



**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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3 **Confidence in the future, health related behaviour and psychological distress –**  
4 **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 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

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3 to have a healthy diet and pessimists more likely to smoke or be high consumers of  
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5 alcohol. No marked differences were found in the consumption of junk food. (12)  
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10 Psychological stress and socioeconomic status (SES) and are well-known predictors of  
11  
12 health-related behaviour. Psychological distress from marital problems, childcare (13) and  
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14 work-related problems (14) have been shown to associate with increase in alcohol  
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16 consumption and other health damaging behaviour. Higher prevalence of unhealthy  
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18 behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms  
19  
20 linking lower SES to worse health (17, 18).  
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25 Psychological distress and SES are also linked with optimism. Optimists well-being is  
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27 likely to be related to their characteristic, flexible coping methods with a variety of stressors  
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29 (19) and to accumulation of resources (20). Thus, SES and current psychological stress  
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31 may partially explain the association between optimism and health related behaviour.  
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36 The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive  
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38 mental health and positive health related behavior in the Finnish population. The aim of  
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40 this study was to explore how optimism, reflected by high confidence in the future, is  
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42 related to health-related behaviors and whether current socioeconomical status and  
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44 psychological distress contribute to these relations in a large web-based sample of 101  
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46 257 Finns aged 18 and above.  
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## 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-



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3 point Likert scale 1 reflecting “Totally disagree” and 7 reflecting “Totally agree”. Answers 6-  
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5 7 were classified as “High confidence in the future” and answers 1-3 as “low confidence in  
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7 the future”. 11 other happiness skills were similarly assessed: I devote a great deal of my  
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9 time to those close to me; I am very grateful for everything that I have received and  
10  
11 achieved; Helping others comes naturally to me; I have complete confidence in the future;  
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13 I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have  
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15 firm life values that I aim to nurture; I see adversity as a challenge; I often become so  
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17 absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw  
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19 strength from contemplation and meditation; I have clear goals in my life.  
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25 Smoking was assessed by the question “How many cigarettes, cigars or pipefuls do you  
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27 smoke per day? Smoking at least once a day was dichotomized as regular smoking. An  
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29 open text field followed the question “How many units of alcohol do you drink per week?”  
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31 At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol  
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33 consumption. Binge drinking was assessed with the question: “How often do you drink  
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35 enough alcohol to feel yourself drunk?” with 4 response options. The answers reflecting  
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37 drinking at least once a week were categorized as “regular binge drinking”. The questions  
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39 on food consumption were formulated “On average, how often do you eat fresh  
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41 vegetables?” and “On average, how often do you eat fresh fruit or berries?” with response  
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43 options: 1) Less than once a week, 4) 1-2 times per week, 5) 3-5 times per week, and 4)  
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45 Once a day or more. The answers reflecting daily consumption was dichotomized as  
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47 “regular consumption”. Leisure time physical activity was recorded by asking the following  
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49 questions: “How much do you exercise and strain yourself physically in your leisure time?”  
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51 (=the so-called Gothenburg scale) (21). Answers reflecting at least 4 hours of leisure  
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53 exercise per week was dichotomized as “regular physical activity”.  
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5 The level of education was captured with an open-ended question "How  
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7 many years in total have you attended school or studied full time?" and participants  
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9 responded as full years. Education was included in the analyses as a continuous variable.  
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11 Income was assessed with the question "What were the gross earnings for your household  
12  
13 last year? (before tax is deducted)?" In the analyses the level of income was included as a  
14  
15 continuous variable. Work-related distress was captured by asking "How often do you find  
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17 yourself annoyed that you have to push yourself to the limit in order to cope with your  
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19 present job or workload?" with 5 response options. "Family-related distress was asked as  
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21 follows: "Do you experience problems in your relationship with your spouse or partner?"  
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23 with 4 response options and "Have your children caused you particular problems?" with 6  
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25 response options. Satisfaction with one's level of income was assessed with a 7-point  
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27 Likert scale.  
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### 34 *Statistical analysis*

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36 Descriptive statistics were reported for the large web-based sample. The missing data  
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38 analyses were conducted using a logistic regression model. The missingness indicator of a  
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40 variable, which had value one if the value was observed and zero otherwise, was used as  
41  
42 the outcome and the variables, which had fewer missing values, as independent variables.  
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44 As the number of observations was large, the Bayesian information criterion (BIC), (22)  
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46 was applied in assessing important predictors of missing values.  
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50 Sequential logistic regression models were used to analyze the association between  
51  
52 optimism and health related behavior. Results are presented in terms of adjusted odds  
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54 ratios (OR) and their 95% confidence intervals (CI). The analyses were performed  
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56 separately for both genders. In the first model the dichotomized health variable was  
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3 explained by only optimism (and age). Education was added in the second model while the  
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5 third model added income as a covariate. Finally the fourth model added the psychological  
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7 distress variables. The R statistical software (version 2.15.0) was used in the analysis. The  
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9 interaction between confidence in the future and gender was tested in all analyses, but  
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11 results are only presented when the effects were significant.  
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For peer review only

## 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

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

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

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43 <Table 2 Confidence in the future, health related behaviour, socioeconomic status and  
44 psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079)  
45 aged 18 and over>  
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52 Compared with subjects with low confidence in the future, those with high confidence in  
53 the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women  
54 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to  
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3 be regular binge drinkers (men OR 0.35, 95% CI 0.30 to 0.40; women 0.37, 95% CI 0.33  
4 to 0.42) and less likely to consume alcohol in excess. Correspondingly, men and women  
5 with high confidence in the future were more likely to exercise regularly (men OR 2.82,  
6 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men  
7 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,  
8 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant  
9 gender interaction in daily consumption of fruit (Bonferroni  $p=0,00089$ ) and vegetables  
10 (Bonferroni  $p=0,00020$ ), in which the associations with high confidence in the future were  
11 stronger in men than in women.  
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25 Adjustment for education and income little effect on the associations between high  
26 confidence in the future and health related behaviours. Adjustment for current  
27 psychological distress at work or in family relationships, and particularly the adjustment for  
28 satisfaction with income, attenuated the association between high confidence in the future  
29 and most health related behaviours. Among women, the association between high  
30 confidence in the future and heavy alcohol consumption was not affected by adjustment  
31 for psychological distress. Among men, the association between confidence in the future  
32 and smoking was rendered statistically insignificant after full adjustments, but other  
33 associations remained statistically significant in the full model.  
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## **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

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3 from the Population Register for an annual survey, which was answered by 59% of the  
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5 sample. The proportion of subjects with basic education was about 15% compared with  
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7 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and  
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9 69%, correspondingly (23). Finally, we were able to assess several health related  
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11 behaviours in one study.  
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15 However, there are also limitations in this study that must be considered. First, the TV-  
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17 program with happiness-training for depressed subjects may have attracted subjects with  
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19 corresponding needs to the website. However, the average score for confidence in the  
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21 future in the national sample of 2035 Finns was 5.08 compared with 5.00 in the web-based  
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23 sample, indicating a rather small potential bias. Furthermore, happiness-related programs  
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25 appeared to attract more women than men. Second, no causal conclusions can be drawn  
26  
27 from this cross-sectional study. Third, missing values in the analysis variables were often  
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29 related to low education, problems with spouse, work-related distress, number of adults in  
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31 the household or alcohol use, although the directions of the associations varied from  
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33 variable to variable. A possible future development could be multiple imputation of the  
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35 missing data in order to assess the effects of, and to remove the possible bias caused by  
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37 the missing data.  
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#### 45 *Strengths and weaknesses in relation to other studies*

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47 In line with our results, a previous Finnish study (12) on 31-year-old men and women  
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49 (n=8690) found optimism, as measured by the 6-item revised Life Orientation Test (LOT-  
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51 R), to associate with high consumption of fruit and vegetables, whereas pessimism  
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53 associated with tendency to smoke and to consume alcohol excessively. The data  
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55 included a vast range of sociodemographic factors, but no information on psychological  
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3 distress. Our study adds to these findings by showing strong negative associations  
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5 between confidence in the future and binge drinking, as well as a positive association  
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7 between high confidence and regular exercise.  
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11 In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from  
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13 general practices in urban Great Britain, optimism was associated with high physical  
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15 activity, not smoking and moderate alcohol consumption, independently of education, area  
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17 deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-  
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19 R), their results support our findings on the positive association between optimism and  
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21 beneficial health related behaviours. Data on diet and psychological stress is unavailable  
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23 for comparison.  
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29 In a prospective Dutch study of 773 elderly community-living men, dispositional optimism  
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31 associated with regular physical activity, being a nonsmoker, higher alcohol consumption,  
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33 and higher consumption of vegetables and fruit at 15-year follow-up independent of  
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35 sociodemographic factors and somatic morbidity (10). Dispositional optimism was assessed  
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37 by four items. In a cross-sectional setting, we show similar results among both genders  
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39 and in a wider age group.  
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46 In short, previous studies show an exhaustive range of dietary variables and rigorously  
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48 assessed sociodemographic background characteristics. Our study adds to the literature  
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50 by examining binge drinking together with a range of other health related behaviours, and  
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52 by assessing the role of psychological distress.  
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3 Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns  
4 found parental socioeconomic status (SES) in childhood to predict higher dispositional  
5 optimism (overall LOT score) irrespective of current SES (24). Another longitudinal study  
6 on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to  
7 predict higher income after controlling for hours worked. On the other hand, higher income  
8 did not increase optimism at follow-up. (20) Although we can draw no conclusions about  
9 causal directions, our data adds to previous literature by showing that subjects with high  
10 confidence in the future report higher satisfaction with their income irrespective of their  
11 income level.  
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25 As previously discussed (25), it might seem paradoxical that people who expect good  
26 things to happen take the initiative and actively promote the good things. According to a  
27 recent meta-analysis, optimists' characteristic coping style includes techniques for  
28 managing both stressful problems and stress-induced emotions (19). Optimists were also  
29 flexible regarding the source and type of stress they were faced with. This flexibility likely  
30 accounts for highly confident subjects' resilience to stressful events (25) such as family-  
31 and work-related stressors in our data.  
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### 43 *Conclusions*

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45 This study produced further evidence, as high confidence in the future appeared to  
46 associate with a range of beneficial health related behaviours, including rare binge  
47 drinking. Although no causal conclusions can be drawn from this study, subjects with high  
48 confidence in the future appeared to make the effort to promote a healthy lifestyle  
49 irrespective of educational level or financial situation, possibly partly due to their high  
50 coping skills with psychological distress. Future health –related interventions may benefit  
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3 from tailoring each intervention according to the target population's level of confidence in  
4 the future as well as their level of psychological distress. More research is, however, still  
5 needed to increase the current understanding of changes in confidence in the future with  
6 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.

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All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://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

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5 may be relevant to the submitted work.  
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9 An ethics approval was not required for this web-based observational study.  
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46 All authors had full access to all of the data (including statistical reports and tables) in the  
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48 study and can take responsibility for the integrity of the data and the accuracy of the data  
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50 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		Confidence in the future						X <sup>2</sup>	df	p
	Valid <sup>†</sup>	N=101257	Valid <sup>†</sup>	Low 14.5% N=12060	Valid <sup>†</sup>	Moderate 44.7% N=37154	Valid <sup>†</sup>	High 40.8% N=33936			
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			

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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			

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	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

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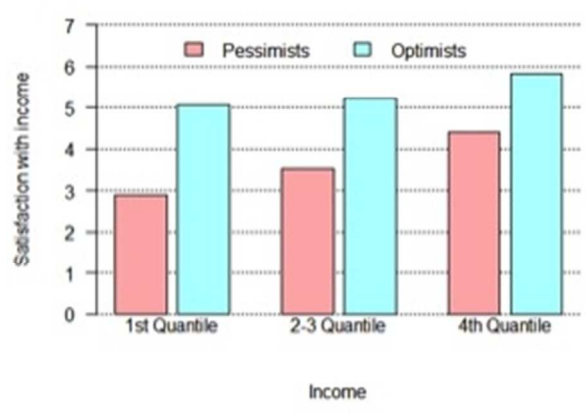


