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Confidence in the future, health related behaviour and psychological distress – results from a population-based cross-sectional study of 101 257 Finns

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Abstract

Objectives: to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

Design: web-based cross-sectional study including an "Electronic Health Check" at the Finnish Happiness-Flourishing Study website linked to a TV-program on happiness and depression.

Setting: The Finnish population with access to the internet

Participants: 101 257 Finns aged 18 and above (21 365 men; 79 892 women). Participants who were under the age of 18 and who did not provide information about their gender were excluded.

Primary outcome measures: As planned, we assessed smoking, weekly alcohol consumption and binge drinking, daily intake of fruit and vegetables, and regular exercise.

Results: Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) and binge drinkers (men 0.35; 0.30 to 0.40; women 0.37; 0.33 to 0.42). Subjects with high confidence in the future were more likely to exercise regularly, and consume vegetables and fruit daily. Adjustment for education and income had little effect on the associations, whereas adjustment for current psychological distress and satisfaction for income attenuated the results.

Conclusions: This study elaborates previous findings on the association between healthy lifestyle and high confidence in the future by reporting rare binge drinking among subjects with high confidence. Confidence in the future may associate with a healthier lifestyle through behavioural and psychological coping mechanisms. Health-related interventions may benefit from tailoring interventions according to the target population's level of confidence in the future as well as their level of psychological distress.

Summary

Article Focus

This study aims to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

The web-based cross-sectional study including an “Electronic Health Check” at the Finnish Happiness-Flourishing Study website was linked to a TV-program on happiness and depression.

Key Messages

Our large, population-based study on Finnish adults confirms previous findings of an overall healthy lifestyle among subjects with high confidence in the future.

Our large, web-based study suggests that binge drinking is rare among subjects with high confidence in the future, irrespective of socioeconomic status.

Efficient coping skills with current psychological distress may mediate the association between high confidence in the future and a healthy lifestyle.

Strengths and Limitations

The sample size is considerably larger than in previous studies on optimism, and we were able to assess a wide range of confounding factors as well as several health related behaviours in one study.

The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website.

No causal conclusions can be drawn from this cross-sectional study.

Introduction

Optimists benefit from expecting positive generalized outcomes (1) and from explaining bad events with external, unstable and specific causes (2) in terms of health. Previous longitudinal studies have shown the association between optimism and longevity (3) (4) and optimism and mental (5) and physical (6) health. Less is known about the link between trait optimism and health related behaviour, which is a well-known pathway to better health.

Positive associations between optimism and proactive efforts in promoting health were reported in clinical study on patients in cardiac rehabilitation, as optimism predicted success in lowering levels of saturated fat and body fat, and in increasing physical activity. (7). A Finnish study recruited subjects at increased risk for type 2 diabetes. The sample of men and women aged 50-65 participated in the Lifestyle Implementation Trial. Dispositional optimism and pessimism were unrelated to waist circumference change. (8)

Regarding community-based studies, a study on adults aged 40 to 60 years reported that optimists knew more about risk factors for heart-attacks than their less optimistic counterparts.(9). In a study on elderly community-living men, dispositional optimism associated with healthy lifestyle and dietary habits at 15-year follow-up independent of age, education, living arrangement and somatic morbity (10). In an urban sample of men and women aged 65 to 80 years, optimism was associated with not smoking, moderate alcohol consumption, and physical activity, independently of socio-demographic factors and clinical condition (11). Less is known about optimism and health related behaviours in young adults. A study on young adults born in Northern Finland found optimists more likely

to have a healthy diet and pessimists more likely to smoke or be high consumers of alcohol. No marked differences were found in the consumption of junk food. (12)

Psychological stress and socioeconomic status (SES) and are well-known predictors of health-related behaviour. Psychological distress from marital problems, childcare (13) and work-related problems (14) have been shown to associate with increase in alcohol consumption and other health damaging behaviour. Higher prevalence of unhealthy behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms linking lower SES to worse health (17, 18).

Psychological distress and SES are also linked with optimism. Optimists well-being is likely to be related to their characteristic, flexible coping methods with a variety of stressors (19) and to accumulation of resources (20). Thus, SES and current psychological stress may partially explain the association between optimism and health related behaviour.

The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive mental health and positive health related behavior in the Finnish population. The aim of this study was to explore how optimism, reflected by high confidence in the future, is related to health-related behaviors and whether current socioeconomical status and psychological distress contribute to these relations in a large web-based sample of 101 257 Finns aged 18 and above.

Data and methods

Data

The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo (a Finnish television production company), and Finland's national public service broadcasting company YLE. The collection of the web-based data was connected to 8 series "Reality TV"- program with happiness training for selected unhappy celebrities in 2009. At the freely available happiness website, 139 462 Finns measured their own happiness on the Happiness–Flourishing Scale and identified their important sources of happiness. Some of the numerical variables were measured using an open text field in the internet questionnaire. These variables had impossible minimum and maximum values indicating typing errors. Restrictions were made on the maximum and minimum values of the following variables: income (0 – 5 000 000), education years (0 – participant's age), alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes per week), and age (7(18) – 110 years). In addition, we excluded participants who were under the age of 18 and who did not provide information about their gender. The final sample size after these restrictions was 101 257.

For validation purposes, we also collected a separate web-based random sample of Finns representing the population aged 17-79 (N=2035).

Variables

Confidence in the future was assessed by the item "I have complete confidence in the future", and subjects were to choose a smiley face that best reflected their answer on a 7-

point Likert scale 1 reflecting “Totally disagree” and 7 reflecting “Totally agree”. Answers 6-7 were classified as “High confidence in the future” and answers 1-3 as “low confidence in the future”. 11 other happiness skills were similarly assessed: I devote a great deal of my time to those close to me; I am very grateful for everything that I have received and achieved; Helping others comes naturally to me; I have complete confidence in the future; I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have firm life values that I aim to nurture; I see adversity as a challenge; I often become so absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw strength from contemplation and meditation; I have clear goals in my life.

Smoking was assessed by the question “How many cigarettes, cigars or pipefuls do you smoke per day? Smoking at least once a day was dichotomized as regular smoking. An open text field followed the question “How many units of alcohol do you drink per week?” At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol consumption. Binge drinking was assessed with the question: “How often do you drink enough alcohol to feel yourself drunk?” with 4 response options. The answers reflecting drinking at least once a week were categorized as “regular binge drinking”. The questions on food consumption were formulated “On average, how often do you eat fresh vegetables?” and “On average, how often do you eat fresh fruit or berries?” with response options: 1) Less than once a week, 4) 1-2 times per veek, 5) 3-5 times per week, and 4) Once a day or more. The answers reflecting daily consumption was dichotomized as “regular consumption”. Leisure time physical activity was recorded by asking the following questions: “How much do you exercise and strain yourself physically in your leisure time?” (=the so-called Gothenburg scale) (21). Answers reflecting at least 4 hours of leisure exercise per week was dichotomized as “regular physical activity”.

The level of education was captured with an open-ended question ”How many years in total have you attended school or studied full time?” and participants responded as full years. Education was included in the analyses as a continuous variable. Income was assessed with the question “What were the gross earnings for your household last year? (before tax is deducted)?” In the analyses the level of income was included as a continuous variable. Work-related distress was captured by asking “How often do you find yourself annoyed that you have to push yourself to the limit in order to cope with your present job or workload?” with 5 response options. “Family-related distress was asked as follows: “Do you experience problems in your relationship with your spouse or partner?” with 4 response options and “Have your children caused you particular problems?” with 6 response options. Satisfaction with one’s level of income was assessed with a 7-point Likert scale.

Statistical analysis

Descriptive statistics were reported for the large web-based sample. The missing data analyses were conducted using a logistic regression model. The missingness indicator of a variable, which had value one if the value was observed and zero otherwise, was used as the outcome and the variables, which had fewer missing values, as independent variables. As the number of observations was large, the Bayesian information criterion (BIC), (22) was applied in assessing important predictors of missing values.

Sequential logistic regression models were used to analyze the association between optimism and health related behavior. Results are presented in terms of adjusted odds ratios (OR) and their 95% confidence intervals (CI). The analyses were performed separately for both genders. In the first model the dichotomized heath variable was

explained by only optimism (and age). Education was added in the second model while the third model added income as a covariate. Finally the fourth model added the psychological distress variables. The R statistical software (version 2.15.0) was used in the analysis. The interaction between confidence in the future and gender was tested in all analyses, but results are only presented when the effects were significant.

Results

Description of study population

<Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)>

The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 % were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the future varied little by age and education. Subjects with high confidence in the future lead a healthier lifestyle and reported less psychological distress. The proportion of subjects with high confidence was highest in the highest income quartile and they reported higher satisfaction with their income.

<Figure 1 Confidence in the future, satisfaction with economical situation and income>

In separate analyses on income quartiles (Figure 1), subjects with high confidence in the future were more satisfied with their income irrespective of their level of income.

Missing data

<Figure 2 Missing data in the Finnish Happiness-Flourishing Study>

Age and gender appeared to be the most important predictors for missing values (Figure 2). In eating vegetables the predictor was little problems with children. In binge drinking the

predictors were problems with spouse or work-related distress all the time, and eating vegetables less than once a week. In alcohol quantity the predictors were problems with spouse all the time, eating vegetables at most twice a week and binge drinking less than once a month, in which case the alcohol quantity was likely to be close to zero. In income the predictors were low physical activity, work-related distress all the time, small number of education years, and low alcohol consumption. In the number of cigarettes per day the predictors were physical activity, problems with spouse not all the time, binge drinking at least once a week, small number of education years, and consumption of alcohol.. Variables related to smoking, alcohol, income or education contained relatively large amount of missing values.

Confidence in the future

Regarding correlations with other happiness skills, confidence in the future correlated strongly with “I want to live in this exact moment” (0.64), “I am very grateful for all that I have accomplished” (0.59) and “I have clear goals in my life” (0.57).

Health related behaviour and confidence in the future

<Table 2 Confidence in the future, health related behaviour, socioeconomic status and psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079) aged 18 and over>

Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to

be regular binge drinkers (men OR 0.35, 95% CI 0.30 to 0.40; women 0.37, 95% CI 0.33 to 0.42) and less likely to consume alcohol in excess. Correspondingly, men and women with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant gender interaction in daily consumption of fruit (Bonferroni p=0,00089) and vegetables (Bonferroni p=0,00020), in which the associations with high confidence in the future were stronger in men than in women.

Adjustment for education and income little effect on the associations between high confidence in the future and health related behaviours. Adjustment for current psychological distress at work or in family relationships, and particularly the adjustment for satisfaction with income, attenuated the association between high confidence in the future and most health related behaviours. Among women, the association between high confidence in the future and heavy alcohol consumption was not affected by adjustment for psychological distress. Among men, the association between confidence in the future and smoking was rendered statistically insignificant after full adjustments, but other associations remained statistically significant in the full model.

Discussion

Principal findings

Optimism has been shown to associate with good health and beneficial health related behaviours in studies focusing on middle-aged and elderly subjects. To the best of our knowledge, data on young adults, as well as information on the extent to which socio-economic factors and psychological distress explain the association is lacking. In connection to the Finnish Happiness-Flourishing project, this population-based study found subjects with high confidence in the future to be the most satisfied with their economical situation regardless of their level of income. High confidence in the future was strongly associated with different dimensions of beneficial health related behaviour among both genders independent of education and income. Adjustment for current psychological distress at work and at home, as well as adjustment for satisfaction with income attenuated the associations.

Strengths and weaknesses

There are several strengths in this study. First, the sample size is considerably larger than in previous studies on optimism, which enables better detection of associations between confidence in the future, health behavior and related mechanisms. Furthermore, we also captured younger age-groups than previous studies. Second, we were able to assess a wide range of confounding factors, although the possibility of residual confounding cannot be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by level of education, was roughly comparable to another Finnish survey conducted in 2009 (23). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived

from the Population Register for an annual survey, which was answered by 59% of the sample. The proportion of subjects with basic education was about 15% compared with 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and 69%, correspondingly (23). Finally, we were able to assess several health related behaviours in one study.

However, there are also limitations in this study that must be considered. First, the TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website. However, the average score for confidence in the future in the national sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a rather small potential bias. Furthermore, happiness-related programs appeared to attract more women than men. Second, no causal conclusions can be drawn from this cross-sectional study. Third, missing values in the analysis variables were often related to low education, problems with spouse, work-related distress, number of adults in the household or alcohol use, although the directions of the associations varied from variable to variable. A possible future development could be multiple imputation of the missing data in order to assess the effects of, and to remove the possible bias caused by the missing data.

Strengths and weaknesses in relation to other studies

In line with our results, a previous Finnish study (12) on 31-year-old men and women (n=8690) found optimism, as measured by the 6-item revised Life Orientation Test (LOT-R), to associate with high consumption of fruit and vegetables, whereas pessimism associated with tendency to smoke and to consume alcohol excessively. The data included a vast range of sociodemographic factors, but no information on psychological

distress. Our study adds to these findings by showing strong negative associations between confidence in the future and binge drinking, as well as a positive association between high confidence and regular exercise.

In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from general practices in urban Great Britain, optimism was associated with high physical activity, not smoking and moderate alcohol consumption, independently of education, area deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-R), their results support our findings on the positive association between optimism and beneficial health related behaviours. Data on diet and psychological stress is unavailable for comparison.

In a prospective Dutch study of 773 elderly community-living men, dispositional optimism associated with regular physical activity, being a nonsmoker, higher alcohol consumption, and higher consumption of vegetables and fruit at 15-year follow-up independent of sociodemographic factors and somatic morbity (10). Dispositional optimism was assessed by four items. In a cross-sectional setting, we show similar results among both genders and in a wider age group.

In short, previous studies show an exhaustive range of dietary variables and rigorously assessed sociodemographic background characteristics. Our study adds to the literature by examining binge drinking together with a range of other health related behaviours, and by assessing the role of psychological distress.

Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns found parental socioeconomic status (SES) in childhood to predict higher dispositional optimism (overall LOT score) irrespective of current SES (24). Another longitudinal study on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to predict higher income after controlling for hours worked. On the other hand, higher income did not increase optimism at follow-up. (20) Although we can draw no conclusions about causal directions, our data adds to previous literature by showing that subjects with high confidence in the future report higher satisfaction with their income irrespective of their income level.

As previously discussed (25), it might seem paradoxical that people who expect good things to happen take the initiative and actively promote the good things. According to a recent meta-analysis, optimists' characteristic coping style includes techniques for managing both stressful problems and stress-induced emotions (19). Optimists were also flexible regarding the source and type of stress they were faced with. This flexibility likely accounts for highly confident subjects' resilience to stressful events (25) such as family- and work-related stressors in our data.

Conclusions

This study produced further evidence, as high confidence in the future appeared to associate with a range of beneficial health related behaviours, including rare binge drinking. Although no causal conclusions can be drawn from this study, subjects with high confidence in the future appeared to make the effort to promote a healthy lifestyle irrespective of educational level or financial situation, possibly partly due to their high coping skills with psychological distress. Future health –related interventions may benefit

from tailoring each intervention according to the target population's level of confidence in the future as well as their level of psychological distress. More research is, however, still needed to increase the current understanding of changes in confidence in the future with alternating loads and quality of psychological distress.

Appendices

Contributorship statement

Osmo Saarelma, Heimo Langinvainio, Antti S. Mattila, Tommi Härkänen, Jouko Lönnqvist and Pekka Mustonen designed the study. Kaisla Joutsenniemi managed the literature searches and wrote the first draft of the manuscript. Maiju Pankakoski undertook the statistical analysis under the supervision of Tommi Härkänen and Kaisla Joutsenniemi. Maiju Pankakoski and Tommi Härkänen wrote the chapters on statistical methods. Heimo Langinvainio and Antti S. Mattila provided their expertise in research of positive psychology. All authors contributed to and have approved the final manuscript.

