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The Association Between Life Satisfaction and Self-Reported Health Status in Europe

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Abstract: Previous research has shown that life satisfaction (LS) and self-reported health status are strongly related to each other. However, it is not clear whether this association holds across different nations or whether certain country-level indicators significantly affect this association. The study was based on nationally representative samples of 32 countries from the first six rounds of the European Social Survey (N = 291 686). Results from hierarchical multilevel modelling indicated that there was a positive association between LS and self-reported health status across countries, but this association was slightly stronger in countries where governments spent less on the health care of their residents. Self-reported health ratings were also more strongly tied to LS judgements in countries where variability in LS ratings was larger. These results suggest that, especially in less wealthy European countries, policies should target reducing overall social inequality and the negative impact of governments' underinvestment in health care on LS. Copyright © 2015 European Association of Personality Psychology

Key words: life satisfaction; subjective well-being; self-reported health; cross-national comparison; European Social Survey

Subjective well-being (SWB) refers to people's evaluations of their lives—evaluations that are both affective and cognitive (Diener, 2000). It is known to be associated with many important outcomes in life, including physical health and longevity (Diener & Chan, 2011). The cognitive component of SWB, life satisfaction (LS), reflects an individual's reflective judgement of the degree to which his or her life is going well. To assess this component, measures of global LS or specific life domain satisfaction are often administered (Lucas & Diener, 2008). Global judgements of one's LS and satisfaction with important life domains can be considered separable from each other (Diener, 2000). Top–down models of LS posit that personality processes influence the general affective tone that a person experiences, and this general tendency colours all aspects of that person's life. Thus, happy people tend to be satisfied with all (or most) aspects of their lives, whereas unhappy people are satisfied with very few aspects of their lives, or none at all (Lucas & Diener, 2008). In bottom–up models, however, individuals are thought to construct global LS judgements by evaluating various domains in their lives (Schimmack, Diener, & Oishi, 2002). In order to arrive at an overall judgement of LS, people are thought to 'mentally calculate' satisfaction scores for each life domain and then aggregate across domains. Yet, the vast amount of information that one must aggregate does not allow for quick and efficient ratings of LS (Lucas & Diener, 2008); moreover, external variables (such as income and education) have been shown to account for a rather small amount of the variance in SWB reports (Diener, Suh, Lucas, & Smith, 1999). Nevertheless, researchers agree that LS judgements are based on accessible and relevant information (Schwartz & Strack, 1999) that can be accessed either chronically or temporarily (Schimmack et al., 2002). In this study, people's ratings of their general LS ratings are explored in relation to their ratings of self-reported health status across different European countries.

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Self-reported health

Many different approaches to SWB research have included health (along with financial situation, job, family, etc.) in the list of important life domains that are central to LS ratings (e.g. Cummins, 1996; Schimmack, Diener, & Oishi, 2002; van Praag, Frijters, & Ferrer-i-Carbonell, 2003). Good health is obviously one of the most important things to people, and thus, health status is often seen as an important source of information that people use when constructing their global or overall LS evaluation. However, *health* does not necessarily point to people's 'true' medical status but rather to how they perceive their health. A person may perceive having rather poor health but nevertheless be satisfied with it, thinking that 'things could always be worse' or knowing that things have already been much worse in the past. This was demonstrated by Greco and colleagues (2015), who studied patients with cardiovascular disease. They found that illness severity had a negative impact on patients' health satisfaction but that this effect disappeared when patients perceived their illness and its treatment more positively. The opposite could also be true—a person without any serious illness or disability can blow benign physical symptoms out of proportion, and have negative feelings about their health. In the most extreme cases, the anxious misinterpretation of bodily symptoms

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can lead to hypochondriasis or somatization disorder (American Psychiatric Association, 1994).