Figure 1 Confidence in the future, satisfaction with economical situation and income  
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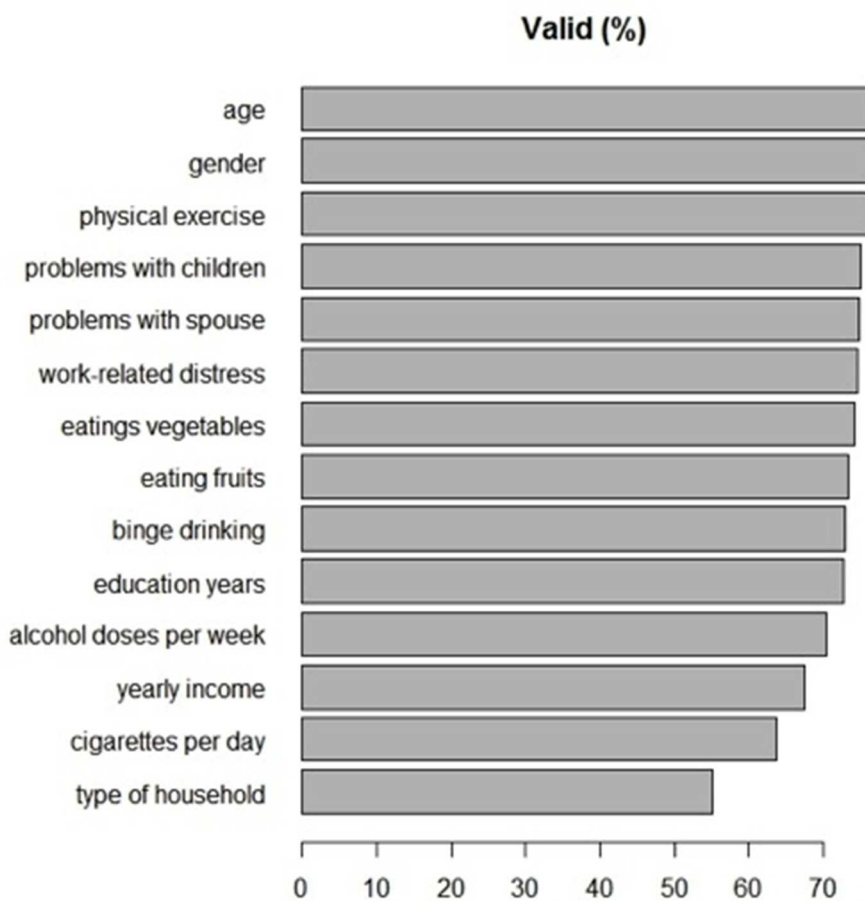


Figure 2 Missing data in the Finnish Happiness-Flourishing Study  
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**Confidence in the future, health related behaviour and psychological distress – results from a population-based cross-sectional study of 101 257 Finns**

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## 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

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3 Optimists benefit from expecting positive generalized outcomes (1) and from explaining  
4 bad events with external, unstable and specific causes (2) in terms of health. Previous  
5 longitudinal studies have shown the association between optimism and longevity (3) (4)  
6 and optimism and mental (5) and physical (6) health. Less is known about the link between  
7 a specific dimension of optimism, i.e. confidence in the future and health related behavior.  
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12 For the sake of clarity, hereafter we use the term 'optimism' only when referring to  
13 previous literature. Positive associations between optimism and proactive efforts in  
14 promoting health were reported in clinical study on patients in cardiac rehabilitation, as  
15 optimism predicted success in lowering levels of saturated fat and body fat, and in  
16 increasing physical activity. (7). A Finnish study recruited subjects at increased risk for  
17 type 2 diabetes. The sample of men and women aged 50-65 participated in the Lifestyle  
18 Implementation Trial. Dispositional optimism and pessimism were unrelated to waist  
19 circumference change. (8)  
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36 Regarding community-based studies, a study on adults aged 40 to 60 years reported that  
37 optimists knew more about risk factors for heart-attacks than their less optimistic  
38 counterparts.(9). In a study on elderly community-living men, dispositional optimism  
39 associated with healthy lifestyle and dietary habits at 15-year follow-up independent of  
40 age, education, living arrangement and somatic morbidity (10). In an urban sample of men  
41 and women aged 65 to 80 years, optimism was associated with not smoking, moderate  
42 alcohol consumption, and physical activity, independently of socio-demographic factors  
43 and clinical condition (11). Less is known about optimism and health related behaviours in  
44 young adults. A study on young adults born in Northern Finland found optimists more likely  
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3 to have a healthy diet and pessimists more likely to smoke or be high consumers of  
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5 alcohol. No marked differences were found in the consumption of junk food. (12)  
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10 Psychological stress and socioeconomic status (SES) and are well-known predictors of  
11  
12 health-related behaviour. Psychological distress from marital problems, childcare (13) and  
13  
14 work-related problems (14) have been shown to associate with increase in alcohol  
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16 consumption and other health damaging behaviour. Higher prevalence of unhealthy  
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18 behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms  
19  
20 linking lower SES to worse health (17, 18).  
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25 Psychological distress and SES are also linked with optimism. Optimists well-being is  
26  
27 likely to be related to their characteristic, flexible coping methods with a variety of stressors  
28  
29 (19) and to accumulation of resources (20). Thus, SES and current psychological stress  
30  
31 may partially explain the association between optimism and health related behaviour.  
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36 A study with approximately 100 000 women aged between 50 and 79 analysed whether  
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38 optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were  
39  
40 prospectively associated with coronary heart disease (CHD) morbidity and with total  
41  
42 mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and  
43  
44 mortality. The associations were independent of a number of sociodemographic variables,  
45  
46 smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another  
47  
48 recent study assessed the connections between optimism and psychological distress in a  
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50 sample of 284 depressed patients, who had undergone coronary bypass surgery.  
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52 Compared with pessimists, optimists had lower rates of re-hospitalization (21).  
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3 The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive  
4 mental health and positive health related behavior in the Finnish population. The aim of  
5 this study was to explore how one dimension of optimism, i.e. high confidence in the  
6 future, is related to health-related behaviors and whether current socioeconomical status  
7 and psychological distress contribute to these relations in a large web-based sample of  
8 101 257 Finns aged 18 and above.  
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## 23 **Data and methods**

### 24 *Data*

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27 The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with  
28 Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo  
29 (a Finnish television production company), and Finland's national public service  
30 broadcasting company YLE. The collection of the web-based data was connected to a  
31 "Reality TV"- program with happiness training for selected unhappy celebrities in 2009.  
32 Each of the eight episodes gained an audience of about 250 000 viewers. The TV-  
33 program guided viewers to a freely available happiness website, where 139 462 Finns  
34 anonymously measured their own happiness on the Happiness-Flourishing Scale and  
35 identified their important sources of happiness. The study website was also advertised on  
36 the television production company's own website. All Finnish-speaking individuals were  
37 eligible study subjects irrespective of whether they had watched the TV-program or not.  
38 The website clearly stated that the collected data would be used for creating reports on the  
39 happiness and factors connected to happiness. After filling the questionnaires, the  
40 subjects instantly received data on how their overall happiness score (measured by a new  
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3 Happiness-Flourishing Scale (HFS)) compared to those of other Finns. The HFS was  
4  
5 validated in a separate web-based random sample of Finns representing the population  
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7 aged 17-79 (N=2035). The collection of the data, the validation and the HFS are described  
8  
9 in detail elsewhere (22).  
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14 Some of the numerical variables were measured using an open text field in the internet  
15  
16 questionnaire. These variables had impossible minimum and maximum values indicating  
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18 typing errors. Restrictions were made on the maximum and minimum values of the  
19  
20 following variables: income (0 – 5 000 000), education years (0 – participant's age),  
21  
22 alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes  
23  
24 per day), and age (7(18) – 110 years). In addition, we excluded participants who were  
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26 under the age of 18 and who did not provide information about their gender. The final  
27  
28 sample size after these restrictions was 101 257. No other exclusion or inclusion criteria  
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30 were applied in this study.  
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#### 41 *Variables*

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43 Confidence in the future was assessed by the item “I have complete confidence in the  
44  
45 future”, and subjects were to choose a smiley face that best reflected their answer on a 7-  
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47 point Likert scale 1 reflecting “Totally disagree” and 7 reflecting “Totally agree”. Answers 6-  
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49 7 were classified as “High confidence in the future” and answers 1-3 as “low confidence in  
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51 the future”. 11 other happiness skills were similarly assessed: I devote a great deal of my  
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53 time to those close to me; I am very grateful for everything that I have received and  
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55 achieved; Helping others comes naturally to me; I have complete confidence in the future;  
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3 I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have  
4 firm life values that I aim to nurture; I see adversity as a challenge; I often become so  
5 absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw  
6 strength from contemplation and meditation; I have clear goals in my life.  
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14 Smoking was assessed by the question “How many cigarettes, cigars or pipefuls do you  
15 smoke per day? Smoking at least once a day was dichotomized as regular smoking. An  
16 open text field followed the question “How many units of alcohol do you drink per week?”  
17  
18 At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol  
19 consumption. Binge drinking was assessed with the question: “How often do you drink  
20 enough alcohol to feel yourself drunk?” with 4 response options. The answers reflecting  
21 drinking at least once a week were categorized as “regular binge drinking”. The questions  
22 on food consumption were formulated “On average, how often do you eat fresh  
23 vegetables?” and “On average, how often do you eat fresh fruit or berries?” with response  
24 options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4)  
25 Once a day or more. The answers reflecting daily consumption was dichotomized as  
26 “regular consumption”. Leisure time physical activity was recorded by asking the following  
27 questions: “How much do you exercise and strain yourself physically in your leisure time?”  
28 (=the so-called Gothenburg scale) (23). Answers reflecting at least 4 hours of leisure  
29 exercise per week was dichotomized as “regular physical activity”.  
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49 The level of education was captured with an open-ended question “How  
50 many years in total have you attended school or studied full time?” and participants  
51 responded as full years. Education was included in the analyses as a continuous variable.  
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Income was assessed with the question “What were the gross earnings for your household

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3 last year? (before tax is deducted)?" In the analyses the level of income was included as a  
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5 continuous variable. Work-related distress was captured by asking "How often do you find  
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7 yourself annoyed that you have to push yourself to the limit in order to cope with your  
8  
9 present job or workload?" with 5 response options. "Family-related distress was asked as  
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11 follows: "Do you experience problems in your relationship with your spouse or partner?"  
12  
13 with 4 response options and "Have your children caused you particular problems?" with 6  
14  
15 response options. Satisfaction with one's level of income was assessed with a 7-point  
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17 Likert scale.  
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### 20 21 22 *Statistical analysis*

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24 Descriptive statistics were reported for the large web-based sample. The missing data  
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26 analyses were conducted using a logistic regression model. The missingness indicator of a  
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28 variable, which had value one if the value was observed and zero otherwise, was used as  
29  
30 the outcome and the variables, which had fewer missing values, as independent variables.  
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32 As the number of observations was large, the Bayesian information criterion (BIC), (24)  
33  
34 was applied in assessing important predictors of missing values.  
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38 Sequential logistic regression models were used to analyze the association between  
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40 optimism and health related behavior. Results are presented in terms of adjusted odds  
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42 ratios (OR) and their 95% confidence intervals (CI). The analyses were performed  
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44 separately for both genders. In the first model the dichotomized health variable was  
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46 explained by only optimism (and age). Education was added in the second model while the  
47  
48 third model added income as a covariate. Finally the fourth model added the psychological  
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50 distress variables. Each analysis included only those subjects who had data on all the  
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52 variables included in the model. The R statistical software (version 2.15.0) was used in the  
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3 analysis. The interaction between confidence in the future and gender was tested in all  
4 analyses, but results are only presented when the effects were significant.  
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## 7 **Results**

### 8 *Description of study population*

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16 <Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by  
17 level of confidence in the future (N=101 257)>  
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20 The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 %  
21 were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all  
22 subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the  
23 future varied little by age and education. Regarding all measures of health related  
24 behaviour, subjects with high confidence in the future lead a healthier lifestyle and  
25 reported less psychological distress in both family and work contexts. The proportion of  
26 subjects with high confidence was highest in the highest income quartile and they reported  
27 higher satisfaction with their income.  
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41 <Figure 1 Confidence in the future, satisfaction with economical situation and income>  
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45 In separate analyses on income quartiles (Figure 1), subjects with high confidence in the  
46 future were more satisfied with their income irrespective of their level of income.  
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### 50 *Missing data*

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56 <Figure 2 Missing data in the Finnish Happiness-Flourishing Study>  
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5 Age and gender appeared to be the most important predictors for missing values, as very  
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7 low and high age, as well as male gender predicted missing values in most variables.  
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9 (data not shown). In eating vegetables the predictor was little problems with children. In  
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11 binge drinking the predictors were problems with spouse or work-related distress all the  
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13 time, and eating vegetables less than once a week. In alcohol quantity the predictors were  
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15 problems with spouse all the time, eating vegetables at most twice a week and binge  
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17 drinking less than once a month, in which case the alcohol quantity was likely to be close  
18  
19 to zero. In income the predictors were low physical activity, work-related distress all the  
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21 time, small number of education years, and low alcohol consumption. In the number of  
22  
23 cigarettes per day the predictors were physical activity, problems with spouse not all the  
24  
25 time, binge drinking at least once a week, small number of education years, and  
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27 consumption of alcohol. Variables related to smoking, alcohol consumption, income or type  
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29 of household contained relatively large amount of missing values (Figure 2).  
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#### 40 *Health related behaviour and confidence in the future*

