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ORIGINAL ARTICLE

Differentiating positive and negative self-rated health: results from a cross-sectional study in Estonia

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Abstract
Objectives To examine possible differences in the correlates of positive and negative self-rated health (SRH).
Methods Data for 2,127 men and 2,385 women in the 25–74 age group came from the Estonian Health Interview Survey 2006. Multinomial logistic regression analysis was used to study the association of socio-demographic, physical and psychological health and well-being characteristics with positive (good or very good) and negative (bad or very bad) SRH as compared to fair SRH.
Results Negative SRH was related to male gender, the presence of chronic illnesses, limitations in daily activities and physical functioning, emotional distress, an external locus of control, and to low satisfaction with life and physical fitness. These indicators (except satisfaction with life) were also related to positive SRH, presenting a mirrored pattern of association. Additionally, positive SRH was related to younger age, an Estonian ethnic identity, and to higher education and income.
Conclusions Although SRH forms a ill/healthy continuum when physical and psychological health characteristics are considered, the broader spectrum of predictors indicates that positive SRH and negative SRH are two distinct and alternative concepts.

Keywords Self-rated health · Continuity · Determinants · Estonia

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Introduction

Self-rated health (SRH), usually presented as a single-item question, is a widely used and recognized measure of individual health status. SRH has proven to be a reliable and valid predictor of subsequent mortality (Benyamini and Leventhal 1999) and morbidity (Dominick et al. 2002) indicating the biological basis of subjective health evaluation. A considerable amount of research focusing on the determinants of SRH has found both physical (Manderbacka et al. 1999) and psychological aspects (Pikhart 2002) of health significantly related to SRH. The subjective evaluation of one's health is contextualized in a socio-structural framework with a majority of studies yielding similar findings—lower occupational class (Kaikkonen et al. 2009), lower educational level (Leinsalu 2002) and poor economic situation (Aittomäki et al. 2010) increase the odds for poor SRH.

Despite the wide use of SRH, as yet, relatively little research has been devoted to elaborating its theoretical framework in order to understand what underpins health perceptions. The self-assessment of health is an active dynamic evaluation process (Jylhä 2009), which according to Manderbacka et al. (2003) consists of several steps starting with the compilation of relevant information on one's health and then evaluating it against a reference group or standard. As a result, the determinants of SRH may vary considerably across studies. For example, Krause

and Jay (1994) found that older adults are more likely to use health problems as a basis for health evaluation, whereas health behaviour is more important in the assessments of younger people. The finding that the same objective health status may not translate into an equivalent SRH category in different socioeconomic groups (Dowd and Zajacova 2010) and that there is reported variation in factors associated with different levels of SRH (Kaplan and Baron-Epel 2003) indicate that positive and negative health evaluations may not share the same set of determinants.

The discussion on the possible conceptual differentiation between positive and negative health mainly concerns whether the determinants of both dimensions share a similar but mirrored pattern of association (Breidablik et al. 2008; Manderbacka et al. 1998; Mackenbach et al. 1994) or whether they are two different concepts that are perceived and evaluated in different ways (Shooshtari et al. 2007; Kaplan and Baron-Epel 2003; Smith et al. 1994). Against this background, the current study aims to further explore the conceptual issue of SRH by examining whether the characteristics commonly recognized as predictors of SRH are different or similar (but reversely associated) when positive and negative SRH is assessed. Drawing on previous literature, we use a number of demographic and socioeconomic indicators, as well as indicators of physical and psychological health and general well-being to analyse their association with both positive and negative SRH.

Methods

Study population

Data were retrieved from the nationally representative Estonian Health Interview Survey. The Population Registry served as the sampling frame, and all permanent residents aged 15–84 years on 1 January 2006 were eligible for sampling with a pre-determined probability across sampling units. A stratified (based on the region, age and gender) systematic random sampling method was applied to select 11,023 contact individuals. The survey was approved by the Tallinn Medical Research Ethics Committee, and informed consent was obtained from all respondents before their inclusion. Face-to-face structured interviews were undertaken between October 2006 and October 2007. In all, 6,434 interviews were completed. After adjustment for sampling frame error, the overall response rate was 60.2 %. Stratum-specific weights were calculated to match the population structure. The survey methodology is described in detail elsewhere (Oja et al. 2008). In the current study, the analysis was limited to the 25–74 age group, that is, 4,512 respondents (2,127 men and 2,385 women). This age restriction was intended to minimize the effects of the potential misclassification of socioeconomic status among younger respondents and of recall bias among older respondents.

Dependent variable

Self-rated health was measured with a single question 'How do you evaluate your health in general?' with five possible response alternatives: 'very good', 'good', 'fair', 'bad' or 'very bad'. The answers were split into three SRH categories—positive (combining very good and good health), fair and negative (bad and very bad health).

