinal studies are needed to examine these mechanisms in detail and whether interventions designed to reduce pessimism would alter stroke risk.

REFERENCES

1.   Scheier MF, Matthews KA, Owens JF, Magovern GJ, Sr., 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

2.   Scheier MF, Matthews KA, Owens JF, Schulz R, Bridges MW, Magovern GJ, Carver CS. Optimism and rehospitalization after coronary artery bypass graft surgery. *Arch Intern Med*. 1999;159:829-835

3.   Peterson C, Seligman ME, Vaillant GE. Pessimistic explanatory style is a risk factor for physical illness: A thirty-five-year longitudinal study. *J Pers Soc Psychol*. 1988;55:23-27

4.   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

5.   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

6.   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

7.   Kivimaki M, Vahtera J, Elovainio M, Helenius H, Singh-Manoux A, Pentti J. Optimism and pessimism as predictors of change in health after death or onset of severe illness in family. *Health Psychol*. 2005;24:413-421

8.   Kivimaki M, Gimeno D, Ferrie JE, Batty GD, Oksanen T, Jokela M, Virtanen M, Salo P, Akbaraly TN, Elovainio M, Pentti J, Vahtera J. Socioeconomic position, psychosocial work environment and cerebrovascular disease among women: The finnish public sector study. *Int J Epidemiol*. 2009

9.   Vahtera J, Kivimaki M, Hublin C, Korkeila K, Suominen S, Paunio T, Koskenvuo M. Liability to anxiety and severe life events as predictors of new-onset sleep disturbances. *Sleep*. 2007;30:1537-1546

10.   Giltay EJ, Zitman FG, Kromhout D. Dispositional optimism and the risk of depressive symptoms during 15 years of follow-up: The zutphen elderly study. *J Affect Disord*. 2006;91:45-52

11.   Larson SL, Owens PL, Ford D, Eaton W. Depressive disorder, dysthymia, and risk of stroke: Thirteen-year follow-up from the baltimore epidemiologic catchment area study. *Stroke*. 2001;32:1979-1983

12.   Kubzansky LD, Sparrow D, Vokonas P, Kawachi I. Is the glass half empty or half full? A prospective study of optimism and coronary heart disease in the normative aging study. *Psychosom Med*. 2001;63:910-916

13.   Schulz R, Bookwala J, Knapp JE, Scheier M, Williamson GM. Pessimism, age, and cancer mortality. *Psychol Aging*. 1996;11:304-309

14.   MacMahon S, Rodgers A. Blood pressure, antihypertensive treatment and stroke risk. *J Hypertens Suppl*. 1994;12:S5-14

Table 1: Sample characteristics as a function of the number of stroke events and pessimism score levels