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42 <Table 2 Confidence in the future, health related behaviour, socioeconomic status and  
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44 psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079)  
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46 aged 18 and over>  
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52 Compared with subjects with low confidence in the future, those with high confidence in  
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54 the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women  
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56 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to  
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3 be regular binge drinkers (men OR 0.35, 95% CI 0.30 to 0.40; women 0.37, 95% CI 0.33  
4 to 0.42) and less likely to consume alcohol in excess. Correspondingly, men and women  
5 with high confidence in the future were more likely to exercise regularly (men OR 2.82,  
6 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men  
7 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,  
8 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant  
9 gender interaction in daily consumption of fruit (Bonferroni  $p=0,00089$ ) and vegetables  
10 (Bonferroni  $p=0,00020$ ), in which the associations with high confidence in the future were  
11 stronger in men than in women.  
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25 Adjustment for education and income had little or no effect on the associations between  
26 high confidence in the future and health related behaviours. Adjustment for current  
27 psychological distress at work or in family relationships, and particularly the adjustment for  
28 satisfaction with income, attenuated the association between high confidence in the future  
29 and most health related behaviours. Compared with subjects with low confidence in the  
30 future, those with high confidence in the future remained less likely to be daily smokers  
31 (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  
32 regular binge drinkers (men OR 0.49, 95% CI 0.40 to 0.60; women 0.51, 95% CI 0.44 to  
33 0.60) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82;  
34 women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained  
35 more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI  
36 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56,  
37 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  
38 1.28 to 1.47) daily. Among women, the association between high confidence in the future  
39 and heavy alcohol consumption was not affected by adjustment for psychological distress.  
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3 Among men, the association between confidence in the future and smoking was rendered  
4 statistically insignificant after full adjustments, but other associations remained statistically  
5 significant in the full model.  
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## 10 11 12 13 **Discussion**

### 14 *Principal findings*

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

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45 There are several strengths in this study. First, the sample size is considerably larger than  
46 in previous studies on optimism, which enables better detection of associations between  
47 confidence in the future, health behavior and related mechanisms. Furthermore, we also  
48 captured younger age-groups than previous studies. Second, we were able to assess a  
49 wide range of confounding factors, although the possibility of residual confounding cannot  
50 be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by  
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3 level of education, was roughly comparable to another Finnish survey conducted in 2009  
4 (25). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived  
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6 from the Population Register for an annual survey, which was answered by 59% of the  
7  
8 sample. The proportion of subjects with basic education was about 15% compared with  
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10 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and  
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12 69%, correspondingly (25). Finally, we were able to assess several health related  
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14 behaviours in one study.  
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20 However, there are also limitations in this study that must be considered. First, due to self-  
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22 selection, the generalizability of these results is limited. The TV-program with happiness-  
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24 training for depressed subjects may have attracted subjects with corresponding needs to  
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26 the website. However, the average score for confidence in the future in the national  
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28 sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a  
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30 rather small potential bias. Accordingly, a previous study on 912 online happiness seeking  
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32 adults found that the participants reported depressive symptoms above the mean of the  
33  
34 general population and life satisfaction below the average (26). Furthermore, we had no  
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36 information on whether the subjects had actually watched the happiness-related TV-  
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38 program or not. However, watching the TV-program was unlikely to bias our results on the  
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40 connection between confidence in the future and health related behaviours. Also, the  
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42 happiness-related website appeared to attract more women than men. Second, no causal  
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44 conclusions can be drawn from this cross-sectional study. Third, missing values in the  
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46 analysis variables were often related to low education, problems with spouse, work-related  
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48 distress, number of adults in the household or alcohol use, although the directions of the  
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50 associations varied from variable to variable. A possible future development could be  
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52 multiple imputation of the missing data in order to assess the effects of, and to remove the  
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3 possible bias caused by the missing data. Fourth, this study includes only one item that  
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5 measures optimism, i.e. confidence in the future. Thus, these results should not be  
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7 interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge  
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9 drinking may underestimate the level of true binge drinking; due to tolerance, individuals  
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11 may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used  
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13 several non-validated single item questions on background variables such as  
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15 psychological distress. This decision was made in order to ensure user-friendliness in a  
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17 large, web-based study. Seventh, we had relatively large proportions of missing data for  
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19 several variables. However, this is a common problem shared by most web-based studies.  
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21 Regarding web-based interventions, it has been suggested that individuals may approach  
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23 them differently than more traditional methods, and that 'dropouts' may in fact be  
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25 individuals who received adequate help with a lower 'dose' of treatment. With caution, this  
26  
27 may also apply to our cross-sectional study, as our study subjects may have selected to fill  
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29 out the questionnaires they found most interesting or useful regarding the automated  
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31 feedback they received on their happiness score. (27)  
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### 38 *Strengths and weaknesses in relation to other studies*

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40 In line with our results, a previous Finnish study (12) on 31-year-old men and women  
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42 (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high  
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44 consumption of fruit and vegetables, whereas pessimism associated with tendency to  
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46 smoke and to consume alcohol excessively. The data included a vast range of  
47  
48 sociodemographic factors, but no information on psychological distress. Our study adds to  
49  
50 these findings by showing strong negative associations between confidence in the future  
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52 and binge drinking, as well as a positive association between high confidence and regular  
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54 exercise.  
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5 In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from  
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7 general practices in urban Great Britain, optimism was associated with high physical  
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9 activity, not smoking and moderate alcohol consumption, independently of education, area  
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11 deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-  
12  
13 R), their results support our findings on the positive association between optimism and  
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15 beneficial health related behaviours. Data on diet and psychological stress is unavailable  
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17 for comparison.  
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23 In a prospective Dutch study of 773 elderly community-living men, dispositional optimism  
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25 associated with regular physical activity, being a nonsmoker, higher alcohol consumption,  
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27 and higher consumption of vegetables and fruit at 15-year follow-up independent of  
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29 sociodemographic factors and somatic morbidity (10). Dispositional optimism was  
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31 assessed by four items. In a cross-sectional setting, we show similar results among both  
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33 genders and in a wider age group.  
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39 In short, previous studies show an exhaustive range of dietary variables and rigorously  
40  
41 assessed sociodemographic background characteristics. Our study adds to the literature  
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43 by examining a range of health related behaviours, and by assessing the role of  
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45 psychological distress. With caution, and bearing in mind that we only measured one  
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47 dimension of optimism with one item, our results for high and low confidence in the future  
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49 appear to be in the exact directions and magnitude expected for optimism and pessimism,  
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51 respectively.  
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3 Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns  
4 found parental socioeconomic status (SES) in childhood to predict higher dispositional  
5 optimism (overall LOT score) irrespective of current SES (28). Another longitudinal study  
6 on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to  
7 predict higher income after controlling for hours worked. On the other hand, higher income  
8 did not increase optimism at follow-up. (20) Although we can draw no conclusions about  
9 causal directions, our data adds to previous literature by showing that subjects with high  
10 confidence in the future report higher satisfaction with their income irrespective of their  
11 income level.  
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24  
25 As previously discussed (29), it might seem paradoxical that people who expect good  
26 things to happen take the initiative and actively promote the good things. According to a  
27 recent meta-analysis, optimists' characteristic coping style includes techniques for  
28 managing both stressful problems and stress-induced emotions (19). Optimists were also  
29 flexible regarding the source and type of stress they were faced with. This flexibility likely  
30 accounts for highly confident subjects' resilience to stressful events (29) such as family-  
31 and work-related stressors in our data.  
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### 43 *Conclusions*

44  
45 This study produced further evidence, as high confidence in the future appeared to  
46 associate with a range of beneficial health related behaviours and low psychological  
47 distress in different areas of life. Although no causal conclusions can be drawn from this  
48 study, subjects with high confidence in the future appeared to make the effort to promote a  
49 healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies  
50 in different populations are needed to disentangle the cause and effect chain between  
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3 different dimensions of optimism and health related behaviours. Future health –related  
4 interventions may benefit from tailoring each intervention according to the target  
5 population's level of confidence in the future as well as their level of psychological distress.  
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7 Furthermore, more research is needed to increase the current understanding of changes  
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9 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.

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All authors have completed the Unified Competing Interest form at

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1  
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3 partners, or children have no financial relationships that may be relevant to the submitted  
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5 work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that  
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7 may be relevant to the submitted work.  
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10  
11 An ethics approval was not required for this web-based observational study.  
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31 the data, in the writing of the article or in the decision to submit the article for publication.  
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34  
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36  
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38  
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45 Data sharing statement: There is no additional data available.  
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49 All authors had full access to all of the data (including statistical reports and tables) in the  
50  
51 study and can take responsibility for the integrity of the data and the accuracy of the data  
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53 analysis.  
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3 **Confidence in the future, health related behaviour and psychological distress –**  
4 **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

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

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

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

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3 to have a healthy diet and pessimists more likely to smoke or be high consumers of  
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5 alcohol. No marked differences were found in the consumption of junk food. (12)  
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10 Psychological stress and socioeconomic status (SES) and are well-known predictors of  
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12 health-related behaviour. Psychological distress from marital problems, childcare (13) and  
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14 work-related problems (14) have been shown to associate with increase in alcohol  
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16 consumption and other health damaging behaviour. Higher prevalence of unhealthy  
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18 behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms  
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20 linking lower SES to worse health (17, 18).  
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25 Psychological distress and SES are also linked with optimism. Optimists well-being is  
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27 likely to be related to their characteristic, flexible coping methods with a variety of stressors  
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29 (19) and to accumulation of resources (20). Thus, SES and current psychological stress  
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31 may partially explain the association between optimism and health related behaviour.  
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36 A study with approximately 100 000 women aged between 50 and 79 analysed whether  
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38 optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were  
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40 prospectively associated with coronary heart disease (CHD) morbidity and with total  
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42 mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and  
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44 mortality. The associations were independent of a number of sociodemographic variables,  
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46 smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another  
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48 recent study assessed the connections between optimism and psychological distress in a  
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50 sample of 284 depressed patients, who had undergone coronary bypass surgery.  
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52 Compared with pessimists, optimists had lower rates of re-hospitalization (21).  
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3 The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive  
4 mental health and positive health related behavior in the Finnish population. The aim of  
5 this study was to explore how **one dimension of** optimism, **i.e.** high confidence in the  
6 future, is related to health-related behaviors and whether current socioeconomical status  
7 and psychological distress contribute to these relations in a large web-based sample of  
8 101 257 Finns aged 18 and above.  
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## 23 **Data and methods**

### 24 *Data*

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27 The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with  
28 Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo  
29 (a Finnish television production company), and Finland's national public service  
30 broadcasting company YLE. The collection of the web-based data was connected to a  
31 "Reality TV"- program with happiness training for selected unhappy celebrities in 2009.  
32 **Each of the eight episodes gained an audience of about 250 000 viewers. The TV-**  
33 **program guided viewers to a** freely available happiness website, where 139 462 Finns  
34 **anonymously** measured their own happiness on the Happiness-Flourishing Scale and  
35 identified their important sources of happiness. **The study website was also advertised on**  
36 **the television production company's own website. All Finnish-speaking individuals were**  
37 **eligible study subjects irrespective of whether they had watched the TV-program or not.**  
38 **The website clearly stated that the collected data would be used for creating reports on the**  
39 **happiness and factors connected to happiness. After filling the questionnaires, the**  
40 **subjects instantly received data on how their overall happiness score (measured by a new**  
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3 Happiness-Flourishing Scale (HFS)) compared to those of other Finns. The HFS was  
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5 validated in a separate web-based random sample of Finns representing the population  
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7 aged 17-79 (N=2035). The collection of the data, the validation and the HFS are described  
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9 in detail elsewhere (22).  
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14 Some of the numerical variables were measured using an open text field in the internet  
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16 questionnaire. These variables had impossible minimum and maximum values indicating  
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18 typing errors. Restrictions were made on the maximum and minimum values of the  
19  
20 following variables: income (0 – 5 000 000), education years (0 – participant's age),  
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22 alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes  
23  
24 per day), and age (7(18) – 110 years). In addition, we excluded participants who were  
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26 under the age of 18 and who did not provide information about their gender. The final  
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28 sample size after these restrictions was 101 257. No other exclusion or inclusion criteria  
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30 were applied in this study.  
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#### 41 *Variables*

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43 Confidence in the future was assessed by the item “I have complete confidence in the  
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45 future”, and subjects were to choose a smiley face that best reflected their answer on a 7-  
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47 point Likert scale 1 reflecting “Totally disagree” and 7 reflecting “Totally agree”. Answers 6-  
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49 7 were classified as “High confidence in the future” and answers 1-3 as “low confidence in  
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51 the future”. 11 other happiness skills were similarly assessed: I devote a great deal of my  
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53 time to those close to me; I am very grateful for everything that I have received and  
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55 achieved; Helping others comes naturally to me; I have complete confidence in the future;  
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3 I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have  
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5 firm life values that I aim to nurture; I see adversity as a challenge; I often become so  
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7 absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw  
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9 strength from contemplation and meditation; I have clear goals in my life.  
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14 Smoking was assessed by the question “How many cigarettes, cigars or pipefuls do you  
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16 smoke per day? Smoking at least once a day was dichotomized as regular smoking. An  
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18 open text field followed the question “How many units of alcohol do you drink per week?”  
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20 At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol  
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22 consumption. Binge drinking was assessed with the question: “How often do you drink  
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24 enough alcohol to feel yourself drunk?” with 4 response options. The answers reflecting  
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26 drinking at least once a week were categorized as “regular binge drinking”. The questions  
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28 on food consumption were formulated “On average, how often do you eat fresh  
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30 vegetables?” and “On average, how often do you eat fresh fruit or berries?” with response  
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32 options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4)  
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34 Once a day or more. The answers reflecting daily consumption was dichotomized as  
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36 “regular consumption”. Leisure time physical activity was recorded by asking the following  
37  
38 questions: “How much do you exercise and strain yourself physically in your leisure time?”  
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40 (=the so-called Gothenburg scale) (23). Answers reflecting at least 4 hours of leisure  
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42 exercise per week was dichotomized as “regular physical activity”.  
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50 The level of education was captured with an open-ended question “How  
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52 many years in total have you attended school or studied full time?” and participants  
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54 responded as full years. Education was included in the analyses as a continuous variable.  
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56 Income was assessed with the question “What were the gross earnings for your household  
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3 last year? (before tax is deducted)?" In the analyses the level of income was included as a  
4 continuous variable. Work-related distress was captured by asking "How often do you find  
5 yourself annoyed that you have to push yourself to the limit in order to cope with your  
6 present job or workload?" with 5 response options. "Family-related distress was asked as  
7 follows: "Do you experience problems in your relationship with your spouse or partner?"  
8 with 4 response options and "Have your children caused you particular problems?" with 6  
9 response options. Satisfaction with one's level of income was assessed with a 7-point  
10 Likert scale.  
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### 21 22 23 *Statistical analysis*