Independent variables

Demographic and socioeconomic measures included age, gender, ethnicity, level of education and income. *Ethnicity* refers to self-reported ethnic identity. In the analyses, we distinguished between Estonians and other ethnic groups, the latter consisting mostly of Russians, Ukrainians and Belarusians. *Level of education* was determined by the highest level of achieved education and was combined into three categories corresponding to the International Standard Classification of Education (ISCED): post-secondary (ISCED categories 4–6), upper secondary (3) and lower secondary or less education (0–2). Income was measured by using average personal monthly net income and was divided into quartiles with the cutoff points being 195, 283 and 468 Euros (converted from kroons), respectively.

Physical health was covered by three indicators corresponding to the European Health Status Module (Oja et al. 2008). For each person, the *chronic or long-term illness* variable summarizes the self-reports of 23 listed chronic or long-term illnesses ever experienced. These were assessed using a continuous scale running from 0 to 12, the maximum number of conditions that could be listed per person. *Limitations in daily activities* were assessed with the question: 'During the past 6 months to what extent have your daily activities been limited because of a long-term illness or health problem?' Persons who reported that their daily activities had been limited either significantly or somewhat were considered as having illness-related limitations in contrast to persons not having such limitations. The variable *functional limitations* encompass five measures of physical functioning covering the person's ability to (a) walk 500 m; (b) walk up and down one length of a stairway unit; (c) bend down and straighten up; (d) get down on one's knees and get up again and (e) lift and carry a 5-kg shopping bag. For each person, the number of functional limitations was summed on a continuous scale running from 0 to 5.

Psychological health was measured by three indicators. The presence of past episodes of *depression* was assessed with two questions from the depressive episode sub-module

of the Mini-International Neuropsychiatric Interview (M.I.N.I.5.0.0) (Sheehan et al. 1998). Respondents who reported ever having had a period of at least 2 weeks when they were consistently depressed or down nearly every day, or a period of at least 2 weeks when they were less interested in most things or were less able to enjoy the things they used to enjoy were categorized as ever having had depression against those who did not. *Emotional distress* was measured by the Emotional State Questionnaire (EST-Q) (Aluoja et al. 1999) consisting of 28 questions about depressiveness, general anxiety, panic, social-anxiety, tiredness and insomnia experienced during the past 4 weeks and assessed on a scale ranging from 1 (not at all) to 5 (very often). The instrument-specific cutoff point of 63 was used to differentiate between respondents with and without substantial distress. *Locus of control*, defined as the individual's perception of the causal relationship between his/her own behaviour and external factors (Rotter 1966), was measured by three pairs of questions. The first question in the pair indicated that the person could influence his/her own life (internal locus of control), whereas the second question emphasized the role of external factors (external locus of control). The respective answer categories in each pair were recoded as 0 and 1. Lower scores on the four-point scale (range 0–3) indicate a higher degree of self-command.

Well-being was assessed by four single-item questions covering the person's satisfaction with different domains of personal life. Respondents were asked to what extent they are satisfied with their: (a) life in general, (b) economic situation, (c) physical shape and physical abilities and (d) close relatives. Satisfaction was measured on a scale from 1 (satisfied) to 4 (not satisfied at all) with lower individual scores indicating higher overall satisfaction.

Statistical analysis

Multinomial logistic regression analysis was used to study the associations between SRH and its determinants, that is, demographic and socioeconomic measures, physical and psychological health and well-being characteristics. 'Fair' SRH was used as the reference category. The results are presented as odds ratios (OR) together with 95 % confidence intervals (CI) and p values, separately for the bivariate and multivariate analyses. The statistical analysis was conducted using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA).

Results

Table 1 presents the descriptive characteristics of the sample. The mean age of the participants was 51 (SD = 14.7) years. About 53 % of the respondents were women, 64 % were native Estonians and nearly 37 % of the respondents had received a post-secondary or tertiary education. Health was rated as 'good' or 'very good' by 41 % of respondents, 46 % perceived their health as 'fair', whereas 13 %

Table 1 Descriptive characteristics of the sample in the 25–74 age group, Estonia 2006