Baseline Covariates	N events/N participants	Quartiles of pessimism score				P value /for trend
		1 Lowest	2	3	4 Highest	
Sex						0.243
Men	59/9480	3124 (33.0)	2333 (24.6)	2268 (23.9)	1755 (18.5)	
Women	46/13736	4467 (32.5)	3571 (26.0)	3319 (24.2)	2379 (17.3)	
Age-group						0.001
20-24	3/6324	1938 (30.6)	1518 (24.0)	1664 (26.3)	1204 (19.0)	
30-34	8/5533	1937 (35.0)	1399 (25.3)	1273 (23.0)	924 (16.7)	
40-44	28/5555	1831 (33.0)	1473 (26.5)	1262 (22.7)	989 (17.8)	
50-54	66/5804	1885 (32.5)	1514 (26.1)	1388 (23.9)	1017 (17.5)	
Level of education						< 0.001
Basic (compulsory)	44/7412	2136 (28.8)	1756 (23.7)	1911 (25.8)	1609 (21.7)	
Secondary	24/5232	1367 (26.1)	1273 (24.3)	1441 (27.5)	1151 (22.0)	
College	26/7400	2696 (36.4)	2033 (27.5)	1654 (22.4)	1017 (13.7)	
University	11/3172	1392 (43.9)	842 (26.5)	581 (18.3)	357 (11.3)	
Marital Status						< 0.001
Other	25/7674	2325 (30.3)	1735 (22.6)	1881 (24.5)	1733 (22.6)	
Married /cohabiting	80/15542	5266 (33.9)	4169 (26.8)	3706 (23.8)	2401 (15.4)	
Current smoker						< 0.001
No	62/15508	5256 (33.9)	4114 (26.5)	3714 (23.9)	2424 (15.6)	
Yes	35/5862	1717 (29.3)	1311 (22.4)	1441 (24.6)	1393 (23.8)	
Missing	8/1846	618 (33.5)	479 (25.9)	432 (23.4)	317 (17.2)	
High alcohol intake (200 g of alcohol /week[a])						< 0.001
No	87/20956	6950 (33.2)	5412 (25.8)	5034 (24.0)	3560 (17.0)	
Yes	18/2260	641 (28.4)	492 (21.8)	553 (24.5)	574 (25.4)	
Obesity (body mass index ≥ 30 kg/m^2)						< 0.001
No	83/20992	6973 (33.2)	5395 (25.7)	5050 (24.1)	3574 (17.0)	
Yes	22/2224	618 (27.8)	509 (22.9)	537 (24.1)	560 (25.2)	
Sedentary life style (<2 MET [b] hours per day)						< 0.001
No	69/17855	6072 (34.0)	4672 (26.2)	4205 (23.6)	2906 (16.3)	
Yes	36/5361	1519 (28.3)	1232 (23.0)	1382 (25.8)	1228 (22.9)	
Depression (BDI score ≥ 10)						< 0.001
No	97/22159	7559 (34.1)	5833 (26.3)	5408 (24.4)	3359 (15.2)	
Yes	8/1057	32 (3.0)	71 (6.7)	179 (16.9)	775 (73.3)	
General feeling of stressfulness in daily life						0.715
Low	46/10497	3464 (33.0)	2604 (24.8)	2574 (24.5)	1855 (17.7)	
Intermediate	27/5547	1790 (32.3)	1426 (25.7)	1312 (23.7)	1019 (18.4)	
High	31/7020	2294 (32.7)	1833 (26.1)	1666 (23.7)	1227 (17.5)	
Missing	1/152	43 (28.3)	41 (27.0)	35 (23.0)	33 (21.7)	
Hypertension or diabetes						< 0.001
No	85/22136	7299 (33.0)	5648 (25.5)	5300 (23.9)	3889 (17.6)	
Yes	20/1080	292 (27.0)	256 (23.7)	287 (26.6)	245 (22.7)	
Ischemic heart disease						0.002
No	102/23016	7566 (32.7)	5864 (25.5)	5533 (24.0)	4083 (17.7)	
Yes	3/200	55 (27.5)	40 (20.0)	54 (27.0)	51 (25.5)	