24 Descriptive statistics were reported for the large web-based sample. The missing data  
25 analyses were conducted using a logistic regression model. The missingness indicator of a  
26 variable, which had value one if the value was observed and zero otherwise, was used as  
27 the outcome and the variables, which had fewer missing values, as independent variables.  
28 As the number of observations was large, the Bayesian information criterion (BIC), (24)  
29 was applied in assessing important predictors of missing values.  
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38 Sequential logistic regression models were used to analyze the association between  
39 optimism and health related behavior. Results are presented in terms of adjusted odds  
40 ratios (OR) and their 95% confidence intervals (CI). The analyses were performed  
41 separately for both genders. In the first model the dichotomized health variable was  
42 explained by only optimism (and age). Education was added in the second model while the  
43 third model added income as a covariate. Finally the fourth model added the psychological  
44 distress variables. Each analysis included only those subjects who had data on all the  
45 variables included in the model. The R statistical software (version 2.15.0) was used in the  
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3 analysis. The interaction between confidence in the future and gender was tested in all  
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5 analyses, but results are only presented when the effects were significant.  
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## 7 8 **Results**

### 9 10 11 *Description of study population*

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16 <Table 1: Background characteristics (%) in the Finnish Happiness-Flourishing Study by  
17 level of confidence in the future (N=101 257)>  
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21 The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 %  
22 were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all  
23 subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the  
24 future varied little by age and education. Regarding all measures of health related  
25 behaviour, subjects with high confidence in the future lead a healthier lifestyle and  
26 reported less psychological distress in both family and work contexts. The proportion of  
27 subjects with high confidence was highest in the highest income quartile and they reported  
28 higher satisfaction with their income.  
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41 <Figure 1 Confidence in the future, satisfaction with economical situation and income>  
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45 In separate analyses on income quartiles (Figure 1), subjects with high confidence in the  
46 future were more satisfied with their income irrespective of their level of income.  
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### 50 51 52 *Missing data*

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56 <Figure 2 Missing data in the Finnish Happiness-Flourishing Study>  
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5 Age and gender appeared to be the most important predictors for missing values, as very  
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7 low and high age, as well as male gender predicted missing values in most variables.  
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9 (data not shown). In eating vegetables the predictor was little problems with children. In  
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11 binge drinking the predictors were problems with spouse or work-related distress all the  
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13 time, and eating vegetables less than once a week. In alcohol quantity the predictors were  
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15 problems with spouse all the time, eating vegetables at most twice a week and binge  
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17 drinking less than once a month, in which case the alcohol quantity was likely to be close  
18  
19 to zero. In income the predictors were low physical activity, work-related distress all the  
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21 time, small number of education years, and low alcohol consumption. In the number of  
22  
23 cigarettes per day the predictors were physical activity, problems with spouse not all the  
24  
25 time, binge drinking at least once a week, small number of education years, and  
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27 consumption of alcohol. Variables related to smoking, alcohol consumption, income or type  
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29 of household contained relatively large amount of missing values (Figure 2).  
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#### Health related behaviour and confidence in the future

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42 <Table 2 Confidence in the future, health related behaviour, socioeconomic status and  
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44 psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079)  
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46 aged 18 and over>  
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52 Compared with subjects with low confidence in the future, those with high confidence in  
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54 the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women  
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56 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to  
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3 be regular binge drinkers (men OR 0.35, 95% CI 0.30 to 0.40; women 0.37, 95% CI 0.33  
4 to 0.42) and less likely to consume alcohol in excess. Correspondingly, men and women  
5 with high confidence in the future were more likely to exercise regularly (men OR 2.82,  
6 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men  
7 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,  
8 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant  
9 gender interaction in daily consumption of fruit (Bonferroni  $p=0,00089$ ) and vegetables  
10 (Bonferroni  $p=0,00020$ ), in which the associations with high confidence in the future were  
11 stronger in men than in women.  
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25 Adjustment for education and income had little or no effect on the associations between  
26 high confidence in the future and health related behaviours. Adjustment for current  
27 psychological distress at work or in family relationships, and particularly the adjustment for  
28 satisfaction with income, attenuated the association between high confidence in the future  
29 and most health related behaviours. Compared with subjects with low confidence in the  
30 future, those with high confidence in the future remained less likely to be daily smokers  
31 (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  
32 regular binge drinkers (men OR 0.49, 95% CI 0.40 to 0.60; women 0.51, 95% CI 0.44 to  
33 0.60) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82;  
34 women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained  
35 more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI  
36 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56,  
37 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  
38 1.28 to 1.47) daily. Among women, the association between high confidence in the future  
39 and heavy alcohol consumption was not affected by adjustment for psychological distress.  
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3 Among men, the association between confidence in the future and smoking was rendered  
4 statistically insignificant after full adjustments, but other associations remained statistically  
5 significant in the full model.  
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## 10 11 12 13 **Discussion**

### 14 *Principal findings*

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

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45 There are several strengths in this study. First, the sample size is considerably larger than  
46 in previous studies on optimism, which enables better detection of associations between  
47 confidence in the future, health behavior and related mechanisms. Furthermore, we also  
48 captured younger age-groups than previous studies. Second, we were able to assess a  
49 wide range of confounding factors, although the possibility of residual confounding cannot  
50 be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by  
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3 level of education, was roughly comparable to another Finnish survey conducted in 2009  
4 (25). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived  
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7 from the Population Register for an annual survey, which was answered by 59% of the  
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10 sample. The proportion of subjects with basic education was about 15% compared with  
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12 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and  
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14 69%, correspondingly (25). Finally, we were able to assess several health related  
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16 behaviours in one study.  
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20 However, there are also limitations in this study that must be considered. First, due to self-  
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22 selection, the generalizability of these results is limited. The TV-program with happiness-  
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24 training for depressed subjects may have attracted subjects with corresponding needs to  
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26 the website. However, the average score for confidence in the future in the national  
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28 sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a  
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30 rather small potential bias. Accordingly, a previous study on 912 online happiness seeking  
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32 adults found that the participants reported depressive symptoms above the mean of the  
33  
34 general population and life satisfaction below the average (26). Furthermore, we had no  
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36 information on whether the subjects had actually watched the happiness-related TV-  
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38 program or not. However, watching the TV-program was unlikely to bias our results on the  
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40 connection between confidence in the future and health related behaviours. Also, the  
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42 happiness-related website appeared to attract more women than men. Second, no causal  
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44 conclusions can be drawn from this cross-sectional study. Third, missing values in the  
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46 analysis variables were often related to low education, problems with spouse, work-related  
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48 distress, number of adults in the household or alcohol use, although the directions of the  
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50 associations varied from variable to variable. A possible future development could be  
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52 multiple imputation of the missing data in order to assess the effects of, and to remove the  
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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.

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5 In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from  
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7 general practices in urban Great Britain, optimism was associated with high physical  
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9 activity, not smoking and moderate alcohol consumption, independently of education, area  
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11 deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-  
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13 R), their results support our findings on the positive association between optimism and  
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15 beneficial health related behaviours. Data on diet and psychological stress is unavailable  
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17 for comparison.  
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23 In a prospective Dutch study of 773 elderly community-living men, dispositional optimism  
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25 associated with regular physical activity, being a nonsmoker, higher alcohol consumption,  
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27 and higher consumption of vegetables and fruit at 15-year follow-up independent of  
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29 sociodemographic factors and somatic morbidity (10). Dispositional optimism was  
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31 assessed by four items. In a cross-sectional setting, we show similar results among both  
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33 genders and in a wider age group.  
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38 In short, previous studies show an exhaustive range of dietary variables and rigorously  
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40 assessed sociodemographic background characteristics. Our study adds to the literature  
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42 by examining a range of health related behaviours, and by assessing the role of  
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44 psychological distress. **With caution, and bearing in mind that we only measured one**  
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46 **dimension of optimism with one item, our results for high and low confidence in the future**  
47  
48 **appear to be in the exact directions and magnitude expected for optimism and pessimism,**  
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50 **respectively.**  
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3 Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns  
4 found parental socioeconomic status (SES) in childhood to predict higher dispositional  
5 optimism (overall LOT score) irrespective of current SES (28). Another longitudinal study  
6 on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to  
7 predict higher income after controlling for hours worked. On the other hand, higher income  
8 did not increase optimism at follow-up. (20) Although we can draw no conclusions about  
9 causal directions, our data adds to previous literature by showing that subjects with high  
10 confidence in the future report higher satisfaction with their income irrespective of their  
11 income level.  
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25 As previously discussed (29), it might seem paradoxical that people who expect good  
26 things to happen take the initiative and actively promote the good things. According to a  
27 recent meta-analysis, optimists' characteristic coping style includes techniques for  
28 managing both stressful problems and stress-induced emotions (19). Optimists were also  
29 flexible regarding the source and type of stress they were faced with. This flexibility likely  
30 accounts for highly confident subjects' resilience to stressful events (29) such as family-  
31 and work-related stressors in our data.  
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### 43 *Conclusions*

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45 This study produced further evidence, as high confidence in the future appeared to  
46 associate with a range of beneficial health related behaviours and low psychological  
47 distress in different areas of life. Although no causal conclusions can be drawn from this  
48 study, subjects with high confidence in the future appeared to make the effort to promote a  
49 healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies  
50 in different populations are needed to disentangle the cause and effect chain between  
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3 different dimensions of optimism and health related behaviours. Future health –related  
4 interventions may benefit from tailoring each intervention according to the target  
5 population's level of confidence in the future as well as their level of psychological distress.  
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7 Furthermore, more research is needed to increase the current understanding of changes  
8 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.

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All authors have completed the Unified Competing Interest form at

[www.icmje.org/coi\\_disclosure.pdf](http://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,

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3 partners, or children have no financial relationships that may be relevant to the submitted  
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5 work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that  
6  
7 may be relevant to the submitted work.  
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10  
11 An ethics approval was not required for this web-based observational study.  
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19  
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25  
26 been established in May 2009 by Finnish forerunner companies and research  
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29  
30 well-being cluster in Finland. The funders had no role in the analysis and interpretation of  
31  
32 the data, in the writing of the article or in the decision to submit the article for publication.  
33  
34 OS is the Chief Editor and PM is the CEO at Duodecim Medical Publications, which is fully  
35  
36 owned by the Finnish Medical Society Duodecim. OS and PM were involved with  
37  
38 designing the gathering of the data but the data analyses were carried out by the  
39  
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45 Data sharing statement: There is no additional data available.  
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49 All authors had full access to all of the data (including statistical reports and tables) in the  
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51 study and can take responsibility for the integrity of the data and the accuracy of the data  
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53 analysis.  
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For peer review only

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

Variable	Whole sample		Confidence in the future <sup>  </sup>						X <sup>2</sup>	df	p
	Valid <sup>†</sup>	N=101257	Valid <sup>†</sup>	Low 14.5% N=12060	Valid <sup>†</sup>	Moderate 44.7% N=37154	Valid <sup>†</sup>	High 40.8% N=33936			
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			

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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			



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	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

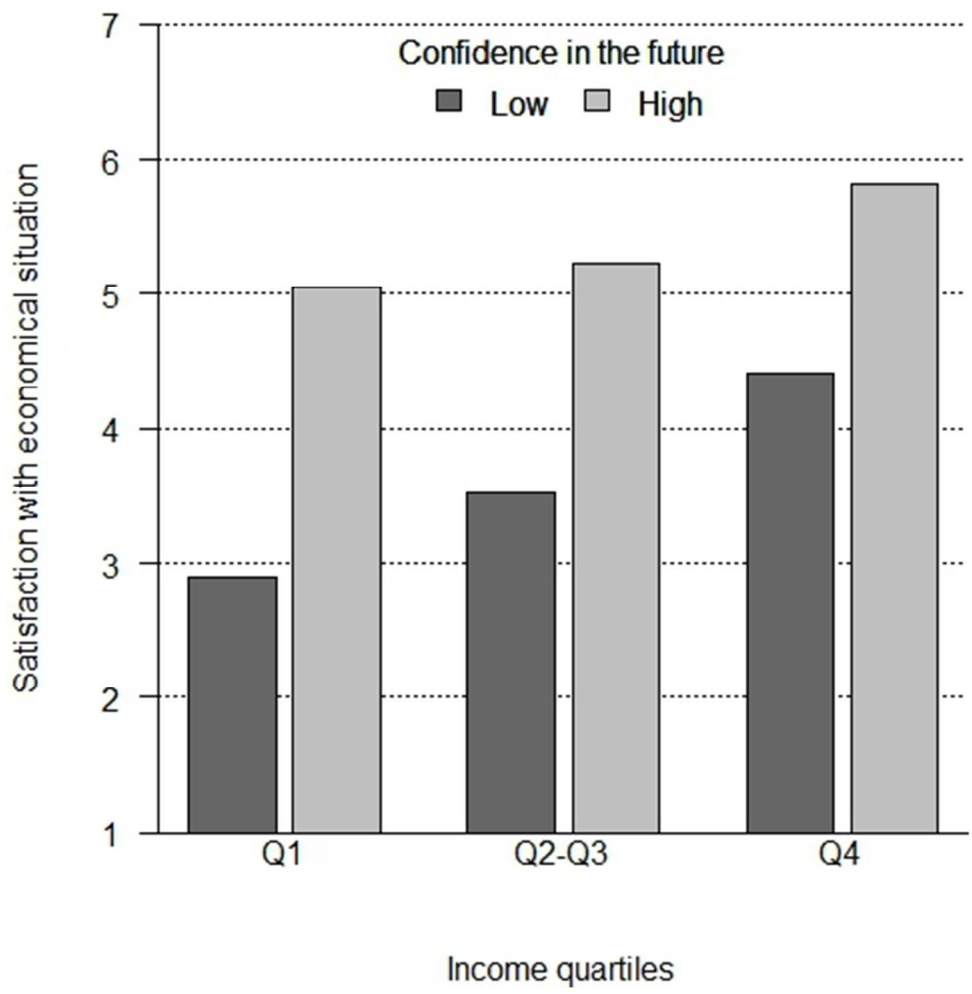
Table 2: High confidence in the future\* and health related behaviours with various adjustments.