Demographic and socioeconomic characteristics	
Age in years (mean/SD)	51.0 ± 14.7
Gender (%/*n*)	
Men	47.1 (2,127)
Women	52.9 (2,385)
Ethnicity (%/*n*)	
Estonian	64.1 (2,894)
Other	35.9 (1,618)
Education (%/*n*)	
Lower secondary or less	14.3 (643)
Upper secondary	49.1 (2,215)
Post-secondary	36.7 (1,654)
Income (%/*n*)	
I (lowest quartile)	24.9 (1,074)
II	24.7 (1,069)
III	24.9 (1,078)
IV (highest quartile)	25.5 (1,100)
Physical health characteristics	
Chronic or long-term illness (0–12) (mean/SD)	1.5 ± 1.7
Limitations in daily activities (%/*n*)	
Yes	41.2 (1,861)
No	58.8 (2,651)
Functional limitations (0–5) (mean/SD)	0.7 ± 1.3
Psychological health characteristics	
Depression (%/*n*)	
Yes	30.2 (1,362)
No	69.8 (3,148)
Emotional distress (%/*n*)	
Yes	12.4 (559)
No	87.6 (3,946)
Locus of control (0–3) (mean/SD)	0.9 ± 0.9
Well-being characteristics	
Satisfaction with	
Life in general (1–4) (mean/SD)	1.7 ± 0.7
Economic situation (1–4) (mean/SD)	2.1 ± 1.0
Physical shape and abilities (1–4) (mean/SD)	2.2 ± 1.0
Close relatives (1–4) (mean/SD)	1.6 ± 1.1
Self-rated health (%/*n*)	
Very good	7.9 (357)
Good	32.8 (1,481)
Fair	46.2 (2,083)
Bad	11.3 (511)
Very bad	1.8 (80)

Table 2 Correlates of positive and negative self-rated health in the 25–74 age group, Estonia 2006

	Positive self-rated health		Negative self-rated health	
	OR (95 % CI)	*p* value	OR (95 % CI)	*p* value
Demographic and socioeconomic characteristics				
Age in years	0.94 (0.93–0.94)	<0.001	1.04 (1.03–1.05)	<0.001
Gender				
Men	0.96 (0.83–1.10)	0.539	0.79 (0.6–0.95)	0.014
Women	1		1	
Ethnicity				
Estonian	1.47 (1.27–1.70)	<0.001	0.81 (0.67–0.98)	0.033
Other	1		1	
Education				
Lower secondary or less	0.34 (0.26–0.44)	<0.001	2.28 (1.73–2.99)	<0.001
Upper secondary	0.57 (0.49–0.66)	<0.001	1.65 (1.30–2.10)	
Post-secondary	1		1	<0.001
Income				
I (lowest quartile)	0.34 (0.27–0.42)	<0.001	3.99 (2.70–5.88)	<0.001
II	0.52 (0.42–0.65)	<0.001	2.61 (1.74–3.90)	<0.001
III	0.53 (0.44–0.64)	<0.001	0.89 (0.57–1.41)	0.631
IV (highest quartile)	1		1	
Physical health characteristics				
Chronic or long-term illness	0.46 (0.43–0.49)	<0.001	1.55 (1.46–1.64)	<0.001
Limitations in daily activities				
Yes	0.14 (0.12–0.17)	<0.001	15.17 (10.39–22.15)	<0.001
No	1		1	
Functional limitations	0.39 (0.33–0.45)	<0.001	2.03 (1.95–2.17)	<0.001
Psychological health characteristics				
Depression				
Yes	0.61 (0.52–0.72)	<0.001	2.44 (2.02–2.96)	<0.001
No	1		1	
Emotional distress				
Yes	0.23 (0.18–0.31)	<0.001	4.59 (3.69–5.72)	<0.001
No	1		1	
Locus of control	0.64 (0.59–0.70)	<0.001	1.85 (1.68–2.01)	<0.001
Well-being characteristics				
Satisfaction with				
Life in general	0.59 (0.53–0.66)	<0.001	2.25 (2.00–2.53)	<0.001
Economic situation	0.67 (0.62–0.73)	<0.001	1.63 (1.48–1.80)	<0.001
Physical shape and abilities	0.51 (0.47–0.56)	<0.001	3.33 (2.95–3.75)	<0.001
Close relatives	0.82 (0.73–0.92)	0.001	1.44 (1.25–1.66)	<0.001

Multinomial logistic regression with 'fair' self-rated health as the reference category, adjusted for age. Odds ratios (OR) with 95 % confidence intervals (CI) and *p* values

reported their health as being either 'bad' or 'very bad'. Both physical and psychological health complaints were rather frequent in the study population with 41 % reporting illness-related limitations in daily activities over the past 6 months, 30 % having experienced depression at some point in their life, and 12 % having had emotional distress in the past 4 weeks.

Results from the age-adjusted bivariate analysis are presented in Table 2. All variables with the exception of gender were statistically significantly related to positive SRH. Younger respondents, ethnic Estonians, the higher educated and those with a higher income were significantly more likely to evaluate their health as being better than average. The strongest associations were found for indicators of physical health: The absence of chronic illnesses as well as of limitations in daily activities and physical functioning were all related to positive health ratings. Having had no depression or emotional distress and having higher self-command and higher satisfaction with all four aspects of one's life also predicted positive health.