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) KJ, MP, TH, HL, AM, OS, JL and PM have support from the National Institute for Health and Welfare and Duodecim Medical Publications Ltd for the submitted work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that might have an interest in the submitted work in the previous 3 years; (3) their spouses, partners, or children have no financial relationships that may be relevant to the submitted

work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that may be relevant to the submitted work.

An ethics approval was not required for this web-based observational study.

Statement on funding

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Data sharing statement: There is no additional data available.

All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)

Variable		Whole sample Valid†	Whole sample N=101257	Confidence in the future Low 14.5% Valid†	Low 14.5% N=12060	Moderate 44.7% Valid†	Moderate 44.7% N=37154	High 40.8% Valid†	High 40.8% N=33936	X²	df	p
Gender %										92.9	2	< 0.001
	male	100 %	21.1	100 %	22.1	100 %	18.4	100 %	20.4			
	female		78.9		77.9		81.6		79.6			
Age %		100 %		100 %		100 %		100 %		757.9	8	< 0.001
	18-29		17.1		22.4		17.6		14.9			
	30-44		30.4		33.1		31.9		29.3			
	45-54		24.6		24.5		24.7		25.4			
	55-64		21.2		15.9		19.8		23.8			
	> 65		6.7		4.2		5.9		6.6			
Education years %		95.0 %		97.2 %		97.4 %		97.9 %		103.1	14	< 0.001
	< 6		4.9		5.5		4.8		4.6			
	6 - 7		2.7		2.6		2.6		2.5			
	8 - 9		5.0		5.0		4.8		5.0			
	10 - 12		18.9		19.5		18.5		18.2			
	13 - 15		27.0		27.0		27.4		26.8			
	16 - 18		27.9		25.6		28.0		29.6			
	19 - 20		9.4		9.8		9.7		9.3			
	> 20		4.2		5.0		4.1		4.1			
Income (€ per year) %		89.9 %		89.4 %		90.0 %		91.4 %		1137.0	6	< 0.001
	0-17999		24.7		32.2		24.4		22.6			
	18000-35999		24.5		28.1		26.1		21.4			
	36000-59999		22.1		20.2		22.1		22.3			
	60000-		28.8		19.4		27.4		33.7			

Alcohol doses per week %		91.1 %		91.0 %		91.8 %		92.6 %		391.0	6	< 0.001
	0		28.3		30.8		27.6		28.6			
	1-5		44.4		38.6		45.4		45.9			
	6-10		16.2		15.5		16.1		16.2			
	11-		11.1		15.1		10.9		9.3			
Binge drinking %		94.2 %		97.1 %		97.1 %		96.9 %		753.2	6	< 0.001
	At least 2 times a week		5.1		8.8		4.8		3.6			
	At least once a week		12.4		14.6		12.7		10.7			
	At least once a month		23.5		22.0		24.6		22.9			
	Less than once a month		59.1		54.6		57.9		62.9			
Daily smoking %		82.2 %		85.3 %		84.4 %		85.2 %		518.8	2	< 0.001
	No		81.1		74.0		81.0		84.2			
	Yes		18.9		26.0		19.0		15.8			
Fruits daily %		94.4 %		97.5 %		97.1 %		97.4 %		1182.2	2	< 0.001
	No		57.9		68.4		59.9		51.3			
	Yes		42.1		31.6		40.1		48.8			
Vegetable daily %		95.6 %		98.5 %		98.4 %		98.2 %		1749.0	2	< 0.001
	No		44.9		58.2		47.1		37.1			
	Yes		55.1		41.8		52.9		62.9			
Physical exercise %		98.4 %		99.1 %		99.1 %		99.2 %		1963.8	6	< 0.001
	Not much exercise		23.5		36.9		25.0		17.7			
	At least 4h light exercise per week		46.5		40.2		46.5		48.6			
	At least 3h heavy exercise per week		27.1		20.7		26.0		30.1			
	Training for sports competitions		2.9		2.3		2.4		3.6			
Problems with children %		96.8 %		97.7 %		97.8 %		97.9 %		3275.6	10	< 0.001
	I do not have children		33.8		45.7		35.3		28.5			
	Almost all the time		1.6		3.8		1.7		0.7			

	Quite often		5.1		7.9		5.8		3.4	
	Sometimes		14.2		13.1		15.3		13.2	
	Rarely		27.4		18.9		26.7		30.8	
	Never		18.0		10.6		15.2		23.3	
Problems with spouse %		96.7 %		97.1 %		97.4 %		97.7 %		5130.3	6	< 0.001
	I do not have a spouse		26.6		38.3		27.8		22.0	
	Almost all the time		7.4		15.6		8.2		3.8	
	Sometimes		43.9		35.9		46.6		43.2	
	Never		22.2		10.2		17.4		31.1	
Work-related distress %		96.2 %		98.9 %		99.0 %		99.0 %		8798.4	8	< 0.001
	No work or studies		13.9		19.0		13.0		12.6	
	Almost all the time		6.9		19.5		7.1		2.6	
	Quite often		16.3		25.1		19.5		9.8	
	Sometimes		38.6		26.6		40.5		40.5	
	Rarely or never		24.3		9.8		19.9		34.6	
Satisfaction with economical situation (1-7) %		94.2 %		97.2 %		97.1 %		96.6 %		13112.2	4	< 0.001
	1-3		21.2		51.7		22.7		9.0	
	4-5		44.9		35.1		51.9		40.6	
	6-7		34.0		13.2		25.4		50.4	

 Data available for 83 150 subjects (82%)
† Proportion of subjects with data available
‡ Classified in quartiles

Table 2: High confidence in the future* and health related behaviours with various adjustments.

Men (N= 7 688 - 9 526)													
Model	Adjustment	Daily smoking		Heavy alcohol consumption (≥14 doses /week)		Regular binge drinking (≥once a week)		Daily fruit consumption		Daily vegetable consumption		Regular physical activity	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
1	Age only	0.58	0.52 - 0.65	0.52	0.46 - 0.58	0.35	0.30 - 0.40	2.09	1.86 - 2.35	2.48	2.25 - 2.74	2.82	2.55 - 3.13
2	Education	0.58	0.52 - 0.65	0.51	0.46 - 0.58	0.35	0.30 - 0.40	2.08	1.85 - 2.34	2.48	2.25 - 2.74	2.82	2.54 - 3.13
3	Income	0.61	0.55 - 0.69	0.50	0.44 - 0.56	0.34	0.29 - 0.40	2.09	1.85 - 2.37	2.30	2.07 - 2.55	2.78	2.50 - 3.10
4	Psychological distress†	0.72	0.63 - 0.83	0.59	0.51 - 0.67	0.44	0.36 - 0.52	1.94	1.68 - 2.23	2.04	1.81 - 2.30	2.30	2.02 - 2.62
5	Satisfaction with income	1.00	0.86 - 1.17	0.70	0.60 - 0.82	0.49	0.40 - 0.60	1.55	1.32 - 1.81	1.63	1.43 - 1.87	1.79	1.55 - 2.06
Women (N=26 035 - 36 079)													
Model	Adjustment	Daily smoking		Heavy alcohol consumption (≥7 doses /week)		Regular binge drinking (≥once a week)		Daily fruit consumption		Daily vegetable consumption		Regular physical activity	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
1	Age only	0.57	0.53 - 0.61	0.67	0.62 - 0.71	0.37	0.33 - 0.42	1.83	1.74 - 1.93	2.13	2.03 - 2.24	2.57	2.44 - 2.71
2	Education	0.57	0.54 - 0.61	0.66	0.62 - 0.71	0.37	0.33 - 0.42	1.84	1.74 - 1.93	2.13	2.03 - 2.24	2.55	2.42 - 2.69
3	Income	0.61	0.57 - 0.66	0.63	0.59 - 0.68	0.37	0.32 - 0.41	1.83	1.73 - 1.93	2.07	1.96 - 2.18	2.56	2.41 - 2.71
4	Psychological distress†	0.69	0.64 - 0.75	0.64	0.59 - 0.69	0.45	0.39 - 0.52	1.64	1.54 - 1.75	1.83	1.73 - 1.95	2.22	2.07 - 2.37
5	Satisfaction with income	0.87	0.80 - 0.96	0.73	0.66 - 0.80	0.51	0.44 - 0.60	1.37	1.28 - 1.47	1.56	1.46 - 1.67	1.84	1.71 - 1.99

* Subjects with high confidence in the future compared with subjects with low confidence in the future
† Work related problems, marital problems, childcare problems

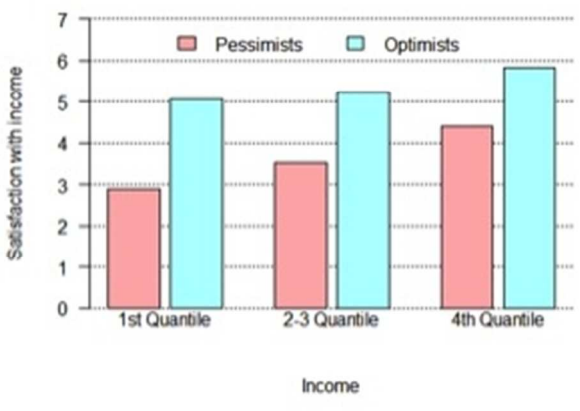

Figure 1 Confidence in the future, satisfaction with economical situation and income
109x87mm (72 x 72 DPI)

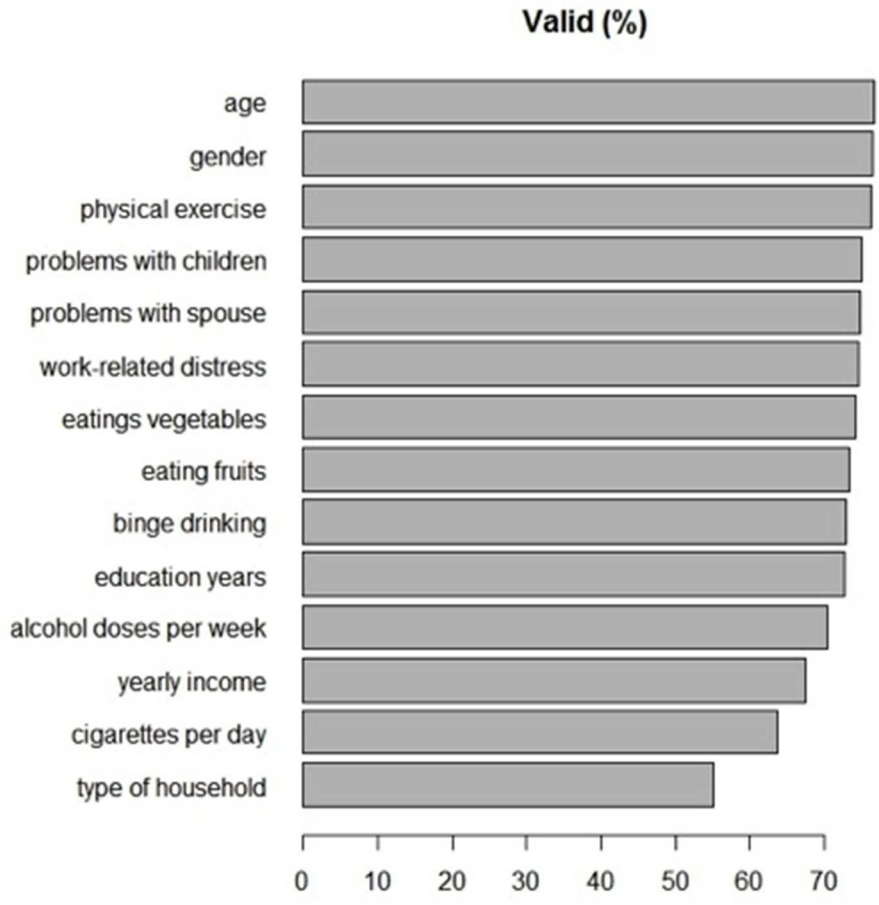

Figure 2 Missing data in the Finnish Happiness-Flourishing Study
165x165mm (72 x 72 DPI)

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Confidence in the future, health related behaviour and psychological distress – results from a population-based cross-sectional study of 101 257 Finns

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Confidence in the future, health related behaviour and psychological distress – results from a web-based cross-sectional study of 101 257 Finns

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Abstract

Objectives: to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

Design: web-based cross-sectional study including an "Electronic Health Check" at the Finnish Happiness-Flourishing Study website linked to a TV-program on happiness and depression.

Setting: The Finnish population with access to the internet

Participants: 101 257 Finns aged 18 and above (21 365 men; 79 892 women). Participants who were under the age of 18 and who did not provide information about their gender were excluded.

Primary outcome measures: As planned, we assessed smoking, weekly alcohol consumption and binge drinking, daily intake of fruit and vegetables, and regular exercise.

Results: Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) and binge drinkers (men 0.35; 0.30 to 0.40; women 0.37; 0.33 to 0.42). Subjects with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. Adjustment for current psychological distress and satisfaction for income attenuated the results.

Conclusions: Having confidence in the future is strongly associated with a healthy lifestyle, as assessed by a healthy diet, physical exercise and substance abuse. Health-related interventions may benefit from tailoring interventions according to the target population's level of confidence in the future as well as their level of psychological distress.

Summary

Article Focus

This study aims to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

The web-based cross-sectional study including an “Electronic Health Check” at the Finnish Happiness-Flourishing Study website was linked to a TV-program on happiness and depression.

Key Messages

Our large, web-based study on Finnish adults confirms previous findings of an overall healthy lifestyle among subjects with high confidence in the future.

Subjects with high confidence in the future were more likely to exercise regularly, and consume vegetables and fruit daily.

Binge drinking, heavy drinking and daily smoking may be less common among subjects with high confidence in the future.

Strengths and Limitations

The sample size is considerably larger than in previous web-based studies, and we were able to assess a wide range of confounding factors as well as several health related behaviours in one study.

The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website.

No causal conclusions can be drawn from this cross-sectional study.

Introduction

Optimists benefit from expecting positive generalized outcomes (1) and from explaining bad events with external, unstable and specific causes (2) in terms of health. Previous longitudinal studies have shown the association between optimism and longevity (3) (4) and optimism and mental (5) and physical (6) health. Less is known about the link between a specific dimension of optimism, i.e. confidence in the future and health related behavior.

For the sake of clarity, hereafter we use the term 'optimism' only when referring to previous literature. Positive associations between optimism and proactive efforts in promoting health were reported in clinical study on patients in cardiac rehabilitation, as optimism predicted success in lowering levels of saturated fat and body fat, and in increasing physical activity. (7). A Finnish study recruited subjects at increased risk for type 2 diabetes. The sample of men and women aged 50-65 participated in the Lifestyle Implementation Trial. Dispositional optimism and pessimism were unrelated to waist circumference change. (8)

Regarding community-based studies, a study on adults aged 40 to 60 years reported that optimists knew more about risk factors for heart-attacks than their less optimistic counterparts.(9). In a study on elderly community-living men, dispositional optimism associated with healthy lifestyle and dietary habits at 15-year follow-up independent of age, education, living arrangement and somatic morbidity (10). In an urban sample of men and women aged 65 to 80 years, optimism was associated with not smoking, moderate alcohol consumption, and physical activity, independently of socio-demographic factors and clinical condition (11). Less is known about optimism and health related behaviours in young adults. A study on young adults born in Northern Finland found optimists more likely

to have a healthy diet and pessimists more likely to smoke or be high consumers of alcohol. No marked differences were found in the consumption of junk food. (12)

Psychological stress and socioeconomic status (SES) and are well-known predictors of health-related behaviour. Psychological distress from marital problems, childcare (13) and work-related problems (14) have been shown to associate with increase in alcohol consumption and other health damaging behaviour. Higher prevalence of unhealthy behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms linking lower SES to worse health (17, 18).