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

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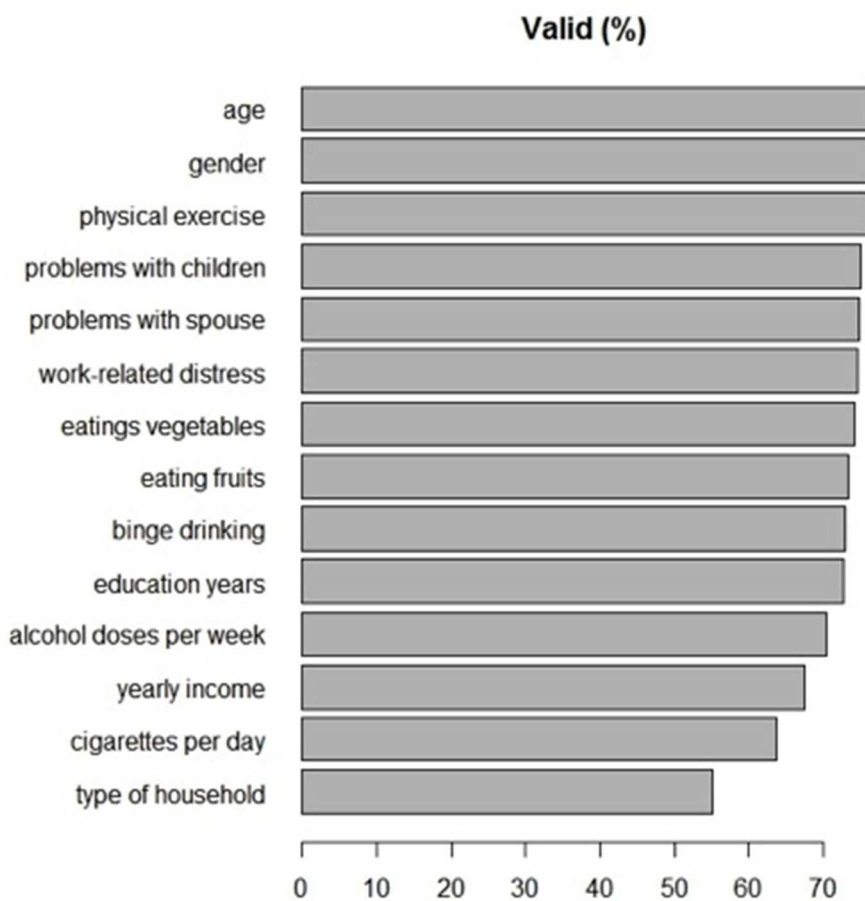


Figure 2 Missing data in the Finnish Happiness-Flourishing Study  
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**Confidence in the future, health related behaviour and psychological distress – results from a population-based cross-sectional study of 101 257 Finns**

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Keywords:	PUBLIC HEALTH, PREVENTIVE MEDICINE, Adult psychiatry < PSYCHIATRY

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3 **Confidence in the future, health related behaviour and psychological distress –**  
4 **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

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3 to have a healthy diet and pessimists more likely to smoke or be high consumers of  
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5 alcohol. No marked differences were found in the consumption of junk food. (12)  
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10 Psychological stress and socioeconomic status (SES) and are well-known predictors of  
11 health-related behaviour. Psychological distress from marital problems, childcare (13) and  
12 work-related problems (14) have been shown to associate with increase in alcohol  
13 consumption and other health damaging behaviour. Higher prevalence of unhealthy  
14 behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms  
15 linking lower SES to worse health (17, 18).  
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25 Psychological distress and SES are also linked with optimism. Optimists well-being is  
26 likely to be related to their characteristic, flexible coping methods with a variety of stressors  
27 (19) and to accumulation of resources (20). Thus, SES and current psychological stress  
28 may partially explain the association between optimism and health related behaviour.  
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36 A study with approximately 100 000 women aged between 50 and 79 analysed whether  
37 optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were  
38 prospectively associated with coronary heart disease (CHD) morbidity and with total  
39 mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and  
40 mortality. The associations were independent of a number of sociodemographic variables,  
41 smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another  
42 recent study assessed the connections between optimism and psychological distress in a  
43 sample of 284 depressed patients, who had undergone coronary bypass surgery.  
44 Compared with pessimists, optimists had lower rates of re-hospitalization (21).  
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3 The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive  
4 mental health and positive health related behavior in the Finnish population. The aim of  
5 this study was to explore how one dimension of optimism, i.e. high confidence in the  
6 future, is related to health-related behaviors and whether current socioeconomical status  
7 and psychological distress contribute to these relations in a large web-based sample of  
8 101 257 Finns aged 18 and above.  
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## 23 **Data and methods**

### 24 *Data*

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27 The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with  
28 Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo  
29 (a Finnish television production company), and Finland's national public service  
30 broadcasting company YLE. The collection of the web-based data was connected to a  
31 "Reality TV"- program with happiness training for selected unhappy celebrities in 2009.  
32 Each of the eight episodes gained an audience of about 250 000 viewers. The TV-  
33 program guided viewers to a freely available happiness website, where 139 462 Finns  
34 anonymously measured their own happiness on the Happiness-Flourishing Scale and  
35 identified their important sources of happiness. The study website was also advertised on  
36 the television production company's own website. All Finnish-speaking individuals were  
37 eligible study subjects irrespective of whether they had watched the TV-program or not.  
38 The website clearly stated that the collected data would be used for creating public  
39 summary reports on the happiness and factors connected to happiness. The time frame  
40 for filling out the questionnaires was September 10<sup>th</sup> 2009- August 17<sup>th</sup> 2010. After filling  
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3 the questionnaires, the subjects instantly received data on how their overall happiness  
4 score (measured by a new Happiness-Flourishing Scale (HFS)) compared to those of  
5 other Finns. The HFS was validated in a separate web-based random sample of Finns  
6 representing the population aged 17-79 (N=2035). The demographic characteristics of the  
7 validation sample are compared with the Finnish Happiness-Flourishing Study sample in  
8 Appendix 1.  
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18 Some of the numerical variables were measured using an open text field in the internet  
19 questionnaire. These variables had impossible minimum and maximum values indicating  
20 typing errors. Restrictions were made on the maximum and minimum values of the  
21 following variables: income (0 – 5 000 000), education years (0 – participant's age),  
22 alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes  
23 per day), and age (7(18) – 110 years). In addition, we excluded participants who were  
24 under the age of 18 and who did not provide information about their gender. The final  
25 sample size after these restrictions was 101 257. No other exclusion or inclusion criteria  
26 were applied in this study.  
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41 <Figure 1 Flow chart>  
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#### 47 *Variables*

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49 Confidence in the future was assessed by the item “I have complete confidence in the  
50 future”, and subjects were to choose a smiley face that best reflected their answer on a 7-  
51 point Likert scale 1 reflecting “Totally disagree” and 7 reflecting “Totally agree”. Answers 6-  
52 7 were classified as “High confidence in the future” and answers 1-3 as “low confidence in  
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3 the future". 11 other happiness skills were similarly assessed: I devote a great deal of my  
4 time to those close to me; I am very grateful for everything that I have received and  
5 achieved; Helping others comes naturally to me; I have complete confidence in the future;  
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7 I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have  
8 firm life values that I aim to nurture; I see adversity as a challenge; I often become so  
9 absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw  
10 strength from contemplation and meditation; I have clear goals in my life.  
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21 Smoking was assessed by the question "How many cigarettes, cigars or pipefuls do you  
22 smoke per day? Smoking at least once a day was dichotomized as regular smoking. An  
23 open text field followed the question "How many units of alcohol do you drink per week?"  
24 At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol  
25 consumption. Binge drinking was assessed with the question: "How often do you drink  
26 enough alcohol to feel yourself drunk?" with 4 response options. The answers reflecting  
27 drinking at least once a week were categorized as "regular binge drinking". The questions  
28 on food consumption were formulated "On average, how often do you eat fresh  
29 vegetables?" and "On average, how often do you eat fresh fruit or berries?" with response  
30 options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4)  
31 Once a day or more. The answers reflecting daily consumption was dichotomized as  
32 "regular consumption". Leisure time physical activity was recorded by asking the following  
33 questions: "How much do you exercise and strain yourself physically in your leisure time?"  
34 (=the so-called Gothenburg scale) (22). Answers reflecting at least 4 hours of leisure  
35 exercise per week was dichotomized as "regular physical activity".  
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56 The level of education was captured with an open-ended question "How  
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3 many years in total have you attended school or studied full time?" and participants  
4  
5 responded as full years. Education was included in the analyses as a continuous variable.  
6  
7 Income was assessed with the question "What were the gross earnings for your household  
8  
9 last year? (before tax is deducted)?" In the analyses the level of income was included as a  
10  
11 continuous variable. Work-related distress was captured by asking "How often do you find  
12  
13 yourself annoyed that you have to push yourself to the limit in order to cope with your  
14  
15 present job or workload?" with 5 response options. "Family-related distress was asked as  
16  
17 follows: "Do you experience problems in your relationship with your spouse or partner?"  
18  
19 with 4 response options and "Have your children caused you particular problems?" with 6  
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21 response options. Satisfaction with one's level of income was assessed with a 7-point  
22  
23 Likert scale.  
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### 29 *Statistical analysis*

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31 Descriptive statistics were reported for the large web-based sample. The missing data  
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33 analyses were conducted using a logistic regression model. The missingness indicator of a  
34  
35 variable, which had value one if the value was observed and zero otherwise, was used as  
36  
37 the outcome and the variables, which had fewer missing values, as independent variables.  
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39 As the number of observations was large, the Bayesian information criterion (BIC), (23)  
40  
41 was applied in assessing important predictors of missing values.  
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45 Sequential logistic regression models were used to analyze the association between  
46  
47 optimism and health related behavior. Results are presented in terms of adjusted odds  
48  
49 ratios (OR) and their 95% confidence intervals (CI). The analyses were performed  
50  
51 separately for both genders. In the first model the dichotomized health variable was  
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53 explained by only optimism (and age). Education was added in the second model while the  
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55 third model added income as a covariate. Finally the fourth model added the psychological  
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3 distress variables. Each analysis included only those subjects who had data on all the  
4  
5 variables included in the model. The R statistical software (version 2.15.0) was used in the  
6  
7 analysis. The interaction between confidence in the future and gender was tested in all  
8  
9 analyses, but results are only presented when the effects were significant.  
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## 11 Results

### 12 *Description of study population*

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

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25 The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 %  
26  
27 were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all  
28  
29 subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the  
30  
31 future varied little by age and education. Regarding all measures of health related  
32  
33 behaviour, subjects with high confidence in the future lead a healthier lifestyle and  
34  
35 reported less psychological distress in both family and work contexts. The proportion of  
36  
37 subjects with high confidence was highest in the highest income quartile and they reported  
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39 higher satisfaction with their income.  
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45 <Figure 2 Confidence in the future, satisfaction with economical situation and income>

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49 In separate analyses on income quartiles (Figure 2), subjects with high confidence in the  
50  
51 future were more satisfied with their income irrespective of their level of income.  
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### 55 *Missing data*