Research has shown that the way people perceive their health may matter even more than their actual medical condition. Namely, correlations between health and SWB are relatively strong when measures of self-reported health status are used (which usually reflect people's overall perception of their health) but are weaker and less stable when medical information or other external, so-to-say more 'objective', health measures of specific disorders are examined (Diener et al., 1999; Røysamb, Tambs, Reichborn-Kjennerud, Neale, & Harris, 2003). Moreover, although self-reported health data may be subject to different biases (Bauhoff, 2011), self-reports of health have nevertheless been shown to predict mortality over and above more objective health measures (cf. Idler & Benyamini, 1997; cf. Lucas & Diener, 2008). Thus, self-reported health status is considered to be a quite reliable (not to mention inexpensive) measure of individuals' health status, at least in the general population (e.g. Idler, Hudson, & Leventhal, 1999; Wu et al., 2013). Although the subjective nature of self-rated health should not be exaggerated (Kunst, Geurts, & van den Berg, 1995), it is, nevertheless, important to know which are the factors that often influence how people report their general health status.

Earlier research has shown that factors reflecting the current experience of physical, functional, and psychological health are more strongly related to self-reported health status than factors related to previous experience, such as earlier medical history (Benyamini, Leventhal, & Leventhal, 1999; Pinquart, 2001). More specifically, low self-reported health status is associated with depression and negative affect (Pinquart, 2001), somatic symptoms, medication use, chronic conditions, and functional ability (French et al., 2012; Verropoulou, 2009). However, self-reported health has been shown to benefit from positive affect and physical as well as social activity (Benyamini et al., 1999; Benyamini, Idler, Leventhal, & Leventhal, 2000).

It has been also shown that social and socioeconomic factors, such as education (Verropoulou, 2009) and social support and networks (Elgar, Davis, Wohl, Trites, Zelenski, & Martin, 2011), have a notable impact on self-reported health. These so-called social determinants (Prus, 2011) are often interrelated. For example, higher education is thought to be positively associated with better self-rated health through more full-time employment, higher income, enhanced psychosocial resources, and healthy lifestyle behaviours (Prus, 2011). The influence of income is also multifaceted: it has been suggested that wealth buffers well-being against the detrimental effects of declining health (Smith, Langa, Kabeto, & Ubel, 2005) and might help to overcome long waiting times for access to certain health care (Prus, 2011). Low income, however, exacerbates the emotional pain associated with ill health (Kahneman & Deaton, 2010). Additionally, income disparity itself could also lead to poor health, because it reduces levels of interpersonal trust and reciprocity within communities (Kawachi, 1999).

The evidence cited earlier also points to the importance of the affective experiences and disposition of a person, and his or her overall outlook on life. As an example, health satisfaction can be predicted by the personality trait Neuroticism, which is a disposition to experience more negative feelings and cognitions (Brief, Butcher, George, & Link, 1993). Emotional experiences and personality traits are thought to mediate the association between self-reported health and the medical status of an individual. While negatively valenced affect has been shown to exacerbate the negative impact of health events on health satisfaction, positively valenced affect helps to attenuate the association between illness and lower health satisfaction (Whitehead & Bergeman, 2013). Research has even shown that the relationship between a person's perception of their health and their general view on life is, to a certain extent, driven by common genes (Røysamb et al., 2003). Similarly to SWB (Lykken & Tellegen, 1996; Nes, Røysamb, Tambs, Harris, & Reichborn-Kjennerud, 2006), genetic factors account for a considerable amount of the variance in self-rated health status (Christensen, Holm, McGue, Corder, & Vaupel, 1999; Røysamb et al., 2003).

In short, self-reported health status reflects many essential aspects of an individual's life and should therefore be a powerful indicator of satisfaction with one's life. Later, however, we describe why analysing such data only at the level of the individual without taking into account the wider context might underestimate the complexity of the association between LS and self-reported health status.

The reasons behind cross-national variability in LS and self-reported health

Several cultural and societal factors have been shown to affect SWB—a nation's wealth as well as cultural norms for positive emotions and appropriate goals (Diener, 2000; Diener, Oishi, & Lucas, 2003). On the other hand, culture and socioeconomic status influence health evaluations and beliefs about disease (Staudinger, Fleeson, & Baltes, 1999). There is also evidence that public general health is affected by countries' social structures—for example, by income inequality (for review, see Subramanian & Kawachi, 2004). Both LS and self-reported health ratings have somewhat different determinants, depending on the level of countries' socioeconomic development. For example, Diener and Biswas-Diener (2002) showed, in their review article, that the correlation between income and SWB is much smaller in economically developed nations than in countries with low levels of wealth. Similarly, Semyonov and colleagues (2013) argued that a more equal distribution of economic resources (i.e. greater egalitarianism) does not raise the average health level of the population but weakens the tie between wealth and self-rated health status (Semyonov, Lewin-Epstein, & Maskileyson, 2013). The strength of the association between LS and self-reported health might, therefore, also vary according to particular country-level economic or social indicators. However, instead of overall economic or human development level, we argue that it is even more important to analyse how countries' economic resources are distributed in terms of public health financing.