Psychological distress and SES are also linked with optimism. Optimists well-being is likely to be related to their characteristic, flexible coping methods with a variety of stressors (19) and to accumulation of resources (20). Thus, SES and current psychological stress may partially explain the association between optimism and health related behaviour.

A study with approximately 100 000 women aged between 50 and 79 analysed whether optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were prospectively associated with coronary heart disease (CHD) morbidity and with total mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and mortality. The associations were independent of a number of sociodemographic variables, smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another recent study assessed the connections between optimism and psychological distress in a sample of 284 depressed patients, who had undergone coronary bypass surgery. Compared with pessimists, optimists had lower rates of re-hospitalization (21).

The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive mental health and positive health related behavior in the Finnish population. The aim of this study was to explore how one dimension of optimism, i.e. high confidence in the future, is related to health-related behaviors and whether current socioeconomical status and psychological distress contribute to these relations in a large web-based sample of 101 257 Finns aged 18 and above.

Data and methods

Data

The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo (a Finnish television production company), and Finland's national public service broadcasting company YLE. The collection of the web-based data was connected to a "Reality TV"- program with happiness training for selected unhappy celebrities in 2009. Each of the eight episodes gained an audience of about 250 000 viewers. The TV-program guided viewers to a freely available happiness website, where 139 462 Finns anonymously measured their own happiness on the Happiness–Flourishing Scale and identified their important sources of happiness. The study website was also advertised on the television production company's own website. All Finnish-speaking individuals were eligible study subjects irrespective of whether they had watched the TV-program or not. The website clearly stated that the collected data would be used for creating reports on the happiness and factors connected to happiness. After filling the questionnaires, the subjects instantly received data on how their overall happiness score (measured by a new

Happiness-Flourishing Scale (HFS)) compared to those of other Finns. The HFS was validated in a separate web-based random sample of Finns representing the population aged 17-79 (N=2035). The collection of the data, the validation and the HFS are described in detail elsewhere (22).

Some of the numerical variables were measured using an open text field in the internet questionnaire. These variables had impossible minimum and maximum values indicating typing errors. Restrictions were made on the maximum and minimum values of the following variables: income (0 – 5 000 000), education years (0 – participant's age), alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes per day), and age (7(18) – 110 years). In addition, we excluded participants who were under the age of 18 and who did not provide information about their gender. The final sample size after these restrictions was 101 257. No other exclusion or inclusion criteria were applied in this study.

Variables

Confidence in the future was assessed by the item "I have complete confidence in the future", and subjects were to choose a smiley face that best reflected their answer on a 7-point Likert scale 1 reflecting "Totally disagree" and 7 reflecting "Totally agree". Answers 6-7 were classified as "High confidence in the future" and answers 1-3 as "low confidence in the future". 11 other happiness skills were similarly assessed: I devote a great deal of my time to those close to me; I am very grateful for everything that I have received and achieved; Helping others comes naturally to me; I have complete confidence in the future;

I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have firm life values that I aim to nurture; I see adversity as a challenge; I often become so absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw strength from contemplation and meditation; I have clear goals in my life.

Smoking was assessed by the question “How many cigarettes, cigars or pipefuls do you smoke per day? Smoking at least once a day was dichotomized as regular smoking. An open text field followed the question “How many units of alcohol do you drink per week?” At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol consumption. Binge drinking was assessed with the question: “How often do you drink enough alcohol to feel yourself drunk?” with 4 response options. The answers reflecting drinking at least once a week were categorized as “regular binge drinking”. The questions on food consumption were formulated “On average, how often do you eat fresh vegetables?” and “On average, how often do you eat fresh fruit or berries?” with response options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4) Once a day or more. The answers reflecting daily consumption was dichotomized as “regular consumption”. Leisure time physical activity was recorded by asking the following questions: “How much do you exercise and strain yourself physically in your leisure time?” (=the so-called Gothenburg scale) (23). Answers reflecting at least 4 hours of leisure exercise per week was dichotomized as “regular physical activity”.

The level of education was captured with an open-ended question ”How many years in total have you attended school or studied full time?” and participants responded as full years. Education was included in the analyses as a continuous variable. Income was assessed with the question “What were the gross earnings for your household

last year? (before tax is deducted)?" In the analyses the level of income was included as a continuous variable. Work-related distress was captured by asking "How often do you find yourself annoyed that you have to push yourself to the limit in order to cope with your present job or workload?" with 5 response options. "Family-related distress was asked as follows: "Do you experience problems in your relationship with your spouse or partner?" with 4 response options and "Have your children caused you particular problems?" with 6 response options. Satisfaction with one's level of income was assessed with a 7-point Likert scale.

Statistical analysis

Descriptive statistics were reported for the large web-based sample. The missing data analyses were conducted using a logistic regression model. The missingness indicator of a variable, which had value one if the value was observed and zero otherwise, was used as the outcome and the variables, which had fewer missing values, as independent variables. As the number of observations was large, the Bayesian information criterion (BIC), (24) was applied in assessing important predictors of missing values.

Sequential logistic regression models were used to analyze the association between optimism and health related behavior. Results are presented in terms of adjusted odds ratios (OR) and their 95% confidence intervals (CI). The analyses were performed separately for both genders. In the first model the dichotomized heath variable was explained by only optimism (and age). Education was added in the second model while the third model added income as a covariate. Finally the fourth model added the psychological distress variables. Each analysis included only those subjects who had data on all the variables included in the model. The R statistical software (version 2.15.0) was used in the

analysis. The interaction between confidence in the future and gender was tested in all analyses, but results are only presented when the effects were significant.

Results

Description of study population

<Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)>

The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 % were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the future varied little by age and education. Regarding all measures of health related behaviour, subjects with high confidence in the future lead a healthier lifestyle and reported less psychological distress in both family and work contexts. The proportion of subjects with high confidence was highest in the highest income quartile and they reported higher satisfaction with their income.

<Figure 1 Confidence in the future, satisfaction with economical situation and income>

In separate analyses on income quartiles (Figure 1), subjects with high confidence in the future were more satisfied with their income irrespective of their level of income.

Missing data

<Figure 2 Missing data in the Finnish Happiness-Flourishing Study>

Age and gender appeared to be the most important predictors for missing values, as very low and high age, as well as male gender predicted missing values in most variables. (data not shown). In eating vegetables the predictor was little problems with children. In binge drinking the predictors were problems with spouse or work-related distress all the time, and eating vegetables less than once a week. In alcohol quantity the predictors were problems with spouse all the time, eating vegetables at most twice a week and binge drinking less than once a month, in which case the alcohol quantity was likely to be close to zero. In income the predictors were low physical activity, work-related distress all the time, small number of education years, and low alcohol consumption. In the number of cigarettes per day the predictors were physical activity, problems with spouse not all the time, binge drinking at least once a week, small number of education years, and consumption of alcohol. Variables related to smoking, alcohol consumpion, income or type of household contained relatively large amount of missing values (Figure 2).

Health related behaviour and confidence in the future

<Table 2 Confidence in the future, health related behaviour, socioeconomic status and psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079) aged 18 and over>

Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to

be regular binge drinkers (men OR 0.35, 95% CI 0.30 to 0.40; women 0.37, 95% CI 0.33 to 0.42) and less likely to consume alcohol in excess. Correspondingly, men and women with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant gender interaction in daily consumption of fruit (Bonferroni p=0,00089) and vegetables (Bonferroni p=0,00020), in which the associations with high confidence in the future were stronger in men than in women.

Adjustment for education and income had little or no effect on the associations between high confidence in the future and health related behaviours. Adjustment for current psychological distress at work or in family relationships, and particularly the adjustment for satisfaction with income, attenuated the association between high confidence in the future and most health related behaviours. Compared with subjects with low confidence in the future, those with high confidence in the future remained less likely to be daily smokers (men OR 1.00, 95% CI 0.86 to 1.17; women 0.87, 95% CI 0.80 to 0.96), less likely to be regular binge drinkers (men OR 0.49, 95% CI 0.40 to 0.60; women 0.51, 95% CI 0.44 to 0.60) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82; women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56, 95% CI 1.46 to 1.67) and fruit (men OR 1.55, 95% CI 1.32 to 1.81; women 1.37, 95% CI 1.28 to 1.47) daily. Among women, the association between high confidence in the future and heavy alcohol consumption was not affected by adjustment for psychological distress.

Among men, the association between confidence in the future and smoking was rendered statistically insignificant after full adjustments, but other associations remained statistically significant in the full model.

Discussion

Principal findings

Optimism, as assessed by the LOT, has previously been shown to associate with good health and a healthy lifestyle in studies focusing on middle-aged and elderly subjects. To the best of our knowledge, data on a specific dimension of optimism, i.e. confidence in the future, as well as information on the extent to which socio-economic factors and psychological distress explain the association, is lacking. This web-based study found high confidence in the future to be strongly associated with several beneficial health related behaviours and little psychological distress among both genders. Adjustment for current psychological distress at work and at home, as well as adjustment for satisfaction with income, attenuated the associations. Nevertheless, disregarding smoking among men, the findings held in multivariable adjusted models in both genders.

Strengths and weaknesses

There are several strengths in this study. First, the sample size is considerably larger than in previous studies on optimism, which enables better detection of associations between confidence in the future, health behavior and related mechanisms. Furthermore, we also captured younger age-groups than previous studies. Second, we were able to assess a wide range of confounding factors, although the possibility of residual confounding cannot be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by

level of education, was roughly comparable to another Finnish survey conducted in 2009 (25). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived from the Population Register for an annual survey, which was answered by 59% of the sample. The proportion of subjects with basic education was about 15% compared with 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and 69%, correspondingly (25). Finally, we were able to assess several health related behaviours in one study.

However, there are also limitations in this study that must be considered. First, due to self-selection, the generalizability of these results is limited. The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website. However, the average score for confidence in the future in the national sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a rather small potential bias. Accordingly, a previous study on 912 online happiness seeking adults found that the participants reported depressive symptoms above the mean of the general population and life satisfaction below the average (26). Furthermore, we had no information on whether the subjects had actually watched the happiness-related TV-program or not. However, watching the TV-program was unlikely to bias our results on the connection between confidence in the future and health related behaviours. Also, the happiness-related website appeared to attract more women than men. Second, no causal conclusions can be drawn from this cross-sectional study. Third, missing values in the analysis variables were often related to low education, problems with spouse, work-related distress, number of adults in the household or alcohol use, although the directions of the associations varied from variable to variable. A possible future development could be multiple imputation of the missing data in order to assess the effects of, and to remove the

possible bias caused by the missing data. Fourth, this study includes only one item that measures optimism, i.e. confidence in the future. Thus, these results should not be interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge drinking may underestimate the level of true binge drinking; due to tolerance, individuals may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used several non-validated single item questions on background variables such as psychological distress. This decision was made in order to ensure user-friendliness in a large, web-based study. Seventh, we had relatively large proportions of missing data for several variables. However, this is a common problem shared by most web-based studies. Regarding web-based interventions, it has been suggested that individuals may approach them differently than more traditional methods, and that 'dropouts' may in fact be individuals who received adequate help with a lower 'dose' of treatment. With caution, this may also apply to our cross-sectional study, as our study subjects may have selected to fill out the questionnaires they found most interesting or useful regarding the automated feedback they received on their happiness score. (27)

Strengths and weaknesses in relation to other studies

In line with our results, a previous Finnish study (12) on 31-year-old men and women (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high consumption of fruit and vegetables, whereas pessimism associated with tendency to smoke and to consume alcohol excessively. The data included a vast range of sociodemographic factors, but no information on psychological distress. Our study adds to these findings by showing strong negative associations between confidence in the future and binge drinking, as well as a positive association between high confidence and regular exercise.

In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from general practices in urban Great Britain, optimism was associated with high physical activity, not smoking and moderate alcohol consumption, independently of education, area deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-R), their results support our findings on the positive association between optimism and beneficial health related behaviours. Data on diet and psychological stress is unavailable for comparison.

In a prospective Dutch study of 773 elderly community-living men, dispositional optimism associated with regular physical activity, being a nonsmoker, higher alcohol consumption, and higher consumption of vegetables and fruit at 15-year follow-up independent of sociodemographic factors and somatic morbidity (10). Dispositional optimism was assessed by four items. In a cross-sectional setting, we show similar results among both genders and in a wider age group.

In short, previous studies show an exhaustive range of dietary variables and rigorously assessed sociodemographic background characteristics. Our study adds to the literature by examining a range of health related behaviours, and by assessing the role of psychological distress. With caution, and bearing in mind that we only measured one dimension of optimism with one item, our results for high and low confidence in the future appear to be in the exact directions and magnitude expected for optimism and pessimism, respectively.

Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns found parental socioeconomic status (SES) in childhood to predict higher dispositional optimism (overall LOT score) irrespective of current SES (28). Another longitudinal study on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to predict higher income after controlling for hours worked. On the other hand, higher income did not increase optimism at follow-up. (20) Although we can draw no conclusions about causal directions, our data adds to previous literature by showing that subjects with high confidence in the future report higher satisfaction with their income irrespective of their income level.

As previously discussed (29), it might seem paradoxical that people who expect good things to happen take the initiative and actively promote the good things. According to a recent meta-analysis, optimists' characteristic coping style includes techniques for managing both stressful problems and stress-induced emotions (19). Optimists were also flexible regarding the source and type of stress they were faced with. This flexibility likely accounts for highly confident subjects' resilience to stressful events (29) such as family- and work-related stressors in our data.

Conclusions

This study produced further evidence, as high confidence in the future appeared to associate with a range of beneficial health related behaviours and low psychological distress in different areas of life. Although no causal conclusions can be drawn from this study, subjects with high confidence in the future appeared to make the effort to promote a healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies in different populations are needed to disentangle the cause and effect chain between

different dimensions of optimism and health related behaviours. Future health –related interventions may benefit from tailoring each intervention according to the target population's level of confidence in the future as well as their level of psychological distress. Furthermore, more research is needed to increase the current understanding of changes in confidence in the future with alternating loads and quality of psychological distress.

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Appendices

Contributorship statement

Osmo Saarelma, Heimo Langinvainio, Antti S. Mattila, Tommi Härkänen, Jouko Lönnqvist and Pekka Mustonen designed the study. Kaisla Joutsenniemi managed the literature searches and wrote the first draft of the manuscript. Maiju Pankakoski undertook the statistical analysis under the supervision of Tommi Härkänen and Kaisla Joutsenniemi. Maiju Pankakoski and Tommi Härkänen wrote the chapters on statistical methods. Heimo Langinvainio and Antti S. Mattila provided their expertise in research of positive psychology. All authors contributed to and have approved the final manuscript.

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) KJ, MP, TH, HL, AM, OS, JL and PM have support from the National Institute for Health and Welfare and Duodecim Medical Publications Ltd for the submitted work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that might have an interest in the submitted work in the previous 3 years; (3) their spouses,

partners, or children have no financial relationships that may be relevant to the submitted work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that may be relevant to the submitted work.

An ethics approval was not required for this web-based observational study.

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Data sharing statement: There is no additional data available.

All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

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Confidence in the future, health related behaviour and psychological distress – results from a web-based cross-sectional study of 101 257 Finns

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Abstract

Objectives: to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

Design: web-based cross-sectional study including an "Electronic Health Check" at the Finnish Happiness-Flourishing Study website linked to a TV-program on happiness and depression.

Setting: The Finnish population with access to the internet

Participants: 101 257 Finns aged 18 and above (21 365 men; 79 892 women). Participants who were under the age of 18 and who did not provide information about their gender were excluded.