Negative health ratings were associated with older age, being female or non-Estonian, lower education and lower income. Chronic illnesses, limitations in daily activities and in physical functioning as well as having had depression or emotional distress strongly increased the odds for reporting negative SRH. Negative SRH was also related to lower self-command and lower satisfaction with all four items of general well-being.

After mutual adjustment (Table 3), the odds for positive SRH were slightly attenuated for all demographic, socio-economic and physical health characteristics but remained statistically significant. The association between gender and positive SRH became statistically significant in the multivariate model with men having lower odds (OR = 0.63) of assessing their health positively. The odds for positive SRH were also reduced for the psychological health and well-being variables but remained statistically significant except for depression and for satisfaction with life in general and with economic situation. The association between satisfaction with close relatives and positive health ratings was

Table 3 Correlates of positive and negative self-rated health in the 25–74 age group, Estonia 2006

	Positive self-rated health		Negative self-rated health	
	OR (95 % CI)	*p* value	OR (95 % CI)	*p* value
Demographic and socioeconomic characteristics				
Age in years	0.95 (0.95–0.96)	<0.001	1.01 (1.00–1.02)	0.104
Gender				
Men	0.63 (0.53–0.76)	<0.001	1.30 (1.00–1.68)	0.047
Women	1		1	
Ethnicity				
Estonian	1.45 (1.21–1.75)	<0.001	0.96 (0.74–1.26)	0.778
Other	1		1	
Education				
Lower secondary or less	0.43 (0.31–0.59)	<0.001	1.18 (0.82–1.69)	0.378
Upper secondary	0.59 (0.49–0.71)	<0.001	1.31 (0.97–1.79)	0.082
Post-secondary	1		1	
Income				
I (lowest quartile)	0.57 (0.43–0.74)	<0.001	1.20 (0.73–1.98)	0.469
II	0.71 (0.54–0.92)	0.011	0.96 (0.58–1.60)	0.889
III	0.58 (0.46–0.72)	<0.001	0.56 (0.32–0.95)	0.033
IV (highest quartile)	1		1	
Physical health characteristics				
Chronic or long-term illness	0.62 (0.57–0.68)	<0.001	1.26 (1.17–1.36)	<0.001
Limitations in daily activities				
Yes	0.32 (0.26–0.40)	<0.001	4.42 (2.92–6.69)	<0.001
No	1		1	
Functional limitations	0.69 (0.58–0.82)	<0.001	1.45 (1.34–1.57)	<0.001
Psychological health characteristics				
Depression				
Yes	0.95 (0.78–1.16)	0.639	1.28 (0.98–1.68)	0.073
No	1		1	
Emotional distress				
Yes	0.48 (0.33–0.69)	<0.001	1.42 (1.04–1.95)	0.030
No	1		1	
Locus of control	0.82 (0.74–0.92)	0.001	1.16 (1.02–1.33)	0.028
Well-being characteristics				
Satisfaction with				
Life in general	0.86 (0.74–1.01)	0.071	1.42 (1.18–1.71)	<0.001
Economic situation	0.93 (0.83–1.04)	0.208	0.89 (0.77–1.04)	0.147
Physical shape and abilities	0.64 (0.57–0.72)	<0.001	1.82 (1.57–2.11)	<0.001
Close relatives	1.25 (1.07–1.47)	0.005	0.91 (0.74–1.12)	0.386

Multinomial logistic regression with 'fair' self-rated health as the reference category, mutually adjusted. Odds ratios (OR) with 95 % confidence intervals (CI) and *p* values

reversed in the multivariate model: Those who were less satisfied had higher odds for positive SRH. After mutual adjustment, the associations with negative SRH became statistically non-significant for age, ethnicity, education and income, except for the third income quartile where the odds for negative SRH became significantly lower compared to the highest income group. Men had 30 % higher odds of assessing their health negatively compared to women. Chronic conditions, illness-related limitations in daily activities and limitations in physical functioning remained strongly related to negative SRH: Those who had limitations in their daily activities were four and a half times more likely to assess their health as bad or very bad. Emotional distress, external locus of control, lower satisfaction with life in general and with one's physical fitness also remained statistically significantly associated with negative SRH, whereas the associations with depression and with the variables relating to satisfaction with one's economic situation and close relatives became statistically non-significant in the multivariate analysis.

Discussion

This study aimed to assess the possible differentiation in the correlates of positive and negative SRH and thereby contribute to further elucidating the health/illness continuum on the SRH scale. Results indicate that positive health assessment is determined by a broad set of demographic and socioeconomic measures, physical and psychological health and well-being characteristics, whereas negative health is to a large extent related to physical and psychological health measures.