[a] 200 g of alcohol represent 16 drinks per week
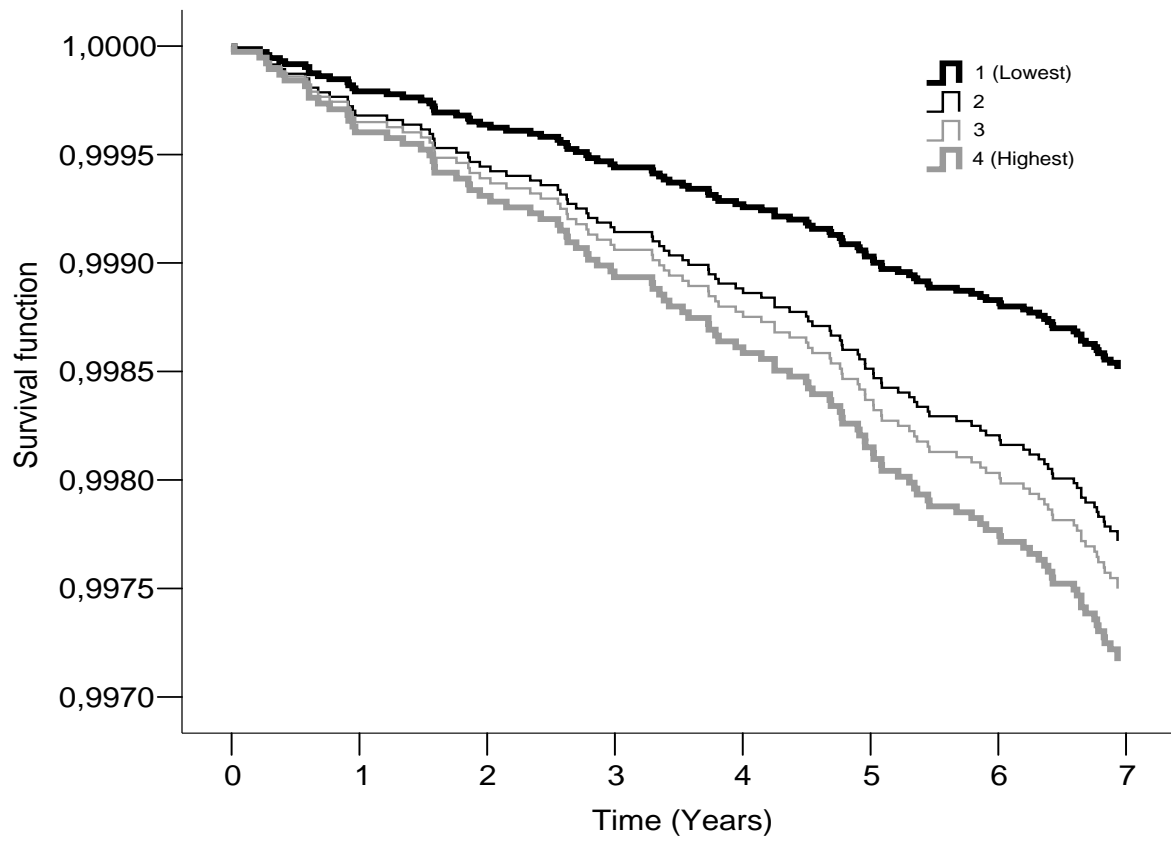
[b] MET : Metabolic Equivalent Task

Table 2: Hazard ratios (95% confidence intervals) for the association between quartiles of pessimism score and incident stroke events.

Adjustments:	Quartiles of pessimism scores			
	1 (Lowest) (22 events/ n=7588)	**2** (27/5904)	**3** (29/5587)	**4 (Highest)** (27/4127)
Model 1: none	0.44 (0.25-0.77)†	0.69 (0.41-1.18)	0.79 (0.46-1.34)	1
Model 2: sex, age, education, marital status	0.47 (0.26-0.84)†	0.71 (0.42-1.23)	0.82 (0.48-1.39)	1
Model 3: sex, age, education, marital status + behavior-related risk factors	0.51 (0.25-0.91)*	0.79 (0.46-1.36)	0.89 (0.52-1.49)	1
Model 4: sex, age, education, marital status + hypertension and diabetes	0.48 (0.27-0.86)†	0.73 (0.43-1.26)	0.83 (0.49-1.39)	1
Model 5: sex, age, education, marital status + depression	0.48 (0.26-0.87)†	0.73 (0.41-1.28)	0.83 (0.48-1.44)	1
Model 6: sex, age, education, marital status + general feeling of stressfulness	0.47(0.270.84)†	0.72 (0.421.24)	0.82 (0.49-1.39)	1
Model 7: sex, age, education, marital status + incident CHD	0.44 (0.25-0.77)†	0.68 (0.40-1.16)	0.80 (0.47-1.36)	1
Model 8: all aforementioned	0.52 (0.29-0.93)*	0.80 (0.47-1.39)	0.88 (0.52-1.50)	1

* $p<0.05$, † $p<0.01$, ‡ $p<0.001$
Behavior-related risk factors: smoking, alcohol consumption, sedentary lifestyle, obesity.

Figure 1: Cumulative incidence of stroke (fully adjusted*) by pessimism scores quartiles

* Sex, age, education, marital status, smoking, alcohol consumption, sedentary lifestyle, obesity, hypertension and diabetes, depression, general feeling of stressfulness and incident CHD