Primary outcome measures: As planned, we assessed smoking, weekly alcohol consumption and binge drinking, daily intake of fruit and vegetables, and regular exercise.

Results: Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) and binge drinkers (men 0.35; 0.30 to 0.40; women 0.37; 0.33 to 0.42). Subjects with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. Adjustment for current psychological distress and satisfaction for income attenuated the results.

Conclusions: Having confidence in the future is strongly associated with a healthy lifestyle, as assessed by a healthy diet, physical exercise and substance abuse. Health-related interventions may benefit from tailoring interventions according to the target population's level of confidence in the future as well as their level of psychological distress.

Summary

Article Focus

This study aims to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

The web-based cross-sectional study including an “Electronic Health Check” at the Finnish Happiness-Flourishing Study website was linked to a TV-program on happiness and depression.

Key Messages

Our large, web-based study on Finnish adults confirms previous findings of an overall healthy lifestyle among subjects with high confidence in the future.

Subjects with high confidence in the future were more likely to exercise regularly, and consume vegetables and fruit daily.

Binge drinking, heavy drinking and daily smoking may be less common among subjects with high confidence in the future.

Strengths and Limitations

The sample size is considerably larger than in previous web-based studies, and we were able to assess a wide range of confounding factors as well as several health related behaviours in one study.

The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website.

No causal conclusions can be drawn from this cross-sectional study.

Introduction

Optimists benefit from expecting positive generalized outcomes (1) and from explaining bad events with external, unstable and specific causes (2) in terms of health. Previous longitudinal studies have shown the association between optimism and longevity (3) (4) and optimism and mental (5) and physical (6) health. Less is known about the link between a specific dimension of optimism, i.e. confidence in the future and health related behavior.

For the sake of clarity, hereafter we use the term 'optimism' only when referring to previous literature. Positive associations between optimism and proactive efforts in promoting health were reported in clinical study on patients in cardiac rehabilitation, as optimism predicted success in lowering levels of saturated fat and body fat, and in increasing physical activity. (7). A Finnish study recruited subjects at increased risk for type 2 diabetes. The sample of men and women aged 50-65 participated in the Lifestyle Implementation Trial. Dispositional optimism and pessimism were unrelated to waist circumference change. (8)

Regarding community-based studies, a study on adults aged 40 to 60 years reported that optimists knew more about risk factors for heart-attacks than their less optimistic counterparts.(9). In a study on elderly community-living men, dispositional optimism associated with healthy lifestyle and dietary habits at 15-year follow-up independent of age, education, living arrangement and somatic morbidity (10). In an urban sample of men and women aged 65 to 80 years, optimism was associated with not smoking, moderate alcohol consumption, and physical activity, independently of socio-demographic factors and clinical condition (11). Less is known about optimism and health related behaviours in young adults. A study on young adults born in Northern Finland found optimists more likely

to have a healthy diet and pessimists more likely to smoke or be high consumers of alcohol. No marked differences were found in the consumption of junk food. (12)

Psychological stress and socioeconomic status (SES) and are well-known predictors of health-related behaviour. Psychological distress from marital problems, childcare (13) and work-related problems (14) have been shown to associate with increase in alcohol consumption and other health damaging behaviour. Higher prevalence of unhealthy behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms linking lower SES to worse health (17, 18).

Psychological distress and SES are also linked with optimism. Optimists well-being is likely to be related to their characteristic, flexible coping methods with a variety of stressors (19) and to accumulation of resources (20). Thus, SES and current psychological stress may partially explain the association between optimism and health related behaviour.

A study with approximately 100 000 women aged between 50 and 79 analysed whether optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were prospectively associated with coronary heart disease (CHD) morbidity and with total mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and mortality. The associations were independent of a number of sociodemographic variables, smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another recent study assessed the connections between optimism and psychological distress in a sample of 284 depressed patients, who had undergone coronary bypass surgery. Compared with pessimists, optimists had lower rates of re-hospitalization (21).

The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive mental health and positive health related behavior in the Finnish population. The aim of this study was to explore how one dimension of optimism, i.e. high confidence in the future, is related to health-related behaviors and whether current socioeconomical status and psychological distress contribute to these relations in a large web-based sample of 101 257 Finns aged 18 and above.

Data and methods

Data

The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo (a Finnish television production company), and Finland's national public service broadcasting company YLE. The collection of the web-based data was connected to a "Reality TV"- program with happiness training for selected unhappy celebrities in 2009. Each of the eight episodes gained an audience of about 250 000 viewers. The TV-program guided viewers to a freely available happiness website, where 139 462 Finns anonymously measured their own happiness on the Happiness–Flourishing Scale and identified their important sources of happiness. The study website was also advertised on the television production company's own website. All Finnish-speaking individuals were eligible study subjects irrespective of whether they had watched the TV-program or not. The website clearly stated that the collected data would be used for creating reports on the happiness and factors connected to happiness. After filling the questionnaires, the subjects instantly received data on how their overall happiness score (measured by a new

Happiness-Flourishing Scale (HFS)) compared to those of other Finns. The HFS was validated in a separate web-based random sample of Finns representing the population aged 17-79 (N=2035). The collection of the data, the validation and the HFS are described in detail elsewhere (22).

Some of the numerical variables were measured using an open text field in the internet questionnaire. These variables had impossible minimum and maximum values indicating typing errors. Restrictions were made on the maximum and minimum values of the following variables: income (0 – 5 000 000), education years (0 – participant's age), alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes per day), and age (7(18) – 110 years). In addition, we excluded participants who were under the age of 18 and who did not provide information about their gender. The final sample size after these restrictions was 101 257. No other exclusion or inclusion criteria were applied in this study.

Variables

Confidence in the future was assessed by the item "I have complete confidence in the future", and subjects were to choose a smiley face that best reflected their answer on a 7-point Likert scale 1 reflecting "Totally disagree" and 7 reflecting "Totally agree". Answers 6-7 were classified as "High confidence in the future" and answers 1-3 as "low confidence in the future". 11 other happiness skills were similarly assessed: I devote a great deal of my time to those close to me; I am very grateful for everything that I have received and achieved; Helping others comes naturally to me; I have complete confidence in the future;

I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have firm life values that I aim to nurture; I see adversity as a challenge; I often become so absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw strength from contemplation and meditation; I have clear goals in my life.

Smoking was assessed by the question “How many cigarettes, cigars or pipefuls do you smoke per day? Smoking at least once a day was dichotomized as regular smoking. An open text field followed the question “How many units of alcohol do you drink per week?” At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol consumption. Binge drinking was assessed with the question: “How often do you drink enough alcohol to feel yourself drunk?” with 4 response options. The answers reflecting drinking at least once a week were categorized as “regular binge drinking”. The questions on food consumption were formulated “On average, how often do you eat fresh vegetables?” and “On average, how often do you eat fresh fruit or berries?” with response options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4) Once a day or more. The answers reflecting daily consumption was dichotomized as “regular consumption”. Leisure time physical activity was recorded by asking the following questions: “How much do you exercise and strain yourself physically in your leisure time?” (=the so-called Gothenburg scale) (23). Answers reflecting at least 4 hours of leisure exercise per week was dichotomized as “regular physical activity”.

The level of education was captured with an open-ended question ”How many years in total have you attended school or studied full time?” and participants responded as full years. Education was included in the analyses as a continuous variable. Income was assessed with the question “What were the gross earnings for your household

last year? (before tax is deducted)?" In the analyses the level of income was included as a continuous variable. Work-related distress was captured by asking "How often do you find yourself annoyed that you have to push yourself to the limit in order to cope with your present job or workload?" with 5 response options. "Family-related distress was asked as follows: "Do you experience problems in your relationship with your spouse or partner?" with 4 response options and "Have your children caused you particular problems?" with 6 response options. Satisfaction with one's level of income was assessed with a 7-point Likert scale.

Statistical analysis

Descriptive statistics were reported for the large web-based sample. The missing data analyses were conducted using a logistic regression model. The missingness indicator of a variable, which had value one if the value was observed and zero otherwise, was used as the outcome and the variables, which had fewer missing values, as independent variables. As the number of observations was large, the Bayesian information criterion (BIC), (24) was applied in assessing important predictors of missing values.

Sequential logistic regression models were used to analyze the association between optimism and health related behavior. Results are presented in terms of adjusted odds ratios (OR) and their 95% confidence intervals (CI). The analyses were performed separately for both genders. In the first model the dichotomized heath variable was explained by only optimism (and age). Education was added in the second model while the third model added income as a covariate. Finally the fourth model added the psychological distress variables. Each analysis included only those subjects who had data on all the variables included in the model. The R statistical software (version 2.15.0) was used in the

analysis. The interaction between confidence in the future and gender was tested in all analyses, but results are only presented when the effects were significant.

Results

Description of study population

<Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)>

The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 % were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the future varied little by age and education. Regarding all measures of health related behaviour, subjects with high confidence in the future lead a healthier lifestyle and reported less psychological distress in both family and work contexts. The proportion of subjects with high confidence was highest in the highest income quartile and they reported higher satisfaction with their income.

<Figure 1 Confidence in the future, satisfaction with economical situation and income>

In separate analyses on income quartiles (Figure 1), subjects with high confidence in the future were more satisfied with their income irrespective of their level of income.

Missing data

<Figure 2 Missing data in the Finnish Happiness-Flourishing Study>

Age and gender appeared to be the most important predictors for missing values, as very low and high age, as well as male gender predicted missing values in most variables. (data not shown). In eating vegetables the predictor was little problems with children. In binge drinking the predictors were problems with spouse or work-related distress all the time, and eating vegetables less than once a week. In alcohol quantity the predictors were problems with spouse all the time, eating vegetables at most twice a week and binge drinking less than once a month, in which case the alcohol quantity was likely to be close to zero. In income the predictors were low physical activity, work-related distress all the time, small number of education years, and low alcohol consumption. In the number of cigarettes per day the predictors were physical activity, problems with spouse not all the time, binge drinking at least once a week, small number of education years, and consumption of alcohol. Variables related to smoking, alcohol consumpion, income or type of household contained relatively large amount of missing values (Figure 2).

Health related behaviour and confidence in the future

<Table 2 Confidence in the future, health related behaviour, socioeconomic status and psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079) aged 18 and over>

Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to

be regular binge drinkers (men OR 0.35, 95% CI 0.30 to 0.40; women 0.37, 95% CI 0.33 to 0.42) and less likely to consume alcohol in excess. Correspondingly, men and women with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant gender interaction in daily consumption of fruit (Bonferroni p=0,00089) and vegetables (Bonferroni p=0,00020), in which the associations with high confidence in the future were stronger in men than in women.

Adjustment for education and income had little or no effect on the associations between high confidence in the future and health related behaviours. Adjustment for current psychological distress at work or in family relationships, and particularly the adjustment for satisfaction with income, attenuated the association between high confidence in the future and most health related behaviours. Compared with subjects with low confidence in the future, those with high confidence in the future remained less likely to be daily smokers (men OR 1.00, 95% CI 0.86 to 1.17; women 0.87, 95% CI 0.80 to 0.96), less likely to be regular binge drinkers (men OR 0.49, 95% CI 0.40 to 0.60; women 0.51, 95% CI 0.44 to 0.60) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82; women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56, 95% CI 1.46 to 1.67) and fruit (men OR 1.55, 95% CI 1.32 to 1.81; women 1.37, 95% CI 1.28 to 1.47) daily. Among women, the association between high confidence in the future and heavy alcohol consumption was not affected by adjustment for psychological distress.

Among men, the association between confidence in the future and smoking was rendered statistically insignificant after full adjustments, but other associations remained statistically significant in the full model.

Discussion

Principal findings

Optimism, as assessed by the LOT, has previously been shown to associate with good health and a healthy lifestyle in studies focusing on middle-aged and elderly subjects. To the best of our knowledge, data on a specific dimension of optimism, i.e. confidence in the future, as well as information on the extent to which socio-economic factors and psychological distress explain the association, is lacking. This web-based study found high confidence in the future to be strongly associated with several beneficial health related behaviours and little psychological distress among both genders. Adjustment for current psychological distress at work and at home, as well as adjustment for satisfaction with income, attenuated the associations. Nevertheless, disregarding smoking among men, the findings held in multivariable adjusted models in both genders.

Strengths and weaknesses

There are several strengths in this study. First, the sample size is considerably larger than in previous studies on optimism, which enables better detection of associations between confidence in the future, health behavior and related mechanisms. Furthermore, we also captured younger age-groups than previous studies. Second, we were able to assess a wide range of confounding factors, although the possibility of residual confounding cannot be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by

level of education, was roughly comparable to another Finnish survey conducted in 2009 (25). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived from the Population Register for an annual survey, which was answered by 59% of the sample. The proportion of subjects with basic education was about 15% compared with 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and 69%, correspondingly (25). Finally, we were able to assess several health related behaviours in one study.

However, there are also limitations in this study that must be considered. First, due to self-selection, the generalizability of these results is limited. The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website. However, the average score for confidence in the future in the national sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a rather small potential bias. Accordingly, a previous study on 912 online happiness seeking adults found that the participants reported depressive symptoms above the mean of the general population and life satisfaction below the average (26). Furthermore, we had no information on whether the subjects had actually watched the happiness-related TV-program or not. However, watching the TV-program was unlikely to bias our results on the connection between confidence in the future and health related behaviours. Also, the happiness-related website appeared to attract more women than men. Second, no causal conclusions can be drawn from this cross-sectional study. Third, missing values in the analysis variables were often related to low education, problems with spouse, work-related distress, number of adults in the household or alcohol use, although the directions of the associations varied from variable to variable. A possible future development could be multiple imputation of the missing data in order to assess the effects of, and to remove the

possible bias caused by the missing data. Fourth, this study includes only one item that measures optimism, i.e. confidence in the future. Thus, these results should not be interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge drinking may underestimate the level of true binge drinking; due to tolerance, individuals may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used several non-validated single item questions on background variables such as psychological distress. This decision was made in order to ensure user-friendliness in a large, web-based study. Seventh, we had relatively large proportions of missing data for several variables. However, this is a common problem shared by most web-based studies. Regarding web-based interventions, it has been suggested that individuals may approach them differently than more traditional methods, and that 'dropouts' may in fact be individuals who received adequate help with a lower 'dose' of treatment. With caution, this may also apply to our cross-sectional study, as our study subjects may have selected to fill out the questionnaires they found most interesting or useful regarding the automated feedback they received on their happiness score. (27)

Strengths and weaknesses in relation to other studies

In line with our results, a previous Finnish study (12) on 31-year-old men and women (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high consumption of fruit and vegetables, whereas pessimism associated with tendency to smoke and to consume alcohol excessively. The data included a vast range of sociodemographic factors, but no information on psychological distress. Our study adds to these findings by showing strong negative associations between confidence in the future and binge drinking, as well as a positive association between high confidence and regular exercise.

In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from general practices in urban Great Britain, optimism was associated with high physical activity, not smoking and moderate alcohol consumption, independently of education, area deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-R), their results support our findings on the positive association between optimism and beneficial health related behaviours. Data on diet and psychological stress is unavailable for comparison.

In a prospective Dutch study of 773 elderly community-living men, dispositional optimism associated with regular physical activity, being a nonsmoker, higher alcohol consumption, and higher consumption of vegetables and fruit at 15-year follow-up independent of sociodemographic factors and somatic morbidity (10). Dispositional optimism was assessed by four items. In a cross-sectional setting, we show similar results among both genders and in a wider age group.

In short, previous studies show an exhaustive range of dietary variables and rigorously assessed sociodemographic background characteristics. Our study adds to the literature by examining a range of health related behaviours, and by assessing the role of psychological distress. With caution, and bearing in mind that we only measured one dimension of optimism with one item, our results for high and low confidence in the future appear to be in the exact directions and magnitude expected for optimism and pessimism, respectively.

Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns found parental socioeconomic status (SES) in childhood to predict higher dispositional optimism (overall LOT score) irrespective of current SES (28). Another longitudinal study on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to predict higher income after controlling for hours worked. On the other hand, higher income did not increase optimism at follow-up. (20) Although we can draw no conclusions about causal directions, our data adds to previous literature by showing that subjects with high confidence in the future report higher satisfaction with their income irrespective of their income level.

As previously discussed (29), it might seem paradoxical that people who expect good things to happen take the initiative and actively promote the good things. According to a recent meta-analysis, optimists' characteristic coping style includes techniques for managing both stressful problems and stress-induced emotions (19). Optimists were also flexible regarding the source and type of stress they were faced with. This flexibility likely accounts for highly confident subjects' resilience to stressful events (29) such as family- and work-related stressors in our data.

Conclusions

This study produced further evidence, as high confidence in the future appeared to associate with a range of beneficial health related behaviours and low psychological distress in different areas of life. Although no causal conclusions can be drawn from this study, subjects with high confidence in the future appeared to make the effort to promote a healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies in different populations are needed to disentangle the cause and effect chain between

different dimensions of optimism and health related behaviours. Future health –related interventions may benefit from tailoring each intervention according to the target population's level of confidence in the future as well as their level of psychological distress. Furthermore, more research is needed to increase the current understanding of changes in confidence in the future with alternating loads and quality of psychological distress.

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Appendices

Contributorship statement

Osmo Saarelma, Heimo Langinvainio, Antti S. Mattila, Tommi Härkänen, Jouko Lönnqvist and Pekka Mustonen designed the study. Kaisla Joutsenniemi managed the literature searches and wrote the first draft of the manuscript. Maiju Pankakoski undertook the statistical analysis under the supervision of Tommi Härkänen and Kaisla Joutsenniemi. Maiju Pankakoski and Tommi Härkänen wrote the chapters on statistical methods. Heimo Langinvainio and Antti S. Mattila provided their expertise in research of positive psychology. All authors contributed to and have approved the final manuscript.

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) KJ, MP, TH, HL, AM, OS, JL and PM have support from the National Institute for Health and Welfare and Duodecim Medical Publications Ltd for the submitted work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that might have an interest in the submitted work in the previous 3 years; (3) their spouses,

partners, or children have no financial relationships that may be relevant to the submitted work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that may be relevant to the submitted work.

An ethics approval was not required for this web-based observational study.

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All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)

				Confidence in the future								
			Whole sample		Low 14.5%		Moderate 44.7%		High 40.8%			
Variable		Valid†	N=101257	Valid†	N=12060	Valid†	N=37154	Valid†	N=33936	X^2	df	p
Gender %										92.9	2	< 0.001
	male	100 %	21.1	100 %	22.1	100 %	18.4	100 %	20.4			
	female		78.9		77.9		81.6		79.6			
Age %		100 %		100 %		100 %		100 %		757.9	8	< 0.001
	18-29		17.1		22.4		17.6		14.9			
	30-44		30.4		33.1		31.9		29.3			
	45-54		24.6		24.5		24.7		25.4			
	55-64		21.2		15.9		19.8		23.8			
	> 65		6.7		4.2		5.9		6.6			
Education years %		95.0 %		97.2 %		97.4 %		97.9 %		103.1	14	< 0.001
	< 6		4.9		5.5		4.8		4.6			
	6 - 7		2.7		2.6		2.6		2.5			
	8 - 9		5.0		5.0		4.8		5.0			
	10 - 12		18.9		19.5		18.5		18.2			
	13 - 15		27.0		27.0		27.4		26.8			
	16 - 18		27.9		25.6		28.0		29.6			
	19 - 20		9.4		9.8		9.7		9.3			
	> 20		4.2		5.0		4.1		4.1			
Income (€ per year) %		89.9 %		89.4 %		90.0 %		91.4 %		1137.0	6	< 0.001
	0-17999		24.7		32.2		24.4		22.6			
	18000-35999		24.5		28.1		26.1		21.4			
	36000-59999		22.1		20.2		22.1		22.3			
	60000-		28.8		19.4		27.4		33.7			

Alcohol doses per week %		91.1 %		91.0 %		91.8 %		92.6 %		391.0	6	< 0.001
	0		28.3		30.8		27.6		28.6			
	1-5		44.4		38.6		45.4		45.9			
	6-10		16.2		15.5		16.1		16.2			
	11-		11.1		15.1		10.9		9.3			
Binge drinking %		94.2 %		97.1 %		97.1 %		96.9 %		753.2	6	< 0.001
	At least 2 times a week		5.1		8.8		4.8		3.6			
	At least once a week		12.4		14.6		12.7		10.7			
	At least once a month		23.5		22.0		24.6		22.9			
	Less than once a month		59.1		54.6		57.9		62.9			
Daily smoking %		82.2 %		85.3 %		84.4 %		85.2 %		518.8	2	< 0.001
	No		81.1		74.0		81.0		84.2			
	Yes		18.9		26.0		19.0		15.8			
Fruits daily %		94.4 %		97.5 %		97.1 %		97.4 %		1182.2	2	< 0.001
	No		57.9		68.4		59.9		51.3			
	Yes		42.1		31.6		40.1		48.8			
Vegetable daily %		95.6 %		98.5 %		98.4 %		98.2 %		1749.0	2	< 0.001
	No		44.9		58.2		47.1		37.1			
	Yes		55.1		41.8		52.9		62.9			
Physical exercise %		98.4 %		99.1 %		99.1 %		99.2 %		1963.8	6	< 0.001
	Not much exercise		23.5		36.9		25.0		17.7			
	At least 4h light exercise per week		46.5		40.2		46.5		48.6			
	At least 3h heavy exercise per week		27.1		20.7		26.0		30.1			
	Training for sports competitions		2.9		2.3		2.4		3.6			
Problems with children %		96.8 %		97.7 %		97.8 %		97.9 %		3275.6	10	< 0.001
	I do not have children		33.8		45.7		35.3		28.5			
	Almost all the time		1.6		3.8		1.7		0.7			

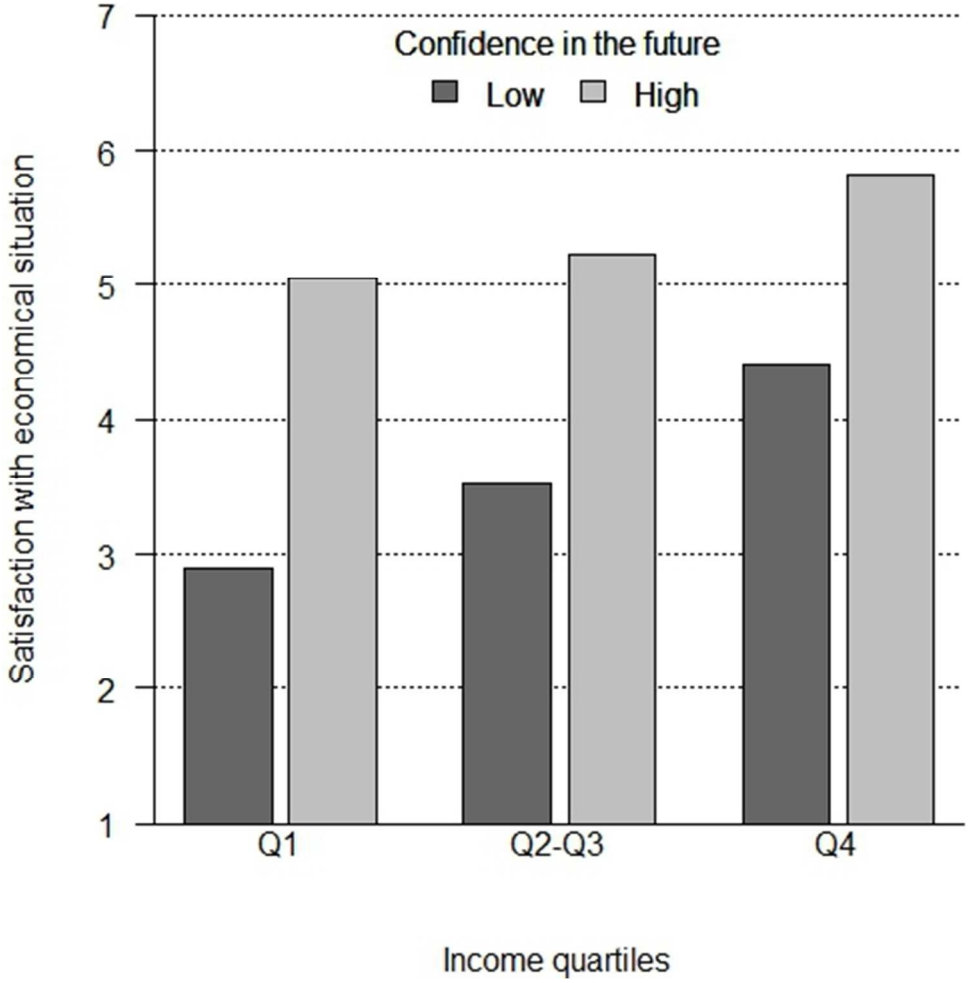
	Quite often		5.1		7.9		5.8		3.4	
	Sometimes		14.2		13.1		15.3		13.2	
	Rarely		27.4		18.9		26.7		30.8	
	Never		18.0		10.6		15.2		23.3	
Problems with spouse %		96.7 %		97.1 %		97.4 %		97.7 %		5130.3	6	< 0.001
	I do not have a spouse		26.6		38.3		27.8		22.0	
	Almost all the time		7.4		15.6		8.2		3.8	
	Sometimes		43.9		35.9		46.6		43.2	
	Never		22.2		10.2		17.4		31.1	
Work-related distress %		96.2 %		98.9 %		99.0 %		99.0 %		8798.4	8	< 0.001
	No work or studies		13.9		19.0		13.0		12.6	
	Almost all the time		6.9		19.5		7.1		2.6	
	Quite often		16.3		25.1		19.5		9.8	
	Sometimes		38.6		26.6		40.5		40.5	
	Rarely or never		24.3		9.8		19.9		34.6	
Satisfaction with economical situation (1-7) %		94.2 %		97.2 %		97.1 %		96.6 %		13112.2	4	< 0.001
	1-3		21.2		51.7		22.7		9.0	
	4-5		44.9		35.1		51.9		40.6	
	6-7		34.0		13.2		25.4		50.4	

 Data available for 83 150 subjects (82%)
† Proportion of subjects with data available
‡ Classified in quartiles

Table 2: High confidence in the future* and health related behaviours with various adjustments.

Men (N= 7 688 - 9 526)													
Model	Adjustment	Daily smoking		Heavy alcohol consumption (≥14 doses /week)		Regular binge drinking (≥once a week)		Daily fruit consumption		Daily vegetable consumption		Regular physical activity	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
1	Age only	0.58	0.52 - 0.65	0.52	0.46 - 0.58	0.35	0.30 - 0.40	2.09	1.86 - 2.35	2.48	2.25 - 2.74	2.82	2.55 - 3.13
2	Education	0.58	0.52 - 0.65	0.51	0.46 - 0.58	0.35	0.30 - 0.40	2.08	1.85 - 2.34	2.48	2.25 - 2.74	2.82	2.54 - 3.13
3	Income	0.61	0.55 - 0.69	0.50	0.44 - 0.56	0.34	0.29 - 0.40	2.09	1.85 - 2.37	2.30	2.07 - 2.55	2.78	2.50 - 3.10
4	Psychological distress†	0.72	0.63 - 0.83	0.59	0.51 - 0.67	0.44	0.36 - 0.52	1.94	1.68 - 2.23	2.04	1.81 - 2.30	2.30	2.02 - 2.62
5	Satisfaction with income	1.00	0.86 - 1.17	0.70	0.60 - 0.82	0.49	0.40 - 0.60	1.55	1.32 - 1.81	1.63	1.43 - 1.87	1.79	1.55 - 2.06
Women (N=26 035 - 36 079)													
Model	Adjustment	Daily smoking		Heavy alcohol consumption (≥7 doses /week)		Regular binge drinking (≥once a week)		Daily fruit consumption		Daily vegetable consumption		Regular physical activity	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
1	Age only	0.57	0.53 - 0.61	0.67	0.62 - 0.71	0.37	0.33 - 0.42	1.83	1.74 - 1.93	2.13	2.03 - 2.24	2.57	2.44 - 2.71
2	Education	0.57	0.54 - 0.61	0.66	0.62 - 0.71	0.37	0.33 - 0.42	1.84	1.74 - 1.93	2.13	2.03 - 2.24	2.55	2.42 - 2.69
3	Income	0.61	0.57 - 0.66	0.63	0.59 - 0.68	0.37	0.32 - 0.41	1.83	1.73 - 1.93	2.07	1.96 - 2.18	2.56	2.41 - 2.71
4	Psychological distress†	0.69	0.64 - 0.75	0.64	0.59 - 0.69	0.45	0.39 - 0.52	1.64	1.54 - 1.75	1.83	1.73 - 1.95	2.22	2.07 - 2.37
5	Satisfaction with income	0.87	0.80 - 0.96	0.73	0.66 - 0.80	0.51	0.44 - 0.60	1.37	1.28 - 1.47	1.56	1.46 - 1.67	1.84	1.71 - 1.99

* Subjects with high confidence in the future compared with subjects with low confidence in the future
† Work related problems, marital problems, childcare problems



176x176mm (72 x 72 DPI)

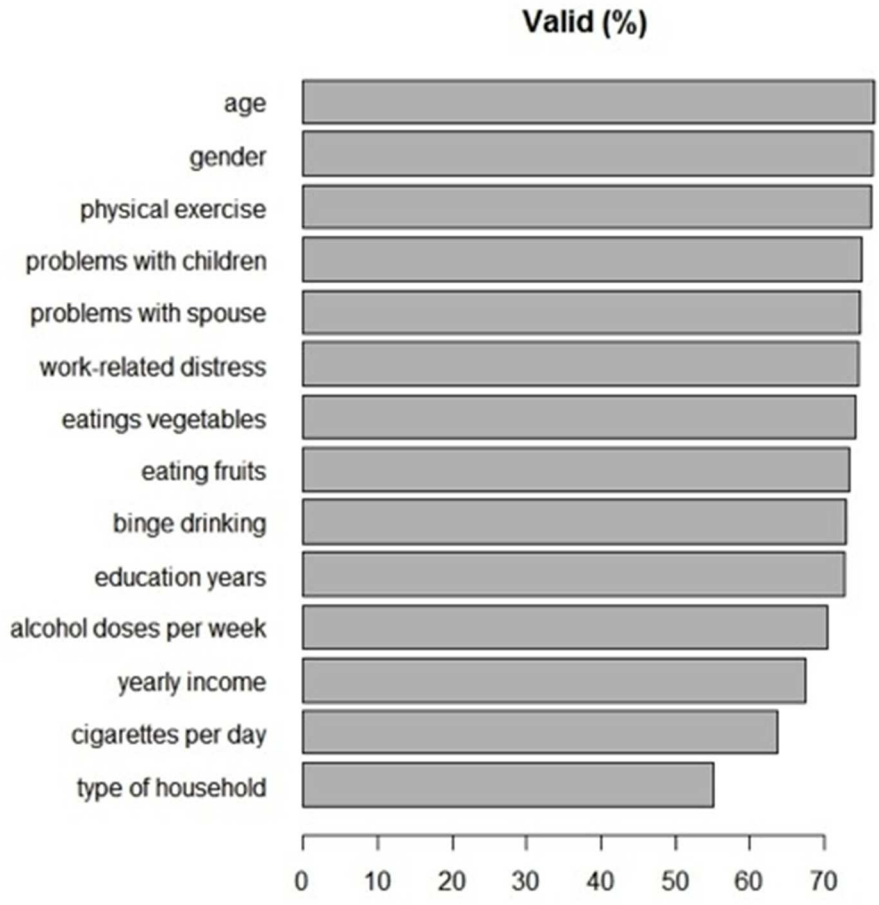


Figure 2 Missing data in the Finnish Happiness-Flourishing Study
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Confidence in the future, health related behaviour and psychological distress – results from a population-based cross-sectional study of 101 257 Finns

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Confidence in the future, health related behaviour and psychological distress – results from a web-based cross-sectional study of 101 257 Finns

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Abstract

Objectives: to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

Design: web-based cross-sectional study including an "Electronic Health Check" at the Finnish Happiness-Flourishing Study website linked to a TV-program on happiness and depression.