Demographic and socioeconomic characteristics did not present a consistent pattern in their association with SRH in this study. Older age was related to lower health ratings, though the association became statistically non-significant with negative SRH in the multivariate analysis. However, this is not surprising considering that negative SRH to a large extent reflects the presence of physical health complaints which are also more common at older ages, and thus, the adjustment for these conditions reduces the age effect on negative SRH. Eriksson et al. (2001), while exploring the different points of reference used in SRH assessments reported weak associations with age for both global and peer group referenced SRH scales implying that self-evaluations include age adjustment by default. Health is thus assessed according to what could be expected considering one's age. Contrary to the well-known paradox that men die earlier but women have worse health, our study showed that men had higher odds than women to report poor health at both ends of the SRH scale. This deviation might be partly explained by the adjustment for physical and psychological health complaints in our study. The independent and statistically significant association for ethnicity was found only with positive SRH, supporting the claim that there are cultural differences in health assessment frameworks (Babones 2009; Jylhä 2009). At the same time, this may also reflect differences in health behaviours between ethnic groups that have been previously reported in Estonia (Tekkel et al. 2010) but which were not examined in this study.

Low education has been related to poor SRH in numerous studies (Pikhart 2002; Leinsalu 2002). Education is a key component of socioeconomic status affecting people's opportunities for obtaining a better job and higher living standard. It can also affect people's lifestyle and health behaviour which might explain the importance of education for health over and above purely wealth-related factors. In this study, higher education predicted positive health, possibly, via the above-mentioned pathways, but the effect on negative health was reduced to non-significance after controlling for other correlates. As in the case of the other demographic and social-structural variables, the attenuated association between education and negative health ratings was mostly explained by the strong explanatory power of physical health characteristics on negative SRH. The observed independent effect of education on positive SRH also indicates that education is incorporated into the evaluation frameworks of people's health ratings, possibly by influencing the selection of objective conditions that form the basis for health ratings (Jylhä 2009). Although Mackenbach et al. (1994) found that education was associated with both excellent and ill health, our results are consistent with the findings of Martinez-Sanchez and Regidor (2002) who also reported that the associations between educational level and negative health were of a small magnitude.

Income has been related to SRH in numerous previous studies (Aittomäki et al. 2010; Denton and Walters 1999). In our study, higher personal income was associated with higher odds for positive health ratings. Interestingly, the persons in the highest income quartile also had elevated odds for assessing their own health negatively when compared to respondents in the middle-income categories in our study. Apouey and Clark (2009) proposed that the association between income and health can be differentiated between health domains, with mental health having a positive and health behaviours having a negative association with income. For example, an Estonian study (Tekkel et al. 2010) showed that a higher body mass index was related to higher income in men. Though we did not look at the effect of health behaviours on SRH in our study, it seems plausible that factors like overweight and obesity, because they are both related to higher levels of subjective discomfort, may explain part of the observed association between high-income and lower subjective health ratings.

Several studies have noted the considerable effect of chronic disease and/or disability (Mitchell and Adkins 2009; Martinez-Sanchez and Regidor 2002) on SRH in the general population. The physical health characteristics used in this study presented a distinct, mirrored association with both positive and negative SRH which is consistent with previous research (Manderbacka et al. 1998; Mackenbach et al. 1994). The strong associations found for chronic conditions, limitations in daily activities and in physical functioning allow us to conclude, in a similar fashion to Manderbacka et al. (1998), that these variables measure the same sort of qualities as SRH. An additional analysis (data not shown) that distinguished between the five SRH categories showed a clear hierarchical, independent and statistically significant association for these variables across all SRH levels, thus providing support for the claim that the SRH scale demonstrates continuity in respect to physical health measures. The relative importance of illness-related limitations in daily activities over the measure of chronic or long-term illnesses found in this study and also reported by Katz et al. (2009) when using the concept of 'valued life activities', illustrates and emphasizes the role of subjectivity in individual perceptions of physical health as well as in other health domains.

The psychological and mental health characteristics displayed a consistent pattern across the SRH scale. Similar to prior research (Barger 2006), we found that emotional distress was associated with SRH, in terms of both positive and negative health ratings. Although depression has been related to SRH in previous studies (Schnittker 2005), the effect of ever having had depression on SRH was not statistically significant in our study. The mediating effect of emotional distress, which covered a similar set of symptoms but during a more recent time period, explained the loss of statistical explanatory power for depression in the multivariate analysis. These findings highlight the potential importance of the instrument-specific timeframe in subjective health evaluation mechanisms, previously noted in studies by Jylhä (2009) and Shaw (2002). In accord with the studies of Pikhart (2002) and Leinsalu (2002) that emphasized the importance of control beliefs on SRH in similar settings, locus of control was independently associated with both positive and negative health ratings in the current study and displayed a mirrored and clearly hierarchical (also on a five-point SRH scale; data not shown) pattern across the SRH scale. This might be partly explained by the fact that the locus of control measure may incorporate health control beliefs that have been shown previously to predict health behaviours more generally (Perlman et al. 2003). Our findings thus suggest that psychological aspects of health may be important for both positive and negative health assessments.