Most of the countries belonging to the Organization of Economic Cooperation and Development (OECD) have

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universal health insurance coverage through the public sector (Self & Grabowski, 2003). However, the proportion of the budget spent on public health is quite different across countries, and it is not necessarily related to the overall economic development level of the country. For example, the USA has one of the lowest shares of public spending on health among the OECD countries, similar to Chile and Mexico (OECD Health Statistics, 2014). It is interesting to note that large per capita public health expenditures seem to have almost no effect on improving health (as measured by the disability-adjusted life expectancy indicator) in wealthy countries, and at higher levels of public sector involvement in health, diminishing returns are seen to set in (Self & Grabowski, 2003). The overall health status of citizens of highly developed countries is already quite close to its potential—meaning that most people in these countries have a relatively long life without serious health conditions that would disable or limit their everyday activities. Therefore, additional investments in public health do not (or even cannot) have a large additional effect. However, public health spending has been shown to be effective in middle-income and lower-income countries, where the extent of public sector involvement in health is much lower than it is in wealthy countries (Self & Grabowski, 2003). Moreover, there is evidence that, in less wealthy countries, the poor are more strongly affected by public spending on health care than richer people, because they are more likely to obtain health care from publicly provided facilities, whereas wealthier individuals have the opportunity to rely more on private resources (Gupta, Verhoeven, & Tiongson, 2003).

Both sets of findings described earlier—weaker ties between SWB and income as well as public health spending and health status in wealthy countries—seem to be partially explained by the phenomenon of diminishing marginal utility or diminishing returns. We speculate that self-reported health status could have a similar effect—decreasing marginal utility—for LS levels. It is possible that if self-reported health status is increased, there comes a point where it will become less 'productive' for LS, and therefore, there will be a decrease in the marginal return of better self-reported health status (see Cramm & Nieboer, 2015, where the authors took a similar approach in describing the association between SWB and social capital). Thus, we hypothesize that individuals' self-reported health status and LS are less strongly related in countries with more effective healthcare systems and/or where larger amounts are invested in public health (Hypothesis 1).

Another reason why, in wealthy countries, the correlation between LS and health ratings might be lower is related to the relative equality, or small variance, in LS judgements in those countries. Namely, previous studies have demonstrated that in addition to the differences in the mean levels of LS, countries also systematically differ in the degree of variance in LS ratings—a phenomenon that has also been called 'happiness inequality' (Ott, 2005; Veenhoven, 2005). There is, in fact, a strong negative correlation between the mean level of LS and the variability in its ratings—higher mean levels of LS are associated with less variance or so-called equality in LS ratings (Ott, 2005). This could, partly, have a technical reason—in the case of bounded scales, the standard deviation (*SD*) is related to the mean of the variable. Namely, *SD* tends to decrease when the mean moves towards the scale end-points (Delhey & Kohler, 2012). However, cross-national differences in LS (or happiness) variability have also been found to have theoretically meaningful correlates. For example, LS has been shown to be associated with the economic development level of nations (Clark, Flèche, & Senik, 2014). Economic growth apparently leads, eventually, to higher levels of SWB and also to convergence in SWB ratings, by way of a better distribution of benefits (such as social security) across the entire population (Ott, 2005). According to Veenhoven (2005), inequality in happiness may be a good indicator of overall inequity in society and possibly a better indicator than income disparities. The latter, however, is disputed by Delhey and Kohler (2011), who have argued that inequalities in happiness and in income are related to each other because, in countries where economic resources are unequally distributed (e.g. Latin American countries), subjective appreciation of life-as-a-whole tends to be rather unequal, too.