Setting: The Finnish population with access to the internet

Participants: 101 257 Finns aged 18 and above (21 365 men; 79 892 women). Participants who were under the age of 18 and who did not provide information about their gender were excluded.

Primary outcome measures: As planned, we assessed smoking, weekly alcohol consumption and binge drinking, daily intake of fruit and vegetables, and regular exercise.

Results: Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) and binge drinkers (men 0.57; 0.52 to 0.63; women 0.54; 0.50 to 0.57). Subjects with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. Adjustment for current psychological distress and satisfaction for income attenuated the results.

Conclusions: Having confidence in the future is strongly associated with a healthy lifestyle, as assessed by a healthy diet, physical exercise and substance abuse. Health-related interventions may benefit from tailoring interventions according to the target population's level of confidence in the future as well as their level of psychological distress.

Summary

Article Focus

This study aims to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

The web-based cross-sectional study including an “Electronic Health Check” at the Finnish Happiness-Flourishing Study website was linked to a TV-program on happiness and depression.

Key Messages

Our large, web-based study on Finnish adults confirms previous findings of an overall healthy lifestyle among subjects with high confidence in the future.

Subjects with high confidence in the future were more likely to exercise regularly, and consume vegetables and fruit daily.

Binge drinking, heavy drinking and daily smoking may be less common among subjects with high confidence in the future.

Strengths and Limitations

The sample size is considerably larger than in previous web-based studies, and we were able to assess a wide range of confounding factors as well as several health related behaviours in one study.

The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website.

No causal conclusions can be drawn from this cross-sectional study.

Introduction

Optimists benefit from expecting positive generalized outcomes (1) and from explaining bad events with external, unstable and specific causes (2) in terms of health. Previous longitudinal studies have shown the association between optimism and longevity (3) (4) and optimism and mental (5) and physical (6) health. Less is known about the link between a specific dimension of optimism, i.e. confidence in the future and health related behavior.

For the sake of clarity, hereafter we use the term 'optimism' only when referring to previous literature. Positive associations between optimism and proactive efforts in promoting health were reported in clinical study on patients in cardiac rehabilitation, as optimism predicted success in lowering levels of saturated fat and body fat, and in increasing physical activity. (7). A Finnish study recruited subjects at increased risk for type 2 diabetes. The sample of men and women aged 50-65 participated in the Lifestyle Implementation Trial. Dispositional optimism and pessimism were unrelated to waist circumference change. (8)

Regarding community-based studies, a study on adults aged 40 to 60 years reported that optimists knew more about risk factors for heart-attacks than their less optimistic counterparts.(9). In a study on elderly community-living men, dispositional optimism associated with healthy lifestyle and dietary habits at 15-year follow-up independent of age, education, living arrangement and somatic morbidity (10). In an urban sample of men and women aged 65 to 80 years, optimism was associated with not smoking, moderate alcohol consumption, and physical activity, independently of socio-demographic factors and clinical condition (11). Less is known about optimism and health related behaviours in young adults. A study on young adults born in Northern Finland found optimists more likely

to have a healthy diet and pessimists more likely to smoke or be high consumers of alcohol. No marked differences were found in the consumption of junk food. (12)

Psychological stress and socioeconomic status (SES) and are well-known predictors of health-related behaviour. Psychological distress from marital problems, childcare (13) and work-related problems (14) have been shown to associate with increase in alcohol consumption and other health damaging behaviour. Higher prevalence of unhealthy behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms linking lower SES to worse health (17, 18).

Psychological distress and SES are also linked with optimism. Optimists well-being is likely to be related to their characteristic, flexible coping methods with a variety of stressors (19) and to accumulation of resources (20). Thus, SES and current psychological stress may partially explain the association between optimism and health related behaviour.

A study with approximately 100 000 women aged between 50 and 79 analysed whether optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were prospectively associated with coronary heart disease (CHD) morbidity and with total mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and mortality. The associations were independent of a number of sociodemographic variables, smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another recent study assessed the connections between optimism and psychological distress in a sample of 284 depressed patients, who had undergone coronary bypass surgery. Compared with pessimists, optimists had lower rates of re-hospitalization (21).

The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive mental health and positive health related behavior in the Finnish population. The aim of this study was to explore how one dimension of optimism, i.e. high confidence in the future, is related to health-related behaviors and whether current socioeconomical status and psychological distress contribute to these relations in a large web-based sample of 101 257 Finns aged 18 and above.

Data and methods

Data

The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo (a Finnish television production company), and Finland's national public service broadcasting company YLE. The collection of the web-based data was connected to a "Reality TV"- program with happiness training for selected unhappy celebrities in 2009. Each of the eight episodes gained an audience of about 250 000 viewers. The TV-program guided viewers to a freely available happiness website, where 139 462 Finns anonymously measured their own happiness on the Happiness–Flourishing Scale and identified their important sources of happiness. The study website was also advertised on the television production company's own website. All Finnish-speaking individuals were eligible study subjects irrespective of whether they had watched the TV-program or not. The website clearly stated that the collected data would be used for creating public summary reports on the happiness and factors connected to happiness. The time frame for filling out the questionnaires was September 10th 2009- August 17th 2010. After filling

the questionnaires, the subjects instantly received data on how their overall happiness score (measured by a new Happiness-Flourishing Scale (HFS)) compared to those of other Finns. The HFS was validated in a separate web-based random sample of Finns representing the population aged 17-79 (N=2035). The demographic characteristics of the validation sample are compared with the Finnish Happiness-Flourishing Study sample in Appendix 1.

Some of the numerical variables were measured using an open text field in the internet questionnaire. These variables had impossible minimum and maximum values indicating typing errors. Restrictions were made on the maximum and minimum values of the following variables: income (0 – 5 000 000), education years (0 – participant's age), alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes per day), and age (7(18) – 110 years). In addition, we excluded participants who were under the age of 18 and who did not provide information about their gender. The final sample size after these restrictions was 101 257. No other exclusion or inclusion criteria were applied in this study.

<Figure 1 Flow chart>

Variables

Confidence in the future was assessed by the item "I have complete confidence in the future", and subjects were to choose a smiley face that best reflected their answer on a 7-point Likert scale 1 reflecting "Totally disagree" and 7 reflecting "Totally agree". Answers 6-7 were classified as "High confidence in the future" and answers 1-3 as "low confidence in

the future". 11 other happiness skills were similarly assessed: I devote a great deal of my time to those close to me; I am very grateful for everything that I have received and achieved; Helping others comes naturally to me; I have complete confidence in the future; I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have firm life values that I aim to nurture; I see adversity as a challenge; I often become so absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw strength from contemplation and meditation; I have clear goals in my life.

Smoking was assessed by the question "How many cigarettes, cigars or pipefuls do you smoke per day? Smoking at least once a day was dichotomized as regular smoking. An open text field followed the question "How many units of alcohol do you drink per week?" At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol consumption. Binge drinking was assessed with the question: "How often do you drink enough alcohol to feel yourself drunk?" with 4 response options. The answers reflecting drinking at least once a week were categorized as "regular binge drinking". The questions on food consumption were formulated "On average, how often do you eat fresh vegetables?" and "On average, how often do you eat fresh fruit or berries?" with response options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4) Once a day or more. The answers reflecting daily consumption was dichotomized as "regular consumption". Leisure time physical activity was recorded by asking the following questions: "How much do you exercise and strain yourself physically in your leisure time?" (=the so-called Gothenburg scale) (22). Answers reflecting at least 4 hours of leisure exercise per week was dichotomized as "regular physical activity".

The level of education was captured with an open-ended question "How

many years in total have you attended school or studied full time?" and participants responded as full years. Education was included in the analyses as a continuous variable. Income was assessed with the question "What were the gross earnings for your household last year? (before tax is deducted)?" In the analyses the level of income was included as a continuous variable. Work-related distress was captured by asking "How often do you find yourself annoyed that you have to push yourself to the limit in order to cope with your present job or workload?" with 5 response options. "Family-related distress was asked as follows: "Do you experience problems in your relationship with your spouse or partner?" with 4 response options and "Have your children caused you particular problems?" with 6 response options. Satisfaction with one's level of income was assessed with a 7-point Likert scale.

Statistical analysis

Descriptive statistics were reported for the large web-based sample. The missing data analyses were conducted using a logistic regression model. The missingness indicator of a variable, which had value one if the value was observed and zero otherwise, was used as the outcome and the variables, which had fewer missing values, as independent variables. As the number of observations was large, the Bayesian information criterion (BIC), (23) was applied in assessing important predictors of missing values.

Sequential logistic regression models were used to analyze the association between optimism and health related behavior. Results are presented in terms of adjusted odds ratios (OR) and their 95% confidence intervals (CI). The analyses were performed separately for both genders. In the first model the dichotomized heath variable was explained by only optimism (and age). Education was added in the second model while the third model added income as a covariate. Finally the fourth model added the psychological

distress variables. Each analysis included only those subjects who had data on all the variables included in the model. The R statistical software (version 2.15.0) was used in the analysis. The interaction between confidence in the future and gender was tested in all analyses, but results are only presented when the effects were significant.

Results

Description of study population

<Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)>

The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 % were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the future varied little by age and education. Regarding all measures of health related behaviour, subjects with high confidence in the future lead a healthier lifestyle and reported less psychological distress in both family and work contexts. The proportion of subjects with high confidence was highest in the highest income quartile and they reported higher satisfaction with their income.

<Figure 2 Confidence in the future, satisfaction with economical situation and income>

In separate analyses on income quartiles (Figure 2), subjects with high confidence in the future were more satisfied with their income irrespective of their level of income.

Missing data

<Figure 2 Missing data in the Finnish Happiness-Flourishing Study>

Age and gender appeared to be the most important predictors for missing values, as very low and high age, as well as male gender predicted missing values in most variables. (data not shown). In eating vegetables the predictor was little problems with children. In binge drinking the predictors were problems with spouse or work-related distress all the time, and eating vegetables less than once a week. In alcohol quantity the predictors were problems with spouse all the time, eating vegetables at most twice a week and binge drinking less than once a month, in which case the alcohol quantity was likely to be close to zero. In income the predictors were low physical activity, work-related distress all the time, small number of education years, and low alcohol consumption. In the number of cigarettes per day the predictors were physical activity, problems with spouse not all the time, binge drinking at least once a week, small number of education years, and consumption of alcohol. Variables related to smoking, alcohol consumpion, income or type of household contained relatively large amount of missing values (Figure 3).

<Figure 3 Missing data in the Finnish Happiness-Flourishing Study>

Health related behaviour and confidence in the future

<Table 2 Confidence in the future, health related behaviour, socioeconomic status and psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079) aged 18 and over>

Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to be regular binge drinkers (men OR 0.57, 95% CI 0.52 to 0.63; women 0.54, 95% CI 0.50 to 0.57) and less likely to consume alcohol in excess. Correspondingly, men and women with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant gender interaction in daily consumption of fruit (Bonferroni p=0,00089) and vegetables (Bonferroni p=0,00020), in which the associations with high confidence in the future were stronger in men than in women.

Adjustment for education and income had little or no effect on the associations between high confidence in the future and health related behaviours. Adjustment for current psychological distress at work or in family relationships, and particularly the adjustment for satisfaction with income, attenuated the association between high confidence in the future and most health related behaviours. Compared with subjects with low confidence in the future, those with high confidence in the future remained less likely to be daily smokers (men OR 1.00, 95% CI 0.86 to 1.17; women 0.87, 95% CI 0.80 to 0.96), less likely to be regular binge drinkers (men OR 0.69, 95% CI 0.60 to 0.79; women 0.65, 95% CI 0.59 to 0.71) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82; women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56,

95% CI 1.46 to 1.67) and fruit (men OR 1.55, 95% CI 1.32 to 1.81; women 1.37, 95% CI 1.28 to 1.47) daily. Among women, the association between high confidence in the future and heavy alcohol consumption was not affected by adjustment for psychological distress. Among men, the association between confidence in the future and smoking was rendered statistically insignificant after full adjustments, but other associations remained statistically significant in the full model.

Discussion

Principal findings

Optimism, as assessed by the LOT, has previously been shown to associate with good health and a healthy lifestyle in studies focusing on middle-aged and elderly subjects. To the best of our knowledge, data on a specific dimension of optimism, i.e. confidence in the future, as well as information on the extent to which socio-economic factors and psychological distress explain the association, is lacking. This web-based study found high confidence in the future to be strongly associated with several beneficial health related behaviours and little psychological distress among both genders. Adjustment for current psychological distress at work and at home, as well as adjustment for satisfaction with income, attenuated the associations. Nevertheless, disregarding smoking among men, the findings held in multivariable adjusted models in both genders.

Strengths and weaknesses

There are several strengths in this study. First, the sample size is considerably larger than in previous studies on optimism, which enables better detection of associations between confidence in the future, health behavior and related mechanisms. Furthermore, we also

captured younger age-groups than previous studies. Second, we were able to assess a wide range of confounding factors, although the possibility of residual confounding cannot be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by level of education, was roughly comparable to another Finnish survey conducted in 2009 (24). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived from the Population Register for an annual survey, which was answered by 59% of the sample. The proportion of subjects with basic education was about 15% compared with 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and 69%, correspondingly (24). Finally, we were able to assess several health related behaviours in one study.

However, there are also limitations in this study that must be considered. First, due to self-selection, the generalizability of these results is limited. The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website. However, the average score for confidence in the future in the national sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a rather small potential bias. Accordingly, a previous study on 912 online happiness seeking adults found that the participants reported depressive symptoms above the mean of the general population and life satisfaction below the average (25). Furthermore, we had no information on whether the subjects had actually watched the happiness-related TV-program or not. However, watching the TV-program was unlikely to bias our results on the connection between confidence in the future and health related behaviours. Also, the happiness-related website appeared to attract more women than men. Second, no causal conclusions can be drawn from this cross-sectional study. Third, missing values in the analysis variables were often related to low education, problems with spouse, work-related

distress, number of adults in the household or alcohol use, although the directions of the associations varied from variable to variable. A possible future development could be multiple imputation of the missing data in order to assess the effects of, and to remove the possible bias caused by the missing data. Fourth, this study includes only one item that measures optimism, i.e. confidence in the future. Thus, these results should not be interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge drinking may underestimate the level of true binge drinking; due to tolerance, individuals may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used several non-validated single item questions on background variables such as psychological distress. This decision was made in order to ensure user-friendliness in a large, web-based study. Seventh, we had relatively large proportions of missing data for several variables. However, this is a common problem shared by most web-based studies. Regarding web-based interventions, it has been suggested that individuals may approach them differently than more traditional methods, and that 'dropouts' may in fact be individuals who received adequate help with a lower 'dose' of treatment. With caution, this may also apply to our cross-sectional study, as our study subjects may have selected to fill out the questionnaires they found most interesting or useful regarding the automated feedback they received on their happiness score. (26)

Strengths and weaknesses in relation to other studies

In line with our results, a previous Finnish study (12) on 31-year-old men and women (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high consumption of fruit and vegetables, whereas pessimism associated with tendency to smoke and to consume alcohol excessively. The data included a vast range of sociodemographic factors, but no information on psychological distress. Our study adds to

these findings by showing strong negative associations between confidence in the future and binge drinking, as well as a positive association between high confidence and regular exercise.