Perceived well-being has had a strong impact on health perceptions in previous studies (Breidablik et al. 2008; Unden and Elofsson 2001). In general, our results support these claims, although only the measure of satisfaction with physical shape and physical abilities was associated with both ends of the SRH scale at a statistically significant level. Apart from mere physical abilities that are more directly related to the presence of illnesses or limitations in physical functioning, physical fitness also seems to encapsulate a person's body image which has been linked to his/her illness experience as illustrated with the case of obesity by Pulvers et al. (2008), thus explaining the association we observed in the multivariate analysis. Satisfaction with one's economic situation was not associated with either positive or negative SRH but the negative association that occurred with poorer health in the multivariate analysis, which was similar to that seen with the income variable, supports our suggestion that a higher economic living standard may not always convert to a healthier lifestyle and thus to a perception of better health. Contrary to this finding, but in accordance with Breidablik et al. (2008), less satisfaction with life in general predicted worse SRH. Although this was statistically significant only for negative SRH, it nevertheless suggests that satisfaction with life encompasses more dimensions than merely economic well-being. Although a greater degree of satisfaction with close relatives elevated the relative odds for positive health in the bivariate analysis, the relationship was reversed after mutual adjustment, implying effect modification by the other variables considered.

Our study has several potential limitations. First, the overall response rate of the survey was 60.2 %, varying from 47 to 81 % by sampling strata. Only small deviations were observed when the gender and ethnic distributions of the sample were compared to the population data from Statistics Estonia, with a slightly higher proportion of men (less than one percentage point difference) and non-Estonians (less than three percentage points difference) found in the sample. Younger age groups were somewhat underestimated in the sample, whereas the opposite was true for the older age groups. Applying stratum-specific weights based on age, gender and region in the multivariate analysis (data not shown) resulted in only minor changes in the OR, and therefore, the weights were not used in the current analysis. Item non-response was generally low, with the highest value (4.2 %) observed for personal income. Additional analyses showed that the OR for the group with missing income were closest to the highest income group (data not shown), suggesting higher non-response among higher salaried persons (Turrell 2000). However, there is no reason to believe that income non-response was selective in terms of SRH. Thus, although we cannot totally exclude the possibility of some selection bias, non-response is unlikely to have affected the

results in terms of the observed associations (Van Loon et al. 2003; Vågerö et al. 2008). Secondly, there are some methodological differences between this study, and previous studies which did not allow direct comparisons to be drawn. For example, Mackenbach et al. (1994) used an aggregate measure for the dependent variable by combining together SRH, chronic conditions and a health complaints checklist, whereas the current study focused solely on SRH while including other health measures as explanatory variables as proposed by Jylhä (2009). In contrast to the present study where 'fair' health was used as a reference category for positive and negative SRH, Manderbacka et al. (1998) and Smith et al. (1994) used 'excellent/good' health as the reference category and compared it with 'fair' and with 'poor/very poor' health. In addition, studies which have examined the continuity hypothesis have had an extensive focus on health behaviour factors which were not covered in the current analysis. However, they did not include the positive aspects of health that could be characterized by well-being and the locus of control measures used in this paper. As noted by Manderbacka et al. (1998), a lack of positive health measures might affect the appearance of conceptual continuity of subjective health assessments. Thirdly, some interpretational challenges could stem from noteworthy differences in the distribution of SRH categories across studies. In our study, 46 % of the respondents rated their health as 'fair' which is considerably larger than in the studies discussed above. Several comparative studies have pointed to the remarkably higher share of the 'fair' SRH category in Eastern Europe (Babones 2009; Kasmel et al. 2004). In part, such differences may arise from cultural differences between countries and population groups (Babones 2009; Jylhä et al. 1998). Kasmel et al. (2004) proposed, for example, that the relatively high proportion of people with 'fair' health in the Baltic countries when compared to Finland can be explained by psychosocial factors related to the former sociopolitical environment where it was vital not to deviate from 'average'. In such circumstances, the 'fair' SRH category may include respondents from both the positive and negative ends of the health spectrum, thus being less discriminative. It is essential to further explore the meaning of 'fair' health with its relative, value-related position on the SRH scale in relation to possible sociocultural differentiation. Finally, the cross-sectional design of our study does not allow conclusions to be reached on the causal direction of the associations observed.