Studies have also reported cross-country variation in the size of health differences (Kunst, et al., 1995). Evidence suggests that health inequalities are sensitive to social and economic policy differences (Kunst, et al., 1995). Although variance is in itself an important piece of information (i.e. reflecting overall inequity in society), cross-nationally differing variance can also cause problems, because when a correlation coefficient between variables is calculated on the basis of restricted variances, it could result in a reduction in correlations (Allik, Realo, Mõttus, Esko, Pullat, & Metspalu, 2010; Sackett & Yang, 2000). Therefore, we postulate the second hypothesis of this study: any weaker within-country association between LS and self-reported health status is related to smaller variance in LS and self-reported health status ratings (Hypothesis 2).

The present study

The main aim of this study is to examine the association between LS and self-reported health status across European countries and to find out which contextual or country-level indicators may influence this association. Our research focused on three questions. First, are there national differences in how strongly ratings of self-reported general health status relate to global judgements of LS? As we argue earlier, it is possible that people from different countries assess their health status differently in deciding how satisfied they are with their lives in general. Second, if there indeed is relevant variance in the association between LS and self-reported health status across European nations, our second aim is to examine the contribution of countries' public health financing [countries' per capita government expenditure on health as well as the share of spending on public health in gross domestic product (GDP)] to the strength of the within-country associations between LS and self-reported health status. The third aim of this study is to examine if the variation in the magnitude of within-country correlations between LS and self-reported health status across Europe could be due

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to methodological reasons—that is, due to unequal distributions of mean LS and subjective health ratings across countries. The issue of unequal variances is, in the present research, addressed by examining within-country *SD*s. According to Kalmijn and Veenhoven (2005), for instance, the degree of dispersion of item responses (which are often expressed as the *SD*) is suitable for measuring inequality in LS. Thus, within-country *SD*s of LS as well as self-reported health will also be examined as country-level moderators of the association between individuals' LS and self-reported health in multilevel modelling.

The present research has two noteworthy methodological strengths. First, we analyse the cumulative dataset of the first six rounds of the European Social Survey (ESS), which involves representative samples from, altogether, 32 European countries. Using the cumulative dataset instead of data from a single ESS wave significantly increases sample power. Second, to the best of our knowledge, no other study has previously explicitly analysed the association between LS and self-reported health status cross-nationally, while taking into account the context of countries' healthcare expenditure, as well as the systematically unequal distributions of dependent variables. In order to properly take into account the contextual level (without ignoring the level of individuals), we will examine the association between LS and self-reported health status by multilevel modelling, which has many benefits in dealing with nested, cross-level data (Nezlek, 2001). For example, it more accurately models the true associations between the outcome and the predictors, as well as cross-level interactions, helping to disentangle individual and group effects on the outcome of interest (Osborne, 2000).

METHOD

Sample

The analyses are based on the biennial multi-country survey —the ESS (http://www.europeansocialsurvey.org). The ESS is an academically driven multi-country survey, which has been administered in altogether 36 countries in the first six data collection rounds, which started in 2002. The current study analyses the ESS cumulative file that contains data from countries that have been included in the ESS in at least two rounds: Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, the Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the Ukraine, and the UK (European Social Survey Cumulative Rounds 1-6 Data, 2014; retrieved from http://www.europeansocialsurvey.org/downloadwizard). Across these 32 countries and six rounds, there were, altogether, 291 686 participants (in Round 1—42 359; in Round 2—49 066, in Round 3—43 000, in Round 4—52 626, in Round 5—52 458, and in Round 6—52 177 participants). The total sample sizes in each country ranged from 1331 (in Iceland) to 17 445 (in Germany) (for sample characteristics, please see Supporting Information Table S1). The overall mean age of participants was 48 years ($SD = 19$), and approximately 54% of all individuals were females. The survey involves strict random probability sampling and rigorous translation protocols (Dorer, 2012).

Materials

The ESS is an hour-long face-to-face interview. All of the individual-level items and country-level variables described were retrieved from the ESS core questionnaire, and data were downloaded from the ESS Cumulative Data Wizard (retrieved from http://www.europeansocialsurvey.org/downloadwizard).

Individual-level indicators

Based on earlier research (e.g. Deaton, 2008; Pinquart & Sörensen, 2000; Steptoe, Deaton, & Stone, 2015), we controlled for age, gender, and education when analysing the associations between the ratings of LS and self-reported general health status at the level of individuals within each country.