In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from general practices in urban Great Britain, optimism was associated with high physical activity, not smoking and moderate alcohol consumption, independently of education, area deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-R), their results support our findings on the positive association between optimism and beneficial health related behaviours. Data on diet and psychological stress is unavailable for comparison.

In a prospective Dutch study of 773 elderly community-living men, dispositional optimism associated with regular physical activity, being a nonsmoker, higher alcohol consumption, and higher consumption of vegetables and fruit at 15-year follow-up independent of sociodemographic factors and somatic morbidity (10). Dispositional optimism was assessed by four items. In a cross-sectional setting, we show similar results among both genders and in a wider age group.

In short, previous studies show an exhaustive range of dietary variables and rigorously assessed sociodemographic background characteristics. Our study adds to the literature by examining a range of health related behaviours, and by assessing the role of psychological distress. With caution, and bearing in mind that we only measured one dimension of optimism with one item, our results for high and low confidence in the future

appear to be in the exact directions and magnitude expected for optimism and pessimism, respectively.

Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns found parental socioeconomic status (SES) in childhood to predict higher dispositional optimism (overall LOT score) irrespective of current SES (27). Another longitudinal study on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to predict higher income after controlling for hours worked. On the other hand, higher income did not increase optimism at follow-up. (20) Although we can draw no conclusions about causal directions, our data adds to previous literature by showing that subjects with high confidence in the future report higher satisfaction with their income irrespective of their income level.

As previously discussed (28), it might seem paradoxical that people who expect good things to happen take the initiative and actively promote the good things. According to a recent meta-analysis, optimists' characteristic coping style includes techniques for managing both stressful problems and stress-induced emotions (19). Optimists were also flexible regarding the source and type of stress they were faced with. This flexibility likely accounts for highly confident subjects' resilience to stressful events (28) such as family- and work-related stressors in our data.

Conclusions

This study produced further evidence, as high confidence in the future appeared to associate with a range of beneficial health related behaviours and low psychological distress in different areas of life. Although no causal conclusions can be drawn from this

study, subjects with high confidence in the future appeared to make the effort to promote a healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies in different populations are needed to disentangle the cause and effect chain between different dimensions of optimism and health related behaviours. Future health –related interventions may benefit from tailoring each intervention according to the target population's level of confidence in the future as well as their level of psychological distress. Furthermore, more research is needed to increase the current understanding of changes in confidence in the future with alternating loads and quality of psychological distress.

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Appendices

Contributorship statement

Osmo Saarelma, Heimo Langinvainio, Antti S. Mattila, Tommi Härkänen, Jouko Lönnqvist and Pekka Mustonen designed the study. Kaisla Joutsenniemi managed the literature searches and wrote the first draft of the manuscript. Maiju Pankakoski undertook the statistical analysis under the supervision of Tommi Härkänen and Kaisla Joutsenniemi. Maiju Pankakoski and Tommi Härkänen wrote the chapters on statistical methods. Heimo Langinvainio and Antti S. Mattila provided their expertise in research of positive psychology. All authors contributed to and have approved the final manuscript.

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) KJ, MP, TH, HL, AM, OS, JL and PM have support from the National

Institute for Health and Welfare and Duodecim Medical Publications Ltd for the submitted work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that might have an interest in the submitted work in the previous 3 years; (3) their spouses, partners, or children have no financial relationships that may be relevant to the submitted work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that may be relevant to the submitted work.

An ethics approval was not required, as the study did not include an intervention, physical samples were not obtained, and the simple questionnaires did not contain delicate data on diseases.

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Data sharing statement: There is no additional data available.

All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

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Confidence in the future, health related behaviour and psychological distress – results from a web-based cross-sectional study of 101 257 Finns

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Abstract

Objectives: to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

Design: web-based cross-sectional study including an "Electronic Health Check" at the Finnish Happiness-Flourishing Study website linked to a TV-program on happiness and depression.

Setting: The Finnish population with access to the internet

Participants: 101 257 Finns aged 18 and above (21 365 men; 79 892 women). Participants who were under the age of 18 and who did not provide information about their gender were excluded.

Primary outcome measures: As planned, we assessed smoking, weekly alcohol consumption and binge drinking, daily intake of fruit and vegetables, and regular exercise.

Results: Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) and binge drinkers (men 0.57; 0.52 to 0.63; women 0.54; 0.50 to 0.57). Subjects with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. Adjustment for current psychological distress and satisfaction for income attenuated the results.

Conclusions: Having confidence in the future is strongly associated with a healthy lifestyle, as assessed by a healthy diet, physical exercise and substance abuse. Health-related interventions may benefit from tailoring interventions according to the target population's level of confidence in the future as well as their level of psychological distress.

Summary

Article Focus

This study aims to investigate the role of socioeconomic status and psychological stress to potential associations between confidence in the future and a wide range of health related behaviours.

The web-based cross-sectional study including an “Electronic Health Check” at the Finnish Happiness-Flourishing Study website was linked to a TV-program on happiness and depression.

Key Messages

Our large, web-based study on Finnish adults confirms previous findings of an overall healthy lifestyle among subjects with high confidence in the future.

Subjects with high confidence in the future were more likely to exercise regularly, and consume vegetables and fruit daily.

Binge drinking, heavy drinking and daily smoking may be less common among subjects with high confidence in the future.

Strengths and Limitations

The sample size is considerably larger than in previous web-based studies, and we were able to assess a wide range of confounding factors as well as several health related behaviours in one study.

The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website.

No causal conclusions can be drawn from this cross-sectional study.

Introduction

Optimists benefit from expecting positive generalized outcomes (1) and from explaining bad events with external, unstable and specific causes (2) in terms of health. Previous longitudinal studies have shown the association between optimism and longevity (3) (4) and optimism and mental (5) and physical (6) health. Less is known about the link between a specific dimension of optimism, i.e. confidence in the future and health related behavior.

For the sake of clarity, hereafter we use the term 'optimism' only when referring to previous literature. Positive associations between optimism and proactive efforts in promoting health were reported in clinical study on patients in cardiac rehabilitation, as optimism predicted success in lowering levels of saturated fat and body fat, and in increasing physical activity. (7). A Finnish study recruited subjects at increased risk for type 2 diabetes. The sample of men and women aged 50-65 participated in the Lifestyle Implementation Trial. Dispositional optimism and pessimism were unrelated to waist circumference change. (8)

Regarding community-based studies, a study on adults aged 40 to 60 years reported that optimists knew more about risk factors for heart-attacks than their less optimistic counterparts.(9). In a study on elderly community-living men, dispositional optimism associated with healthy lifestyle and dietary habits at 15-year follow-up independent of age, education, living arrangement and somatic morbidity (10). In an urban sample of men and women aged 65 to 80 years, optimism was associated with not smoking, moderate alcohol consumption, and physical activity, independently of socio-demographic factors and clinical condition (11). Less is known about optimism and health related behaviours in young adults. A study on young adults born in Northern Finland found optimists more likely

to have a healthy diet and pessimists more likely to smoke or be high consumers of alcohol. No marked differences were found in the consumption of junk food. (12)

Psychological stress and socioeconomic status (SES) and are well-known predictors of health-related behaviour. Psychological distress from marital problems, childcare (13) and work-related problems (14) have been shown to associate with increase in alcohol consumption and other health damaging behaviour. Higher prevalence of unhealthy behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms linking lower SES to worse health (17, 18).

Psychological distress and SES are also linked with optimism. Optimists well-being is likely to be related to their characteristic, flexible coping methods with a variety of stressors (19) and to accumulation of resources (20). Thus, SES and current psychological stress may partially explain the association between optimism and health related behaviour.

A study with approximately 100 000 women aged between 50 and 79 analysed whether optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were prospectively associated with coronary heart disease (CHD) morbidity and with total mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and mortality. The associations were independent of a number of sociodemographic variables, smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another recent study assessed the connections between optimism and psychological distress in a sample of 284 depressed patients, who had undergone coronary bypass surgery. Compared with pessimists, optimists had lower rates of re-hospitalization (21).

The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive mental health and positive health related behavior in the Finnish population. The aim of this study was to explore how one dimension of optimism, i.e. high confidence in the future, is related to health-related behaviors and whether current socioeconomical status and psychological distress contribute to these relations in a large web-based sample of 101 257 Finns aged 18 and above.

Data and methods

Data

The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo (a Finnish television production company), and Finland's national public service broadcasting company YLE. The collection of the web-based data was connected to a "Reality TV"- program with happiness training for selected unhappy celebrities in 2009. Each of the eight episodes gained an audience of about 250 000 viewers. The TV-program guided viewers to a freely available happiness website, where 139 462 Finns anonymously measured their own happiness on the Happiness–Flourishing Scale and identified their important sources of happiness. The study website was also advertised on the television production company's own website. All Finnish-speaking individuals were eligible study subjects irrespective of whether they had watched the TV-program or not. The website clearly stated that the collected data would be used for creating public summary reports on the happiness and factors connected to happiness. The time frame for filling out the questionnaires was September 10th 2009- August 17th 2010. After filling

the questionnaires, the subjects instantly received data on how their overall happiness score (measured by a new Happiness-Flourishing Scale (HFS)) compared to those of other Finns. The HFS was validated in a separate web-based random sample of Finns representing the population aged 17-79 (N=2035). The demographic characteristics of the validation sample are compared with the Finnish Happiness-Flourishing Study sample in Appendix 1.

Some of the numerical variables were measured using an open text field in the internet questionnaire. These variables had impossible minimum and maximum values indicating typing errors. Restrictions were made on the maximum and minimum values of the following variables: income (0 – 5 000 000), education years (0 – participant's age), alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes per day), and age (7(18) – 110 years). In addition, we excluded participants who were under the age of 18 and who did not provide information about their gender. The final sample size after these restrictions was 101 257. No other exclusion or inclusion criteria were applied in this study.

<Figure 1 Flow chart>

Variables

Confidence in the future was assessed by the item "I have complete confidence in the future", and subjects were to choose a smiley face that best reflected their answer on a 7-point Likert scale 1 reflecting "Totally disagree" and 7 reflecting "Totally agree". Answers 6-7 were classified as "High confidence in the future" and answers 1-3 as "low confidence in

the future". 11 other happiness skills were similarly assessed: I devote a great deal of my time to those close to me; I am very grateful for everything that I have received and achieved; Helping others comes naturally to me; I have complete confidence in the future; I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have firm life values that I aim to nurture; I see adversity as a challenge; I often become so absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw strength from contemplation and meditation; I have clear goals in my life.

Smoking was assessed by the question "How many cigarettes, cigars or pipefuls do you smoke per day? Smoking at least once a day was dichotomized as regular smoking. An open text field followed the question "How many units of alcohol do you drink per week?" At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol consumption. Binge drinking was assessed with the question: "How often do you drink enough alcohol to feel yourself drunk?" with 4 response options. The answers reflecting drinking at least once a week were categorized as "regular binge drinking". The questions on food consumption were formulated "On average, how often do you eat fresh vegetables?" and "On average, how often do you eat fresh fruit or berries?" with response options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4) Once a day or more. The answers reflecting daily consumption was dichotomized as "regular consumption". Leisure time physical activity was recorded by asking the following questions: "How much do you exercise and strain yourself physically in your leisure time?" (=the so-called Gothenburg scale) (22). Answers reflecting at least 4 hours of leisure exercise per week was dichotomized as "regular physical activity".

The level of education was captured with an open-ended question "How

many years in total have you attended school or studied full time?" and participants responded as full years. Education was included in the analyses as a continuous variable. Income was assessed with the question "What were the gross earnings for your household last year? (before tax is deducted)?" In the analyses the level of income was included as a continuous variable. Work-related distress was captured by asking "How often do you find yourself annoyed that you have to push yourself to the limit in order to cope with your present job or workload?" with 5 response options. "Family-related distress was asked as follows: "Do you experience problems in your relationship with your spouse or partner?" with 4 response options and "Have your children caused you particular problems?" with 6 response options. Satisfaction with one's level of income was assessed with a 7-point Likert scale.

Statistical analysis

Descriptive statistics were reported for the large web-based sample. The missing data analyses were conducted using a logistic regression model. The missingness indicator of a variable, which had value one if the value was observed and zero otherwise, was used as the outcome and the variables, which had fewer missing values, as independent variables. As the number of observations was large, the Bayesian information criterion (BIC), (23) was applied in assessing important predictors of missing values.

Sequential logistic regression models were used to analyze the association between optimism and health related behavior. Results are presented in terms of adjusted odds ratios (OR) and their 95% confidence intervals (CI). The analyses were performed separately for both genders. In the first model the dichotomized heath variable was explained by only optimism (and age). Education was added in the second model while the third model added income as a covariate. Finally the fourth model added the psychological

distress variables. Each analysis included only those subjects who had data on all the variables included in the model. The R statistical software (version 2.15.0) was used in the analysis. The interaction between confidence in the future and gender was tested in all analyses, but results are only presented when the effects were significant.

Results

Description of study population

<Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by level of confidence in the future (N=101 257)>

The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 % were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the future varied little by age and education. Regarding all measures of health related behaviour, subjects with high confidence in the future lead a healthier lifestyle and reported less psychological distress in both family and work contexts. The proportion of subjects with high confidence was highest in the highest income quartile and they reported higher satisfaction with their income.

<Figure 2 Confidence in the future, satisfaction with economical situation and income>

In separate analyses on income quartiles (Figure 2), subjects with high confidence in the future were more satisfied with their income irrespective of their level of income.

Missing data

<Figure 2 Missing data in the Finnish Happiness-Flourishing Study>

Age and gender appeared to be the most important predictors for missing values, as very low and high age, as well as male gender predicted missing values in most variables. (data not shown). In eating vegetables the predictor was little problems with children. In binge drinking the predictors were problems with spouse or work-related distress all the time, and eating vegetables less than once a week. In alcohol quantity the predictors were problems with spouse all the time, eating vegetables at most twice a week and binge drinking less than once a month, in which case the alcohol quantity was likely to be close to zero. In income the predictors were low physical activity, work-related distress all the time, small number of education years, and low alcohol consumption. In the number of cigarettes per day the predictors were physical activity, problems with spouse not all the time, binge drinking at least once a week, small number of education years, and consumption of alcohol. Variables related to smoking, alcohol consumpion, income or type of household contained relatively large amount of missing values (Figure 3).

<Figure 3 Missing data in the Finnish Happiness-Flourishing Study>

Health related behaviour and confidence in the future

<Table 2 Confidence in the future, health related behaviour, socioeconomic status and psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079) aged 18 and over>

Compared with subjects with low confidence in the future, those with high confidence in the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to be regular binge drinkers (men OR 0.57, 95% CI 0.52 to 0.63; women 0.54, 95% CI 0.50 to 0.57) and less likely to consume alcohol in excess. Correspondingly, men and women with high confidence in the future were more likely to exercise regularly (men OR 2.82, 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 2.48, 95% CI 2.25 to 2.74; women 2.13, 95% CI 2.03 to 2.24) and fruit (men OR 2.09, 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant gender interaction in daily consumption of fruit (Bonferroni p=0,00089) and vegetables (Bonferroni p=0,00020), in which the associations with high confidence in the future were stronger in men than in women.