In conclusion, the findings of the current study suggest that negative SRH is conceptualized more narrowly in comparison with positive SRH, implying that positive human health is a more complex phenomenon than just being understood as the mere opposite of ill health. Although both positive and negative health assessments rely heavily on physical and psychological health characteristics, thus forming a continuum on the SRH scale, the profile of the correlates differs when demographic, socioeconomic and well-being characteristics are considered. In accordance with several other authors (Shooshtari et al. 2007; Kaplan and Baron-Epel 2003) this leads us to conclude that positive and negative assessments of one's health are not mirror images of each other but rather, two alternative concepts.

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Appendix

See Table 4

Table 4 Correlates of positive and negative self-rated health on five item scale, Estonia 2006

	OR			
	Self-rated health			
	Very good	Good	Bad	Very bad
Demographic and socioeconomic characteristics				
Age in years	0.92***	0.96***	1.01	1.02
Gender				
Men	0.55***	0.64***	1.29	1.40
Women	1	1	1	1
Ethnicity				
Estonian	3.20***	1.34**	0.93	1.57
Other	1	1	1	1
Education				
Lower secondary or less	0.31***	0.45***	1.19	0.92
Upper secondary	0.41***	0.62***	1.35	0.90
Post-secondary	1	1	1	1
Income				
I (lowest quartile)	0.75	0.54***	1.23	0.89
II	0.60*	0.71*	0.99	0.67
III	0.51***	0.59***	0.61	0.09*
IV (highest quartile)	1	1	1	1
Physical health characteristics				
Chronic or long-term illness	0.35***	0.65***	1.27***	1.24**
Limitations in daily activities				
Yes	0.13***	0.35***	4.46***	4.81*
No	1	1	1	1
Functional limitations	0.61	0.69***	1.43***	1.65***

Table 4 continued

	OR			
	Self-rated health			
	Very good	Good	Bad	Very bad
Psychological health characteristics				
Depression				
Yes	1.13	0.94	1.24	1.91*
No	1	1	1	1
Emotional distress				
Yes	0.55	0.47**	1.32	2.90**
No	1	1	1	1
Locus of control	0.64***	0.84**	1.15*	1.39*
Well-being characteristics				
Satisfaction with.	0.83	0.87	1.44***	1.16
Life in general				
Economic situation	0.78*	0.95	0.90	0.82
Physical shape and abilities	0.40***	0.68***	1.73***	4.01***
Close relatives	1.22	1.26**	0.92	0.92

Multinomial logistic regression with 'fair' self-rated health as reference category, mutually adjusted. Odds ratios (OR) and p values

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

References

Aittomäki A, Martikainen P, Laaksonen M, Lahelma E, Rahkonen O (2010) The associations of household wealth and income with self-rated health—a study on economic advantage in middle-aged Finnish men and women. Soc Sci Med 71:1018–1026

Aluoja A, Shlik J, Vasar V, Luuk K, Leinsalu M (1999) Development and psychometric properties of the emotional state questionnaire, a self-report questionnaire for depression and anxiety. Nord J Psychiatry 53:443–449

Apouey B, Clark AE (2009) Winning big but feeling no better? The effect of lottery prizes on physical and mental health. PSE working paper 09. Paris School of Economics, Paris

Babones SJ (2009) The consistency of self-rated health in comparative perspective. Public Health 123:199–201

Barger SD (2006) Do psychological characteristics explain socioeconomic stratification of self-rated health? J Health Psychol 11:21–35

Benyamini Y, Leventhal EA (1999) Self-assessment of health: what do people know that predicts their mortality? Res Aging 21:477–500

Breidablik HJ, Meland E, Lydersen S (2008) Self-rated health in adolescence: a multifactorial composite. Scand J Public Health 36:12–20

Denton M, Walters V (1999) Gender differences in structural and behavioral determinants of health: an analysis of the social production of health. Soc Sci Med 48:1221–1235

Dominick KL, Ahern FM, Gold CH, Heller DA (2002) Relationship of health-related quality of life to health care utilization and mortality among older adults. Aging Clin Exp Res 14(6):499–508

Dowd JB, Zajacova A (2010) Does self-rated health mean the same thing across socioeconomic groups? Evidence from biomarker data. Ann Epidemiol 20:743–749

Eriksson I, Unden AL, Elofsson S (2001) Self-rated health. Comparisons between three different measures. Results from a population study. Int J Epidemiol 30:326–333

Jylhä M (2009) What is a self-rated health and why does it predict mortality? Towards an unified conceptual model. Soc Sci Med 69:307–316