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5 <Figure 2 Missing data in the Finnish Happiness-Flourishing Study>  
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10 Age and gender appeared to be the most important predictors for missing values, as very  
11 low and high age, as well as male gender predicted missing values in most variables.  
12 (data not shown). In eating vegetables the predictor was little problems with children. In  
13 binge drinking the predictors were problems with spouse or work-related distress all the  
14 time, and eating vegetables less than once a week. In alcohol quantity the predictors were  
15 problems with spouse all the time, eating vegetables at most twice a week and binge  
16 drinking less than once a month, in which case the alcohol quantity was likely to be close  
17 to zero. In income the predictors were low physical activity, work-related distress all the  
18 time, small number of education years, and low alcohol consumption. In the number of  
19 cigarettes per day the predictors were physical activity, problems with spouse not all the  
20 time, binge drinking at least once a week, small number of education years, and  
21 consumption of alcohol. Variables related to smoking, alcohol consumption, income or type  
22 of household contained relatively large amount of missing values (Figure 3).  
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41 <Figure 3 Missing data in the Finnish Happiness-Flourishing Study>  
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45 *Health related behaviour and confidence in the future*  
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49 <Table 2 Confidence in the future, health related behaviour, socioeconomic status and  
50 psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079)  
51 aged 18 and over>  
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3 Compared with subjects with low confidence in the future, those with high confidence in  
4 the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women  
5 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to  
6 be regular binge drinkers (men OR 0.57, 95% CI 0.52 to 0.63; women 0.54, 95% CI 0.50  
7 to 0.57) and less likely to consume alcohol in excess. Correspondingly, men and women  
8 with high confidence in the future were more likely to exercise regularly (men OR 2.82,  
9 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men  
10 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,  
11 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant  
12 gender interaction in daily consumption of fruit (Bonferroni  $p=0,00089$ ) and vegetables  
13 (Bonferroni  $p=0,00020$ ), in which the associations with high confidence in the future were  
14 stronger in men than in women.  
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32 Adjustment for education and income had little or no effect on the associations between  
33 high confidence in the future and health related behaviours. Adjustment for current  
34 psychological distress at work or in family relationships, and particularly the adjustment for  
35 satisfaction with income, attenuated the association between high confidence in the future  
36 and most health related behaviours. Compared with subjects with low confidence in the  
37 future, those with high confidence in the future remained less likely to be daily smokers  
38 (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  
39 regular binge drinkers (men OR 0.69, 95% CI 0.60 to 0.79; women 0.65, 95% CI 0.59 to  
40 0.71) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82;  
41 women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained  
42 more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI  
43 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56,  
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3 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  
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5 1.28 to 1.47) daily. Among women, the association between high confidence in the future  
6  
7 and heavy alcohol consumption was not affected by adjustment for psychological distress.  
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9 Among men, the association between confidence in the future and smoking was rendered  
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11 statistically insignificant after full adjustments, but other associations remained statistically  
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13 significant in the full model.  
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## 20 **Discussion**

### 21 *Principal findings*

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25 Optimism, as assessed by the LOT, has previously been shown to associate with good  
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27 health and a healthy lifestyle in studies focusing on middle-aged and elderly subjects. To  
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29 the best of our knowledge, data on a specific dimension of optimism, i.e. confidence in the  
30  
31 future, as well as information on the extent to which socio-economic factors and  
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33 psychological distress explain the association, is lacking. This web-based study found high  
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35 confidence in the future to be strongly associated with several beneficial health related  
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37 behaviours and little psychological distress among both genders. Adjustment for current  
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39 psychological distress at work and at home, as well as adjustment for satisfaction with  
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41 income, attenuated the associations. Nevertheless, disregarding smoking among men, the  
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43 findings held in multivariable adjusted models in both genders.  
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### 49 *Strengths and weaknesses*

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52 There are several strengths in this study. First, the sample size is considerably larger than  
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54 in previous studies on optimism, which enables better detection of associations between  
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56 confidence in the future, health behavior and related mechanisms. Furthermore, we also  
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3 captured younger age-groups than previous studies. Second, we were able to assess a  
4 wide range of confounding factors, although the possibility of residual confounding cannot  
5 be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by  
6 level of education, was roughly comparable to another Finnish survey conducted in 2009  
7 (24). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived  
8 from the Population Register for an annual survey, which was answered by 59% of the  
9 sample. The proportion of subjects with basic education was about 15% compared with  
10 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and  
11 69%, correspondingly (24). Finally, we were able to assess several health related  
12 behaviours in one study.  
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27 However, there are also limitations in this study that must be considered. First, due to self-  
28 selection, the generalizability of these results is limited. The TV-program with happiness-  
29 training for depressed subjects may have attracted subjects with corresponding needs to  
30 the website. However, the average score for confidence in the future in the national  
31 sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a  
32 rather small potential bias. Accordingly, a previous study on 912 online happiness seeking  
33 adults found that the participants reported depressive symptoms above the mean of the  
34 general population and life satisfaction below the average (25). Furthermore, we had no  
35 information on whether the subjects had actually watched the happiness-related TV-  
36 program or not. However, watching the TV-program was unlikely to bias our results on the  
37 connection between confidence in the future and health related behaviours. Also, the  
38 happiness-related website appeared to attract more women than men. Second, no causal  
39 conclusions can be drawn from this cross-sectional study. Third, missing values in the  
40 analysis variables were often related to low education, problems with spouse, work-related  
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3 distress, number of adults in the household or alcohol use, although the directions of the  
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5 associations varied from variable to variable. A possible future development could be  
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7 multiple imputation of the missing data in order to assess the effects of, and to remove the  
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9 possible bias caused by the missing data. Fourth, this study includes only one item that  
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11 measures optimism, i.e. confidence in the future. Thus, these results should not be  
12  
13 interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge  
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15 drinking may underestimate the level of true binge drinking; due to tolerance, individuals  
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17 may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used  
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19 several non-validated single item questions on background variables such as  
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21 psychological distress. This decision was made in order to ensure user-friendliness in a  
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23 large, web-based study. Seventh, we had relatively large proportions of missing data for  
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25 several variables. However, this is a common problem shared by most web-based studies.  
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27 Regarding web-based interventions, it has been suggested that individuals may approach  
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29 them differently than more traditional methods, and that 'dropouts' may in fact be  
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31 individuals who received adequate help with a lower 'dose' of treatment. With caution, this  
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33 may also apply to our cross-sectional study, as our study subjects may have selected to fill  
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35 out the questionnaires they found most interesting or useful regarding the automated  
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37 feedback they received on their happiness score. (26)  
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#### 45 *Strengths and weaknesses in relation to other studies*

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47 In line with our results, a previous Finnish study (12) on 31-year-old men and women  
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49 (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high  
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51 consumption of fruit and vegetables, whereas pessimism associated with tendency to  
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53 smoke and to consume alcohol excessively. The data included a vast range of  
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55 sociodemographic factors, but no information on psychological distress. Our study adds to  
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3 these findings by showing strong negative associations between confidence in the future  
4 and binge drinking, as well as a positive association between high confidence and regular  
5 exercise.  
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11 In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from  
12 general practices in urban Great Britain, optimism was associated with high physical  
13 activity, not smoking and moderate alcohol consumption, independently of education, area  
14 deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-  
15 R), their results support our findings on the positive association between optimism and  
16 beneficial health related behaviours. Data on diet and psychological stress is unavailable  
17 for comparison.  
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29 In a prospective Dutch study of 773 elderly community-living men, dispositional optimism  
30 associated with regular physical activity, being a nonsmoker, higher alcohol consumption,  
31 and higher consumption of vegetables and fruit at 15-year follow-up independent of  
32 sociodemographic factors and somatic morbidity (10). Dispositional optimism was  
33 assessed by four items. In a cross-sectional setting, we show similar results among both  
34 genders and in a wider age group.  
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45 In short, previous studies show an exhaustive range of dietary variables and rigorously  
46 assessed sociodemographic background characteristics. Our study adds to the literature  
47 by examining a range of health related behaviours, and by assessing the role of  
48 psychological distress. With caution, and bearing in mind that we only measured one  
49 dimension of optimism with one item, our results for high and low confidence in the future  
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3 appear to be in the exact directions and magnitude expected for optimism and pessimism,  
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5 respectively.  
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10 Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns  
11 found parental socioeconomic status (SES) in childhood to predict higher dispositional  
12 optimism (overall LOT score) irrespective of current SES (27). Another longitudinal study  
13 on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to  
14 predict higher income after controlling for hours worked. On the other hand, higher income  
15 did not increase optimism at follow-up. (20) Although we can draw no conclusions about  
16 causal directions, our data adds to previous literature by showing that subjects with high  
17 confidence in the future report higher satisfaction with their income irrespective of their  
18 income level.  
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32 As previously discussed (28), it might seem paradoxical that people who expect good  
33 things to happen take the initiative and actively promote the good things. According to a  
34 recent meta-analysis, optimists' characteristic coping style includes techniques for  
35 managing both stressful problems and stress-induced emotions (19). Optimists were also  
36 flexible regarding the source and type of stress they were faced with. This flexibility likely  
37 accounts for highly confident subjects' resilience to stressful events (28) such as family-  
38 and work-related stressors in our data.  
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### 49 *Conclusions*

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51 This study produced further evidence, as high confidence in the future appeared to  
52 associate with a range of beneficial health related behaviours and low psychological  
53 distress in different areas of life. Although no causal conclusions can be drawn from this  
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3 study, subjects with high confidence in the future appeared to make the effort to promote a  
4 healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies  
5 in different populations are needed to disentangle the cause and effect chain between  
6 different dimensions of optimism and health related behaviours. Future health –related  
7 interventions may benefit from tailoring each intervention according to the target  
8 population’s level of confidence in the future as well as their level of psychological distress.  
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10 Furthermore, more research is needed to increase the current understanding of changes  
11 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.

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All authors have completed the Unified Competing Interest form at

[www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author)

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2  
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4 work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that  
5 might have an interest in the submitted work in the previous 3 years; (3) their spouses,  
6 partners, or children have no financial relationships that may be relevant to the submitted  
7 work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that  
8 may be relevant to the submitted work.  
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17 An ethics approval was not required, as the study did not include an intervention, physical  
18 samples were not obtained, and the simple questionnaires did not contain delicate data on  
19 diseases.  
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#### 24 25 *Statement on funding* 26

27  
28 The study was a collaboration between The National Institute for Health and Welfare (THL)  
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34 the data, in the writing of the article or in the decision to submit the article for publication.  
35 OS is the Chief Editor and PM is the CEO at Duodecim Medical Publications, which is fully  
36 owned by the Finnish Medical Society Duodecim. OS and PM were involved with  
37 designing the gathering of the data but the data analyses were carried out by the  
38 researchers at THL. HL and AM are independent experts with no funding for this study.  
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53 Data sharing statement: There is no additional data available.  
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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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3 **Confidence in the future, health related behaviour and psychological distress –**  
4 **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

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3 to have a healthy diet and pessimists more likely to smoke or be high consumers of  
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5 alcohol. No marked differences were found in the consumption of junk food. (12)  
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10 Psychological stress and socioeconomic status (SES) and are well-known predictors of  
11  
12 health-related behaviour. Psychological distress from marital problems, childcare (13) and  
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14 work-related problems (14) have been shown to associate with increase in alcohol  
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16 consumption and other health damaging behaviour. Higher prevalence of unhealthy  
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18 behaviors in lower socioeconomic positions (15, 16) is seen to be one of the mechanisms  
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20 linking lower SES to worse health (17, 18).  
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25 Psychological distress and SES are also linked with optimism. Optimists well-being is  
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27 likely to be related to their characteristic, flexible coping methods with a variety of stressors  
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29 (19) and to accumulation of resources (20). Thus, SES and current psychological stress  
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31 may partially explain the association between optimism and health related behaviour.  
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36 A study with approximately 100 000 women aged between 50 and 79 analysed whether  
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38 optimism and pessimism, as measured by the revised Life Orientation Test (LOT-R), were  
39  
40 prospectively associated with coronary heart disease (CHD) morbidity and with total  
41  
42 mortality. Compared with pessimists, optimists had a lower rate of first episode CHD and  
43  
44 mortality. The associations were independent of a number of sociodemographic variables,  
45  
46 smoking, alcohol consumption and exercise, as well as depressive symptoms. (4). Another  
47  
48 recent study assessed the connections between optimism and psychological distress in a  
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50 sample of 284 depressed patients, who had undergone coronary bypass surgery.  
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52 Compared with pessimists, optimists had lower rates of re-hospitalization (21).  
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3 The Finnish Happiness-Flourishing Study (FHFS) is a national effort to promote positive  
4 mental health and positive health related behavior in the Finnish population. The aim of  
5 this study was to explore how one dimension of optimism, i.e. high confidence in the  
6 future, is related to health-related behaviors and whether current socioeconomical status  
7 and psychological distress contribute to these relations in a large web-based sample of  
8 101 257 Finns aged 18 and above.  
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## 23 **Data and methods**