Adjustment for education and income had little or no effect on the associations between high confidence in the future and health related behaviours. Adjustment for current psychological distress at work or in family relationships, and particularly the adjustment for satisfaction with income, attenuated the association between high confidence in the future and most health related behaviours. Compared with subjects with low confidence in the future, those with high confidence in the future remained less likely to be daily smokers (men OR 1.00, 95% CI 0.86 to 1.17; women 0.87, 95% CI 0.80 to 0.96), less likely to be regular binge drinkers (men OR 0.69, 95% CI 0.60 to 0.79; women 0.65, 95% CI 0.59 to 0.71) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82; women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56,

95% CI 1.46 to 1.67) and fruit (men OR 1.55, 95% CI 1.32 to 1.81; women 1.37, 95% CI 1.28 to 1.47) daily. Among women, the association between high confidence in the future and heavy alcohol consumption was not affected by adjustment for psychological distress. Among men, the association between confidence in the future and smoking was rendered statistically insignificant after full adjustments, but other associations remained statistically significant in the full model.

Discussion

Principal findings

Optimism, as assessed by the LOT, has previously been shown to associate with good health and a healthy lifestyle in studies focusing on middle-aged and elderly subjects. To the best of our knowledge, data on a specific dimension of optimism, i.e. confidence in the future, as well as information on the extent to which socio-economic factors and psychological distress explain the association, is lacking. This web-based study found high confidence in the future to be strongly associated with several beneficial health related behaviours and little psychological distress among both genders. Adjustment for current psychological distress at work and at home, as well as adjustment for satisfaction with income, attenuated the associations. Nevertheless, disregarding smoking among men, the findings held in multivariable adjusted models in both genders.

Strengths and weaknesses

There are several strengths in this study. First, the sample size is considerably larger than in previous studies on optimism, which enables better detection of associations between confidence in the future, health behavior and related mechanisms. Furthermore, we also

captured younger age-groups than previous studies. Second, we were able to assess a wide range of confounding factors, although the possibility of residual confounding cannot be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by level of education, was roughly comparable to another Finnish survey conducted in 2009 (24). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived from the Population Register for an annual survey, which was answered by 59% of the sample. The proportion of subjects with basic education was about 15% compared with 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and 69%, correspondingly (24). Finally, we were able to assess several health related behaviours in one study.

However, there are also limitations in this study that must be considered. First, due to self-selection, the generalizability of these results is limited. The TV-program with happiness-training for depressed subjects may have attracted subjects with corresponding needs to the website. However, the average score for confidence in the future in the national sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a rather small potential bias. Accordingly, a previous study on 912 online happiness seeking adults found that the participants reported depressive symptoms above the mean of the general population and life satisfaction below the average (25). Furthermore, we had no information on whether the subjects had actually watched the happiness-related TV-program or not. However, watching the TV-program was unlikely to bias our results on the connection between confidence in the future and health related behaviours. Also, the happiness-related website appeared to attract more women than men. Second, no causal conclusions can be drawn from this cross-sectional study. Third, missing values in the analysis variables were often related to low education, problems with spouse, work-related

distress, number of adults in the household or alcohol use, although the directions of the associations varied from variable to variable. A possible future development could be multiple imputation of the missing data in order to assess the effects of, and to remove the possible bias caused by the missing data. Fourth, this study includes only one item that measures optimism, i.e. confidence in the future. Thus, these results should not be interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge drinking may underestimate the level of true binge drinking; due to tolerance, individuals may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used several non-validated single item questions on background variables such as psychological distress. This decision was made in order to ensure user-friendliness in a large, web-based study. Seventh, we had relatively large proportions of missing data for several variables. However, this is a common problem shared by most web-based studies. Regarding web-based interventions, it has been suggested that individuals may approach them differently than more traditional methods, and that 'dropouts' may in fact be individuals who received adequate help with a lower 'dose' of treatment. With caution, this may also apply to our cross-sectional study, as our study subjects may have selected to fill out the questionnaires they found most interesting or useful regarding the automated feedback they received on their happiness score. (26)

Strengths and weaknesses in relation to other studies

In line with our results, a previous Finnish study (12) on 31-year-old men and women (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high consumption of fruit and vegetables, whereas pessimism associated with tendency to smoke and to consume alcohol excessively. The data included a vast range of sociodemographic factors, but no information on psychological distress. Our study adds to

these findings by showing strong negative associations between confidence in the future and binge drinking, as well as a positive association between high confidence and regular exercise.

In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from general practices in urban Great Britain, optimism was associated with high physical activity, not smoking and moderate alcohol consumption, independently of education, area deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-R), their results support our findings on the positive association between optimism and beneficial health related behaviours. Data on diet and psychological stress is unavailable for comparison.

In a prospective Dutch study of 773 elderly community-living men, dispositional optimism associated with regular physical activity, being a nonsmoker, higher alcohol consumption, and higher consumption of vegetables and fruit at 15-year follow-up independent of sociodemographic factors and somatic morbidity (10). Dispositional optimism was assessed by four items. In a cross-sectional setting, we show similar results among both genders and in a wider age group.

In short, previous studies show an exhaustive range of dietary variables and rigorously assessed sociodemographic background characteristics. Our study adds to the literature by examining a range of health related behaviours, and by assessing the role of psychological distress. With caution, and bearing in mind that we only measured one dimension of optimism with one item, our results for high and low confidence in the future

appear to be in the exact directions and magnitude expected for optimism and pessimism, respectively.

Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns found parental socioeconomic status (SES) in childhood to predict higher dispositional optimism (overall LOT score) irrespective of current SES (27). Another longitudinal study on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to predict higher income after controlling for hours worked. On the other hand, higher income did not increase optimism at follow-up. (20) Although we can draw no conclusions about causal directions, our data adds to previous literature by showing that subjects with high confidence in the future report higher satisfaction with their income irrespective of their income level.

As previously discussed (28), it might seem paradoxical that people who expect good things to happen take the initiative and actively promote the good things. According to a recent meta-analysis, optimists' characteristic coping style includes techniques for managing both stressful problems and stress-induced emotions (19). Optimists were also flexible regarding the source and type of stress they were faced with. This flexibility likely accounts for highly confident subjects' resilience to stressful events (28) such as family- and work-related stressors in our data.

Conclusions

This study produced further evidence, as high confidence in the future appeared to associate with a range of beneficial health related behaviours and low psychological distress in different areas of life. Although no causal conclusions can be drawn from this

study, subjects with high confidence in the future appeared to make the effort to promote a healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies in different populations are needed to disentangle the cause and effect chain between different dimensions of optimism and health related behaviours. Future health –related interventions may benefit from tailoring each intervention according to the target population's level of confidence in the future as well as their level of psychological distress. Furthermore, more research is needed to increase the current understanding of changes in confidence in the future with alternating loads and quality of psychological distress.

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Appendices

Contributorship statement

Osmo Saarelma, Heimo Langinvainio, Antti S. Mattila, Tommi Härkänen, Jouko Lönnqvist and Pekka Mustonen designed the study. Kaisla Joutsenniemi managed the literature searches and wrote the first draft of the manuscript. Maiju Pankakoski undertook the statistical analysis under the supervision of Tommi Härkänen and Kaisla Joutsenniemi. Maiju Pankakoski and Tommi Härkänen wrote the chapters on statistical methods. Heimo Langinvainio and Antti S. Mattila provided their expertise in research of positive psychology. All authors contributed to and have approved the final manuscript.

All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that (1) KJ, MP, TH, HL, AM, OS, JL and PM have support from the National

Institute for Health and Welfare and Duodecim Medical Publications Ltd for the submitted work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that might have an interest in the submitted work in the previous 3 years; (3) their spouses, partners, or children have no financial relationships that may be relevant to the submitted work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that may be relevant to the submitted work.

An ethics approval was not required, as the study did not include an intervention, physical samples were not obtained, and the simple questionnaires did not contain delicate data on diseases.

Statement on funding

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Data sharing statement: There is no additional data available.

All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

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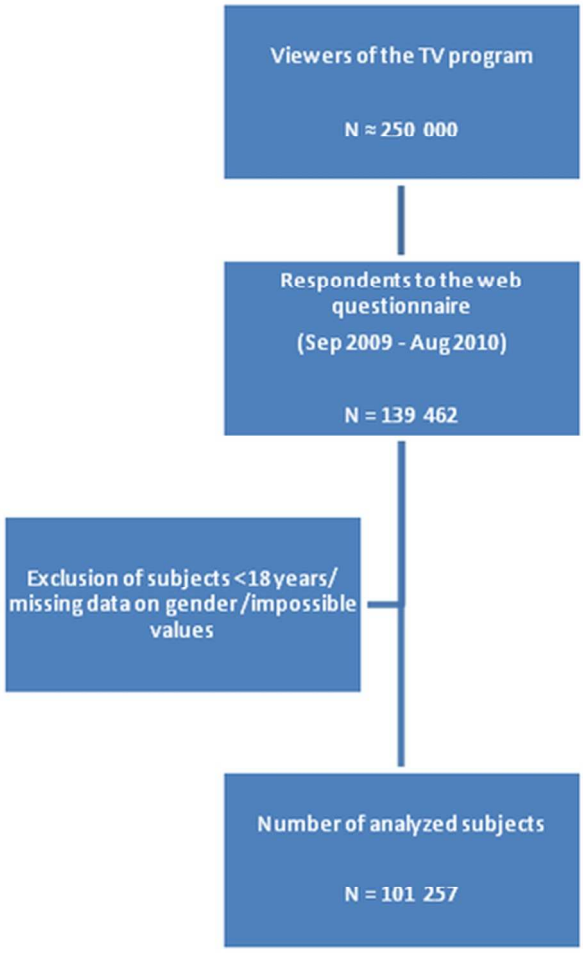
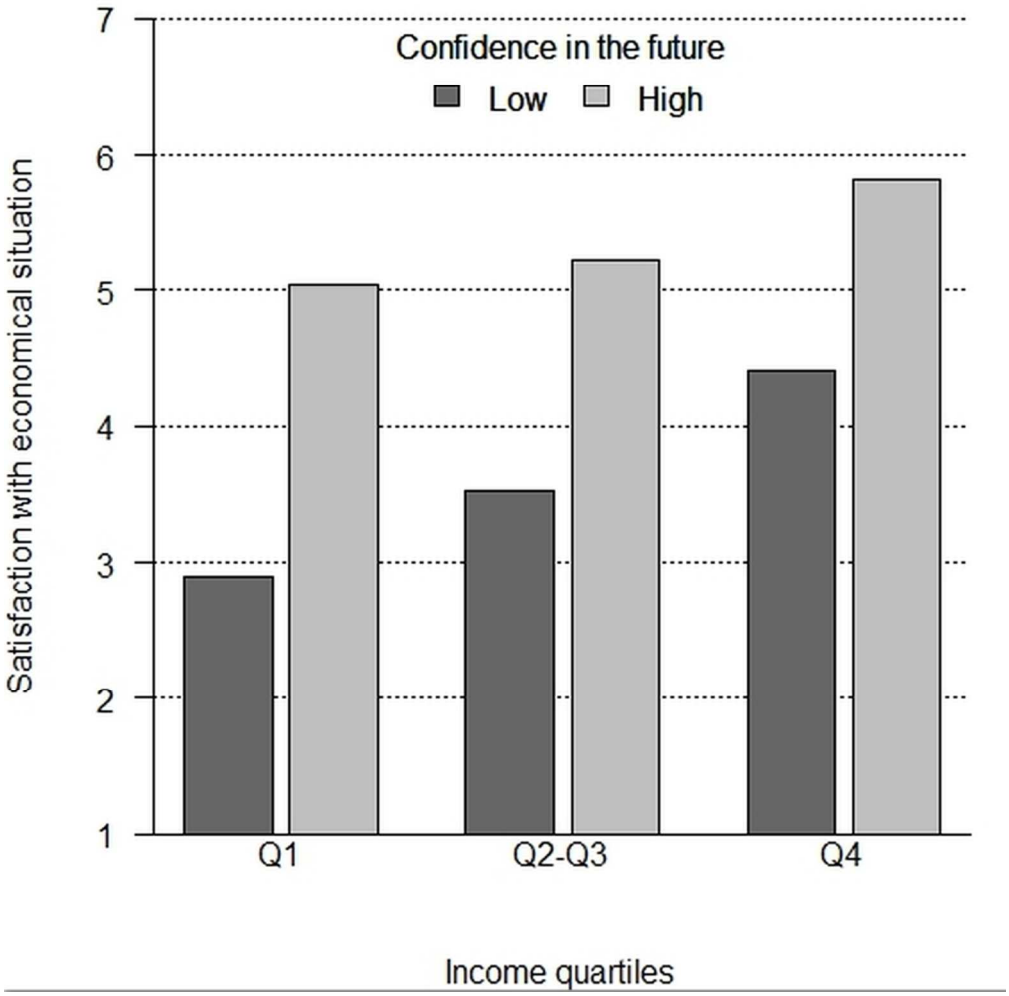
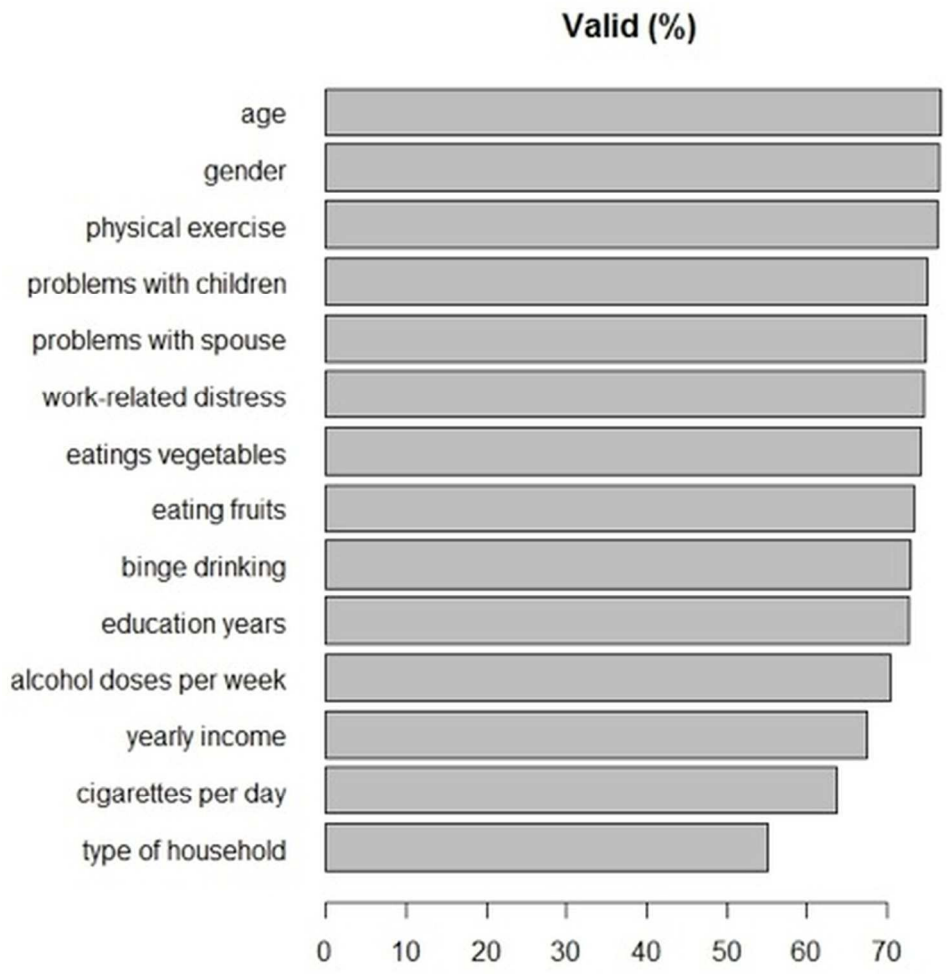


Figure 1. Flow chart

90x166mm (300 x 300 DPI)



90x90mm (300 x 300 DPI)



90x90mm (300 x 300 DPI)