Jylhä M, Guralnik JM, Ferrucci L, Jokela J, Heikkinen E (1998) Is self-rated health comparable across cultures and genders? J Gerontol B Psychol Sci Soc Sci 58:144–152

Kaikkonen R, Rahkonen O, Lallukka T, Lahelma E (2009) Physical and psychosocial working conditions as explanations for occupational class inequalities in self-rated health. Eur J Public Health 19:458–463

Kaplan G, Baron-Epel O (2003) What lies behind the subjective evaluation of health status? Soc Sci Med 56:1669–1676

Kasmel A, Helasoja V, Lipand A, Prättäla R, Klumbiene J, Pudule I (2004) Association between health behaviour and self-rated health in Estonia, Finland, Latvia and Lithuania. Eur J Public Health 14:32–36

Katz P, Morris A, Gregorich S, Yazdany J, Eisner M, Yelin E, Blanc P (2009) Valued life activity disability played a significant role in self-rated health among adults with chronic health conditions. J Clin Epidemiol 62(2):158–166

Krause NM, Jay GM (1994) What do global self-rated health items measure. Med Care 32:930–942

Leinsalu M (2002) Social variation in self-rated health in Estonia: a cross-sectional study. Soc Sci Med 55:847–861

Mackenbach JP, Van den Bos J, Joung IMA, Van de Mheen H, Stronks K (1994) The determinants of excellent health: different from the determinants of ill-health? Int J Epidemiol 23:1273–1281

Manderbacka K, Lahelma E, Martikainen P (1998) Examining continuity of self-rated health. Int J Epidemiol 27:208–213

Manderbacka K, Lundberg O, Martikainen P (1999) Do risk factors and health behaviours contribute to self-ratings of health? Soc Sci Med 481:1713–1720

Manderbacka K, Kareholt I, Martikainen P, Lundberg O (2003) The effect of point of reference on the association between self-rated health and mortality. Soc Sci Med 56:1447–1452

Martinez-Sanchez E, Regidor E (2002) Self-rated health by education level in persons with and without health problems. J Health Psychol 7:459–468

Mitchell JM, Adkins RH (2009) Differences in predictors of self-rated health among people with and without a disability. J Rehabil 75:35–42

Oja L, Matsi A, Leinsalu M (2008) Estonian Health Interview Survey 2006: methodological report. Tervise Arengu Instituut, Tallinn. http://www2.tai.ee/ETeU/met_51.pdf. Accessed 15 August 2012

Perlman F, Bobak M, Steptoe A, Rose R, Marmot M (2003) Do health control beliefs predict behaviour in Russians? Prev Med 37:73–81

Pikhart H (2002) Social and psychosocial determinants of self-rated health in central and eastern Europe. Kluwer Academic Publishers, Boston

Pulvers KM, Kaur H, Nollen N, Greiner A, Befort CA, Hall S, Born W, Fitzgibbon ML, Ahluawalia JS (2008) Comparison of body perceptions between obese primary care patients and physicians: implications for practice. Patient Educ Couns 73:73–81

Rotter J (1966) Generalized expectancies for internal versus external control of reinforcements. Psychol Monogr Gen Appl 80(1):1–28

Schnittker J (2005) When mental health becomes health: age and shifting meaning of self-evaluations of general health. Milbank Q 83:397–423

Shaw I (2002) How lay are lay beliefs? Health 6:287–299

Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T, Baker R, Dunbar GC (1998) The Mini-

International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry 59:22–33

Shooshtari S, Menee V, Tate R (2007) Comparing predictors of positive and negative self-rated health between younger (24–54) and older (55+) Canadian adults. A longitudinal study of well-being. Res Aging 29:512–554

Smith A, Shelley JM, Dennerstein L (1994) Self-rated health: biological continuum or social discontinuity? Soc Sci Med 39:77–83

Tekkel M, Veideman T, Rahu M (2010) Changes over fourteen years in adult obesity in Estonia: socioeconomic status and use of outpatient health care services. Centr Eur J Publ Health 18:186–191

Turrell G (2000) Income non-reporting: implications for health inequalities research. J Epidemiol Community Health 54:207–214

Unden AL, Elofsson S (2001) Health from the patient's view: how does it relate to the physician's judgement? Fam Pract 18:174–180

Vågerö D, Kislitsyna O, Ferlander S, Migranova L, Carlson P, Rimachevskaya N (2008) Moscow health survey 2004–social surveying under difficult circumstances. Int J Public Health 53:171–179

Van Loon AJ, Tijhuis M, Picavet HS, Surtees PG, Ormel J (2003) Survey non-response in the Netherlands: effects on prevalence estimates and associations. Ann Epidemiol 13:105–110