Life satisfaction (LS). The overall LS of each participant was assessed using the following single item: 'All things considered, how satisfied are you with your life as a whole nowadays?' (question B20). This item was answered on an 11-point Likert-like scale, ranging from 0 (*extremely dissatisfied*) to 10 (*extremely satisfied*). The highest overall LS (the average score of all six rounds) was found to be in Denmark ($M = 8.47$, $SD = 1.51$) and the lowest in the Ukraine ($M = 4.49$, $SD = 2.56$). According to an analysis of variance, residents of European countries differ significantly in their LS judgments: $F(31, 289\,909) = 1938.57$, $p < .001$, $\eta^2 = .17$. The country-level correlations of mean LS ratings across different rounds were relatively high, ranging from $r = .84$ to .98 ($ps < .001$; please see Supporting Information Table S2 for mean ratings of LS across ESS rounds 1 to 6).

Self-reported health status. Participants' subjective general health status was measured by the following item: 'How is your health in general?' (question C7). This item was answered on a 5-point scale from 1 (*very good*) to 5 (*very bad*). For this study, the scale was reversed so that higher scores indicated better subjective health. As shown in Supporting Information Table S3, countries' overall means of self-reported health status ranged from $M = 3.05$ in Ukraine ($SD = 0.88$) to $M = 4.18$ in Ireland ($SD = 0.81$). There was a significant variance in the ratings of self-reported health across the 32 ESS countries: $F(31, 291\,197) = 987.29$, $p < .001$, $\eta^2 = .10$. Country-level correlations of mean self-reported health ratings across different rounds were high, ranging from $r = .90$ to .99 ($ps < .001$).

Country-level indicators

We analysed four nation-level indicators: two of them describe countries' government expenditure on public health, and the remaining two represent within-country variability in the ratings of LS and self-reported health status.

Government expenditure on health, per capita (GGHE). This is a core indicator of health financing systems. This indicator contributes to an understanding of the relative

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level of public spending on health on the beneficiary population, expressed in international dollars to facilitate international comparisons. Each country's GGHE for purchasing power parity in international dollars for the years 2002, 2004, 2006, 2008, 2010, and 2012 was retrieved from the World Health Organization (WHO) Global Health Observatory database (from the online database at http://apps.who.int/gho/indicatorregistry/App_Main/view_indicator.aspx?iid=108). The correlations between the figures across the 10 years were high (correlations ranged from .95 to .99). For each country, the mean GGHE score was calculated on the basis of these six figures. Among the 32 ESS countries, mean GGHE indices ranged from 281.83 international dollars in the Ukraine to 5055.50 international dollars in Luxembourg (see Table 1). A very important factor in explaining differences across countries in the level of and growth in total healthcare expenditure is income (per capita GDP) (Xu & Saksena, 2011), but demographic structure, health systems characteristics, and disease pattern have also been found to contribute to government health expenditure.

Public health expenditure (% of GDP). The share of spending on public health in a country's GDP is considered to be a fairly good indicator of the effectiveness of a country's healthcare system. Each country's public health expenditure as a proportion of GDP for the years 2002, 2004, 2006, 2008, 2010, and 2012 was retrieved from the WHO Global Health Expenditure database (retrieved from the online database at http://data.worldbank.org/indicator/SH.XPD.PUBL/countries). The correlations between the figures across the 10 years were quite high (correlations ranged from .82 to .98). For each country, the mean public health expenditure share (HEP) score was calculated from these six figures. Among the 32 ESS countries, mean HEP proportions ranged from 3.32% in Russia to 10.09% in the Netherlands (see Table 1).

Variability in LS ratings. Countries' standard deviations of LS ratings ranged from 1.51 in Denmark to 2.99 in Turkey, with an overall mean *SD* of 2.37 (for information about other countries, see Supporting Information Table S2). Country-level correlations between *SD*s of LS ratings from the different ESS rounds ranged from $r = .83$ to .98 ($ps < .001$).

Variability in self-reported health status ratings. Countries' *SD*s of self-reported health status ratings ranged from 0.76 in the Netherlands to 1.10 in Croatia, with an overall mean *SD* of 0.94 (for information about other countries, see Supporting Information Table S3). Country-level correlations between *SD*s of self-reported health status ratings from the different ESS rounds ranged from $r = .84$ to .94 ($ps < .001$).