### 24 *Data*

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27 The Finnish Happiness-Flourishing Study (FHFS) was a national collaboration with  
28 Duodecim Medical Publishing Ltd., the National Institute for Health and Welfare, Tarinatalo  
29 (a Finnish television production company), and Finland's national public service  
30 broadcasting company YLE. The collection of the web-based data was connected to a  
31 "Reality TV"- program with happiness training for selected unhappy celebrities in 2009.  
32 Each of the eight episodes gained an audience of about 250 000 viewers. The TV-  
33 program guided viewers to a freely available happiness website, where 139 462 Finns  
34 anonymously measured their own happiness on the Happiness-Flourishing Scale and  
35 identified their important sources of happiness. The study website was also advertised on  
36 the television production company's own website. All Finnish-speaking individuals were  
37 eligible study subjects irrespective of whether they had watched the TV-program or not.  
38 The website clearly stated that the collected data would be used for creating **public**  
39 **summary reports** on the happiness and factors connected to happiness. **The time frame**  
40 **for filling out the questionnaires was September 10<sup>th</sup> 2009- August 17<sup>th</sup> 2010.** After filling  
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3 the questionnaires, the subjects instantly received data on how their overall happiness  
4 score (measured by a new Happiness-Flourishing Scale (HFS)) compared to those of  
5 other Finns. The HFS was validated in a separate web-based random sample of Finns  
6 representing the population aged 17-79 (N=2035). The demographic characteristics of the  
7 validation sample are compared with the Finnish Happiness-Flourishing Study sample in  
8 Appendix 1.  
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20 Some of the numerical variables were measured using an open text field in the internet  
21 questionnaire. These variables had impossible minimum and maximum values indicating  
22 typing errors. Restrictions were made on the maximum and minimum values of the  
23 following variables: income (0 – 5 000 000), education years (0 – participant's age),  
24 alcohol consumption (0 – 70 doses per week), cigarette consumption (0 – 100 cigarettes  
25 per day), and age (7(18) – 110 years). In addition, we excluded participants who were  
26 under the age of 18 and who did not provide information about their gender. The final  
27 sample size after these restrictions was 101 257. No other exclusion or inclusion criteria  
28 were applied in this study.  
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40 <Figure 1 Flow chart>  
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#### 47 *Variables*

48 Confidence in the future was assessed by the item “I have complete confidence in the  
49 future”, and subjects were to choose a smiley face that best reflected their answer on a 7-  
50 point Likert scale 1 reflecting “Totally disagree” and 7 reflecting “Totally agree”. Answers 6-  
51 7 were classified as “High confidence in the future” and answers 1-3 as “low confidence in  
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3 the future". 11 other happiness skills were similarly assessed: I devote a great deal of my  
4 time to those close to me; I am very grateful for everything that I have received and  
5 achieved; Helping others comes naturally to me; I have complete confidence in the future;  
6  
7 I want to live in this moment I enjoy outdoor activities, regular exercise and sports; I have  
8 firm life values that I aim to nurture; I see adversity as a challenge; I often become so  
9 absorbed in my work or tasks that I lose track of time; I find it easy to forgive; I draw  
10 strength from contemplation and meditation; I have clear goals in my life.  
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21 Smoking was assessed by the question "How many cigarettes, cigars or pipefuls do you  
22 smoke per day? Smoking at least once a day was dichotomized as regular smoking. An  
23 open text field followed the question "How many units of alcohol do you drink per week?"  
24 At least 7 weekly doses for women and 14 for men was categorized as heavy alcohol  
25 consumption. Binge drinking was assessed with the question: "How often do you drink  
26 enough alcohol to feel yourself drunk?" with 4 response options. The answers reflecting  
27 drinking at least once a week were categorized as "regular binge drinking". The questions  
28 on food consumption were formulated "On average, how often do you eat fresh  
29 vegetables?" and "On average, how often do you eat fresh fruit or berries?" with response  
30 options: 1) Less than once a week, 2) 1-2 times per week, 3) 3-5 times per week, and 4)  
31 Once a day or more. The answers reflecting daily consumption was dichotomized as  
32 "regular consumption". Leisure time physical activity was recorded by asking the following  
33 questions: "How much do you exercise and strain yourself physically in your leisure time?"  
34 (=the so-called Gothenburg scale) (22). Answers reflecting at least 4 hours of leisure  
35 exercise per week was dichotomized as "regular physical activity".  
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56 The level of education was captured with an open-ended question "How  
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3 many years in total have you attended school or studied full time?" and participants  
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5 responded as full years. Education was included in the analyses as a continuous variable.  
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7 Income was assessed with the question "What were the gross earnings for your household  
8  
9 last year? (before tax is deducted)?" In the analyses the level of income was included as a  
10  
11 continuous variable. Work-related distress was captured by asking "How often do you find  
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13 yourself annoyed that you have to push yourself to the limit in order to cope with your  
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15 present job or workload?" with 5 response options. "Family-related distress was asked as  
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17 follows: "Do you experience problems in your relationship with your spouse or partner?"  
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19 with 4 response options and "Have your children caused you particular problems?" with 6  
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21 response options. Satisfaction with one's level of income was assessed with a 7-point  
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23 Likert scale.  
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### 29 *Statistical analysis*

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31 Descriptive statistics were reported for the large web-based sample. The missing data  
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33 analyses were conducted using a logistic regression model. The missingness indicator of a  
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35 variable, which had value one if the value was observed and zero otherwise, was used as  
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37 the outcome and the variables, which had fewer missing values, as independent variables.  
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39 As the number of observations was large, the Bayesian information criterion (BIC), (23)  
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41 was applied in assessing important predictors of missing values.  
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45 Sequential logistic regression models were used to analyze the association between  
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47 optimism and health related behavior. Results are presented in terms of adjusted odds  
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49 ratios (OR) and their 95% confidence intervals (CI). The analyses were performed  
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51 separately for both genders. In the first model the dichotomized health variable was  
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53 explained by only optimism (and age). Education was added in the second model while the  
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55 third model added income as a covariate. Finally the fourth model added the psychological  
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3 distress variables. Each analysis included only those subjects who had data on all the  
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5 variables included in the model. The R statistical software (version 2.15.0) was used in the  
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7 analysis. The interaction between confidence in the future and gender was tested in all  
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9 analyses, but results are only presented when the effects were significant.  
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## 11 Results

### 12 *Description of study population*

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

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25 The majority of the respondents in the FHFS data were women (78.9 %) and only 6.7 %  
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27 were aged over 64 (Table 1). Low confidence in the future was reported by 14.5 % of all  
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29 subjects, average confidence by 44.7 % and high confidence by 40.8 %. Confidence in the  
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31 future varied little by age and education. Regarding all measures of health related  
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33 behaviour, subjects with high confidence in the future lead a healthier lifestyle and  
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35 reported less psychological distress in both family and work contexts. The proportion of  
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37 subjects with high confidence was highest in the highest income quartile and they reported  
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39 higher satisfaction with their income.  
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45 <Figure 2 Confidence in the future, satisfaction with economical situation and income>

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49 In separate analyses on income quartiles (Figure 2), subjects with high confidence in the  
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51 future were more satisfied with their income irrespective of their level of income.  
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### 55 *Missing data*

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5 <Figure 2 Missing data in the Finnish Happiness-Flourishing Study>  
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10 Age and gender appeared to be the most important predictors for missing values, as very  
11 low and high age, as well as male gender predicted missing values in most variables.  
12 (data not shown). In eating vegetables the predictor was little problems with children. In  
13 binge drinking the predictors were problems with spouse or work-related distress all the  
14 time, and eating vegetables less than once a week. In alcohol quantity the predictors were  
15 problems with spouse all the time, eating vegetables at most twice a week and binge  
16 drinking less than once a month, in which case the alcohol quantity was likely to be close  
17 to zero. In income the predictors were low physical activity, work-related distress all the  
18 time, small number of education years, and low alcohol consumption. In the number of  
19 cigarettes per day the predictors were physical activity, problems with spouse not all the  
20 time, binge drinking at least once a week, small number of education years, and  
21 consumption of alcohol. Variables related to smoking, alcohol consumption, income or type  
22 of household contained relatively large amount of missing values (Figure 3).  
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41 <Figure 3 Missing data in the Finnish Happiness-Flourishing Study>  
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45 *Health related behaviour and confidence in the future*  
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49 <Table 2 Confidence in the future, health related behaviour, socioeconomic status and  
50 psychological distress in Finnish men (N=7 688-9 526) and women (N=26 035-36 079)  
51 aged 18 and over>  
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3 Compared with subjects with low confidence in the future, those with high confidence in  
4 the future were less likely to be daily smokers (men OR 0.58, 95% CI 0.52 to 0.65; women  
5 0.57, 95% CI 0.53 to 0.61) (Table 2). Subjects with high confidence were also less likely to  
6 be regular binge drinkers (men OR 0.57, 95% CI 0.52 to 0.63; women 0.54, 95% CI 0.50  
7 to 0.57) and less likely to consume alcohol in excess. Correspondingly, men and women  
8 with high confidence in the future were more likely to exercise regularly (men OR 2.82,  
9 95% CI 2.55 to 3.13; women 2.57, 95% CI 2.44 to 2.71), and consume vegetables (men  
10 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,  
11 95% CI 1.86 to 2.35; women 1.83, 95% CI 1.74 to 1.93) daily. There was a significant  
12 gender interaction in daily consumption of fruit (Bonferroni  $p=0,00089$ ) and vegetables  
13 (Bonferroni  $p=0,00020$ ), in which the associations with high confidence in the future were  
14 stronger in men than in women.  
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32 Adjustment for education and income had little or no effect on the associations between  
33 high confidence in the future and health related behaviours. Adjustment for current  
34 psychological distress at work or in family relationships, and particularly the adjustment for  
35 satisfaction with income, attenuated the association between high confidence in the future  
36 and most health related behaviours. Compared with subjects with low confidence in the  
37 future, those with high confidence in the future remained less likely to be daily smokers  
38 (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  
39 regular binge drinkers (men OR 0.69, 95% CI 0.60 to 0.79; women 0.65, 95% CI 0.59 to  
40 0.71) and less likely to consume alcohol in excess (men OR 0.70, 95% CI 0.60 to 0.82;  
41 women 0.73, 95% CI 0.66 to 0.80). Subjects with high confidence in the future remained  
42 more likely to exercise regularly (men OR 1.79, 95% CI 1.55 to 2.06; women 2.57, 95% CI  
43 2.44 to 2.71), and consume vegetables (men OR 1.63, 95% CI 1.43 to 1.87; women 1.56,  
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3 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  
4 1.28 to 1.47) daily. Among women, the association between high confidence in the future  
5 and heavy alcohol consumption was not affected by adjustment for psychological distress.  
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7 Among men, the association between confidence in the future and smoking was rendered  
8 statistically insignificant after full adjustments, but other associations remained statistically  
9 significant in the full model.  
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## 21 **Discussion**

### 22 *Principal findings*

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

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52 There are several strengths in this study. First, the sample size is considerably larger than  
53 in previous studies on optimism, which enables better detection of associations between  
54 confidence in the future, health behavior and related mechanisms. Furthermore, we also  
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3 captured younger age-groups than previous studies. Second, we were able to assess a  
4 wide range of confounding factors, although the possibility of residual confounding cannot  
5 be fully excluded. Third, the sociodemographic distribution of the FHFP, as reflected by  
6 level of education, was roughly comparable to another Finnish survey conducted in 2009  
7 (24). A random sample (n=5000) of Finnish adults aged between 15 and 64 was derived  
8 from the Population Register for an annual survey, which was answered by 59% of the  
9 sample. The proportion of subjects with basic education was about 15% compared with  
10 13% in the FHFS, whereas higher education (i.e. over 12 years) was reported by 56% and  
11 69%, correspondingly (24). Finally, we were able to assess several health related  
12 behaviours in one study.  
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27 However, there are also limitations in this study that must be considered. First, due to self-  
28 selection, the generalizability of these results is limited. The TV-program with happiness-  
29 training for depressed subjects may have attracted subjects with corresponding needs to  
30 the website. However, the average score for confidence in the future in the national  
31 sample of 2035 Finns was 5.08 compared with 5.00 in the web-based sample, indicating a  
32 rather small potential bias. Accordingly, a previous study on 912 online happiness seeking  
33 adults found that the participants reported depressive symptoms above the mean of the  
34 general population and life satisfaction below the average (25). Furthermore, we had no  
35 information on whether the subjects had actually watched the happiness-related TV-  
36 program or not. However, watching the TV-program was unlikely to bias our results on the  
37 connection between confidence in the future and health related behaviours. Also, the  
38 happiness-related website appeared to attract more women than men. Second, no causal  
39 conclusions can be drawn from this cross-sectional study. Third, missing values in the  
40 analysis variables were often related to low education, problems with spouse, work-related  
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3 distress, number of adults in the household or alcohol use, although the directions of the  
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5 associations varied from variable to variable. A possible future development could be  
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7 multiple imputation of the missing data in order to assess the effects of, and to remove the  
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9 possible bias caused by the missing data. Fourth, this study includes only one item that  
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11 measures optimism, i.e. confidence in the future. Thus, these results should not be  
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13 interpreted to reflect all dimensions of optimism. Fifth, our self-reported measure on binge  
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15 drinking may underestimate the level of true binge drinking; due to tolerance, individuals  
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17 may not feel drunk despite consuming heavy amounts of alcohol. Sixth, this study used  
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19 several non-validated single item questions on background variables such as  
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21 psychological distress. This decision was made in order to ensure user-friendliness in a  
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23 large, web-based study. Seventh, we had relatively large proportions of missing data for  
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25 several variables. However, this is a common problem shared by most web-based studies.  
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27 Regarding web-based interventions, it has been suggested that individuals may approach  
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29 them differently than more traditional methods, and that 'dropouts' may in fact be  
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31 individuals who received adequate help with a lower 'dose' of treatment. With caution, this  
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33 may also apply to our cross-sectional study, as our study subjects may have selected to fill  
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35 out the questionnaires they found most interesting or useful regarding the automated  
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37 feedback they received on their happiness score. (26)  
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#### 45 *Strengths and weaknesses in relation to other studies*