Table 1. The association between life satisfaction and self-reported health across 32 European Social Survey countries (rounds 1–6), and country-level indicators

Country	Partial correlation between LS and SRH†	Mean GGHE per capita ††	Mean HEP (% of GDP) ††
Austria	.32*	2995.17	8.42
Belgium	.27*	2596.50	8.19
Bulgaria	.26*	503.17	4.18
Croatia	.27*	1072.67	5.82
Cyprus	.21*	840.00	3.44
Czech Republic	.30*	1412.17	6.34
Denmark	.28*	3228.50	9.42
Estonia	.33*	814.83	4.62
Finland	.32*	2144.17	6.82
France	.27*	2777.67	8.98
Germany	.31*	2911.50	8.64
Greece	.18*	1530.50	6.22
Hungary	.28*	998.33	4.98
Iceland	.34*	2772.00	7.28
Ireland	.26*	2415.17	6.00
Israel	.23*	1213.67	4.40
Italy	.23*	2161.17	7.10
Lithuania	.31*	788.50	4.35
Luxembourg	.32*	5055.50	5.99
Netherlands	.28*	3167.83	10.09
Norway	.31*	4097.50	7.90
Poland	.29*	780.50	4.67
Portugal	.20*	1559.17	6.36
Russia	.26*	552.33	3.32
Slovakia	.27*	1076.00	5.68
Slovenia	.27*	1621.33	6.70
Spain	.23*	1849.00	6.67
Sweden	.39*	2759.50	7.78
Switzerland	.31*	2935.00	7.52
Turkey	.18*	550.67	4.14
Ukraine	.24*	281.83	4.14
UK	.26*	2374.67	7.79
All countries	.33*	1932.39	6.12

Note: LS, life satisfaction; SRH, self-reported health; GGHE, mean per capita government expenditure on health (at purchasing power parity, in international dollars) (data source: World Health Organization; retrieved from http://apps.who.int/gho/indicatorregistry/App_Main/view_indicator.aspx?iid=108, 10 June 2015); HEP, public health expenditure (% of GDP) (data source: World Health Organization Global Health Expenditure database; retrieved from http://data.worldbank.org/indicator/SH.XPD.PUBL/countries, 10 June 2015); post-stratification weight (including design weight) was applied.

†Partial correlations were calculated controlling for age, gender, and education.

††Means are calculated based on years 2002, 2004, 2006, 2008, 2010, and 2012.

*$p < .001$.

RESULTS

The association between LS and self-reported health

First, we calculated correlation coefficients between the ratings of LS and self-reported health status both at the level of individuals and countries. At the level of the 285 086 individuals, the partial correlation between the ratings of LS and self-reported health status (while controlling for age, gender, and education) was $r = .34$ ($p < .001$). However, at the level of the 32 countries, the correlation between nations' aggregated scores of LS and self-reported health status (across all available rounds of the ESS) was remarkably larger, $r = .79$ ($p < .001$; please see Figure 1 for a graphical representation of the association between countries' mean LS and self-reported health levels). The within-country partial correlations (controlling for age, gender, and education) between

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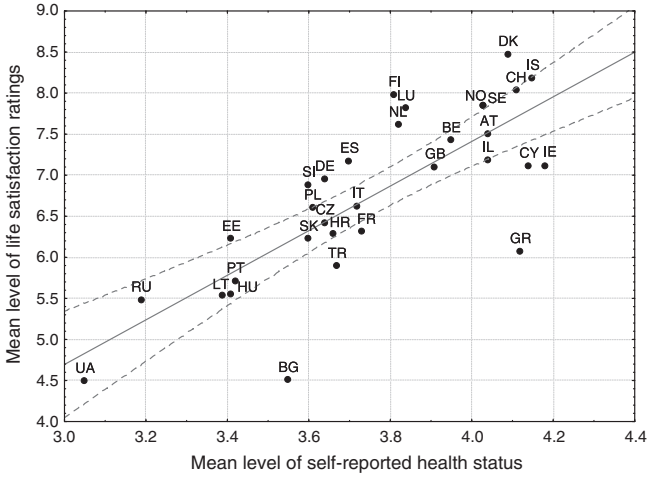