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47 In line with our results, a previous Finnish study (12) on 31-year-old men and women  
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49 (n=8690) found optimism, as measured by the 6-item LOT-R, to associate with high  
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51 consumption of fruit and vegetables, whereas pessimism associated with tendency to  
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53 smoke and to consume alcohol excessively. The data included a vast range of  
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55 sociodemographic factors, but no information on psychological distress. Our study adds to  
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3 these findings by showing strong negative associations between confidence in the future  
4 and binge drinking, as well as a positive association between high confidence and regular  
5 exercise.  
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11 In a relatively small (n=128) sample of men and women aged 65 to 80 years recruited from  
12 general practices in urban Great Britain, optimism was associated with high physical  
13 activity, not smoking and moderate alcohol consumption, independently of education, area  
14 deprivation, clinical condition and medication (11). With optimism assessed by the (LOT-  
15 R), their results support our findings on the positive association between optimism and  
16 beneficial health related behaviours. Data on diet and psychological stress is unavailable  
17 for comparison.  
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29 In a prospective Dutch study of 773 elderly community-living men, dispositional optimism  
30 associated with regular physical activity, being a nonsmoker, higher alcohol consumption,  
31 and higher consumption of vegetables and fruit at 15-year follow-up independent of  
32 sociodemographic factors and somatic morbidity (10). Dispositional optimism was  
33 assessed by four items. In a cross-sectional setting, we show similar results among both  
34 genders and in a wider age group.  
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45 In short, previous studies show an exhaustive range of dietary variables and rigorously  
46 assessed sociodemographic background characteristics. Our study adds to the literature  
47 by examining a range of health related behaviours, and by assessing the role of  
48 psychological distress. With caution, and bearing in mind that we only measured one  
49 dimension of optimism with one item, our results for high and low confidence in the future  
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3 appear to be in the exact directions and magnitude expected for optimism and pessimism,  
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5 respectively.  
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10 Turning to previous findings on socioeconomic status, a longitudinal study on 694 Finns  
11 found parental socioeconomic status (SES) in childhood to predict higher dispositional  
12 optimism (overall LOT score) irrespective of current SES (27). Another longitudinal study  
13 on 61 former law students aged 30-47 at follow-up, found high baseline optimism (LOT) to  
14 predict higher income after controlling for hours worked. On the other hand, higher income  
15 did not increase optimism at follow-up. (20) Although we can draw no conclusions about  
16 causal directions, our data adds to previous literature by showing that subjects with high  
17 confidence in the future report higher satisfaction with their income irrespective of their  
18 income level.  
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32 As previously discussed (28), it might seem paradoxical that people who expect good  
33 things to happen take the initiative and actively promote the good things. According to a  
34 recent meta-analysis, optimists' characteristic coping style includes techniques for  
35 managing both stressful problems and stress-induced emotions (19). Optimists were also  
36 flexible regarding the source and type of stress they were faced with. This flexibility likely  
37 accounts for highly confident subjects' resilience to stressful events (28) such as family-  
38 and work-related stressors in our data.  
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### 49 *Conclusions*

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51 This study produced further evidence, as high confidence in the future appeared to  
52 associate with a range of beneficial health related behaviours and low psychological  
53 distress in different areas of life. Although no causal conclusions can be drawn from this  
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3 study, subjects with high confidence in the future appeared to make the effort to promote a  
4 healthy lifestyle irrespective of educational level or financial situation. Longitudinal studies  
5 in different populations are needed to disentangle the cause and effect chain between  
6 different dimensions of optimism and health related behaviours. Future health –related  
7 interventions may benefit from tailoring each intervention according to the target  
8 population’s level of confidence in the future as well as their level of psychological distress.  
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10 Furthermore, more research is needed to increase the current understanding of changes  
11 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.

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All authors have completed the Unified Competing Interest form at

[www.icmje.org/coi\\_disclosure.pdf](http://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



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3 Institute for Health and Welfare and Duodecim Medical Publications Ltd for the submitted  
4 work; (2) KJ, MP, TH, HL, AM, OS, JL and PM have no relationships with companies that  
5 might have an interest in the submitted work in the previous 3 years; (3) their spouses,  
6 partners, or children have no financial relationships that may be relevant to the submitted  
7 work; and (4) KJ, MP, TH, HL, AM, OS, JL and PM have no non-financial interests that  
8 may be relevant to the submitted work.  
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17 An ethics approval was not required, as the study did not include an intervention, physical  
18 samples were not obtained, and the simple questionnaires did not contain delicate data on  
19 diseases.  
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#### 24 25 *Statement on funding*

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28 The study was a collaboration between The National Institute for Health and Welfare (THL)  
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32 organizations to develop expertise and international business activities of the health and  
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34 the data, in the writing of the article or in the decision to submit the article for publication.  
35 OS is the Chief Editor and PM is the CEO at Duodecim Medical Publications, which is fully  
36 owned by the Finnish Medical Society Duodecim. OS and PM were involved with  
37 designing the gathering of the data but the data analyses were carried out by the  
38 researchers at THL. HL and AM are independent experts with no funding for this study.  
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54 Data sharing statement: There is no additional data available.  
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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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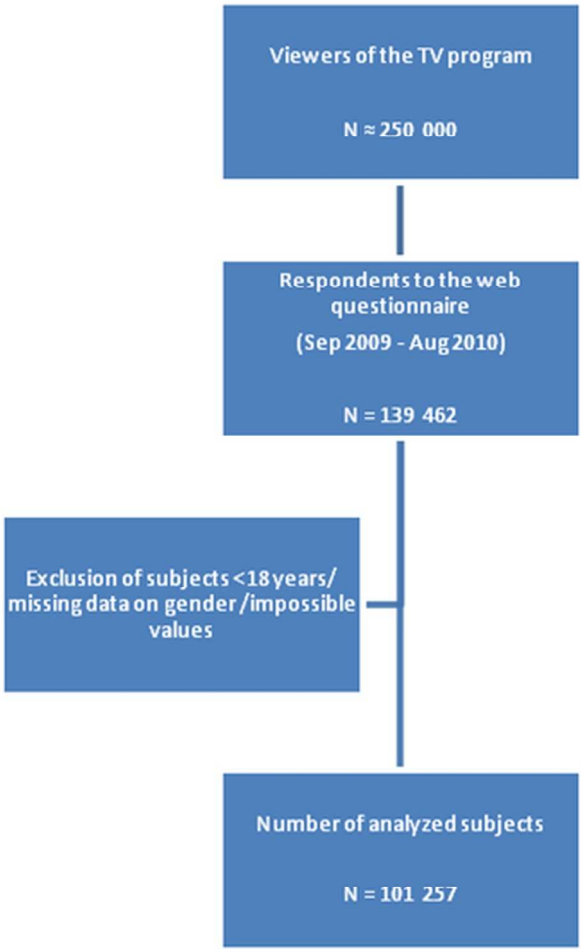
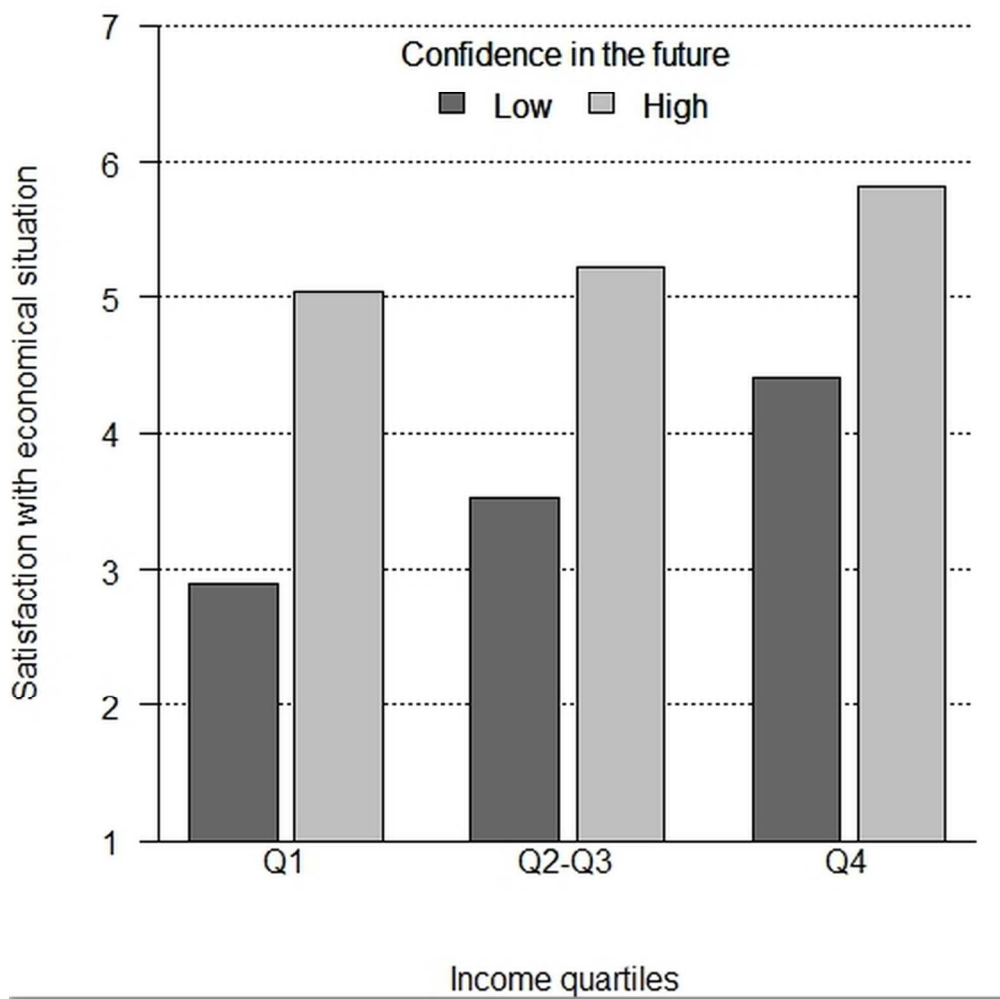


Figure 1. Flow chart

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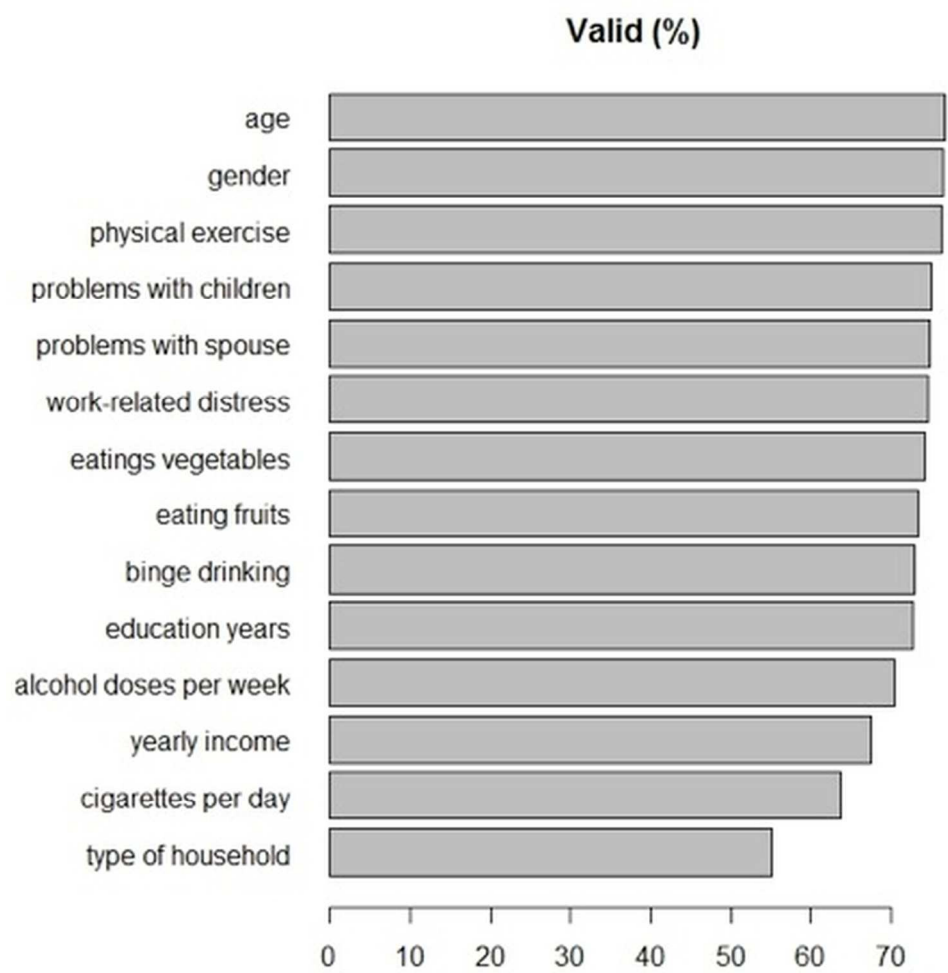


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