Figure 1. Scatter plot of the association between the national mean levels of self-reported health status and life satisfaction ratings across 32 countries in the European Social Survey, from the first six data collection rounds (bands refer to a confidence interval of 95%). Each dot represents a country (country abbreviation codes are shown above each dot): AT, Austria; BE, Belgium; BG, Bulgaria; CH, Switzerland; CY, Cyprus; CZ, Czech Republic; DE, Germany; DK, Denmark; EE, Estonia; ES, Spain; FI, Finland; FR, France; GB, United Kingdom; GR, Greece; HR, Croatia, HU, Hungary; IE, Ireland; IL, Israel; IS, Iceland; IT, Italy; LT, Lithuania; LU, Luxembourg; NL, Netherlands; NO, Norway; PL, Poland; PT, Portugal; RU, Russian Federation; SE, Sweden; SI, Slovenia; SK, Slovakia; TR, Turkey; UA, Ukraine.

LS and self-reported health status are shown in Table 1. Correlations ranged from $r = .18$ in Turkey to $r = .39$ in Sweden (all correlations significant at $p < .001$); these two correlations were significantly different from each other ($z = -12.75$, two-tailed $p < .0001$).

Multilevel analysis

In order to find out if the individual-level association between LS and self-reported health status is moderated by any of the four aforementioned country-level indicators, we conducted hierarchical linear modelling (HLM 6.02; Raudenbush & Bryk, 2002). First, an unconditional model (Model 0) of LS (without any predictors) indicated that 17.5% of the variance in LS lies between countries, which is consistent with the result of the ANOVA ($\eta^2 = .17$). Therefore, it was reasonable to proceed with multilevel analyses—hierarchical linear modelling is generally suggested when the between-country variance is greater than 10% of the total variance (Lee, 2000). Thus, we added self-reported health status as a single predictor of LS to the individual level (or Level 1) of the model first (the predictor was added group-mean centred).[1] Model 1 was the following:

$$LS_{ij} = \beta_{0j} + \beta_{ij}(health) + r_{ij}$$

In this model, *health* (i.e. self-reported health status) refers to the Level 1 predictor (not in the sense of a causal relationship), β_{0j} refers to the intercept of LS in country j (Level 2), β_{1j} is the slope of the association between the Level 1 predictor *health* and LS in group j, and r_{ij} refers to the random errors in prediction for the Level 1 equation.

As expected on the basis of previous correlation analyses, the effect of self-reported health status on LS judgements at Level 1 was positive and significant, $\beta = 0.71$ ($t = 25.45$, $df = 31$, $p < .001$; see Table 2, Model 1). Self-reported health ratings explained about 9% of the individual-level variance in LS. This association remained in the same magnitude also when individual-level control variables (age, gender, and education) were taken into account (in Model 2). Therefore, in general, it can be concluded that the higher the individual's self-reported health status, the higher his or her LS, and vice versa. The strength of the association between average country-level ratings of LS and self-reported health status was significantly different across countries ($\chi^2 = 709.92$, $p < .001$), which means that it is appropriate to examine possible moderators of the association between LS and self-reported health status at Level 2 (i.e. the between-country level).

Country-level moderators

All Level 2 moderators—government health expenditure per capita (GGHE), share of public health expenditure (% of GDP), and variance in LS judgements as well as in self-reported health ratings—were entered separately into subsequent models (Models 3 to 6). All moderators were added grand mean centred and were standardized before they were entered into the models. At the level of individuals, demographic control variables (age, gender, and education) were taken into account.

Intercept and slope models at Level 2 were the following:

$$\beta_{oj} = \gamma_{00} + \gamma_{01}(\mathrm{GGHE})_{j0} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\mathrm{GGHE})_{j} + u_{1j}$$

Here, γ_{00} refers to the overall intercept (the grand mean of the scores on the dependent variable across all groups), GGHE or government expenditure on health per capita is the Level 2 moderator, γ_{01} refers to the overall regression coefficient (or the slope) between LS and the Level 2 moderator, u_{0j} refers to the random error component for the deviation of the intercept of a group from the overall intercept, γ_{10} refers to the overall regression coefficient or the LS—self-reported health slope, γ_{11} is the association or interaction between the Level 2 moderator and the LS—self-reported health slope, and u_{1j} refers to the error component for the slope.

Results for Model 3 (in Table 2) show that the countries' government health expenditure per capita significantly influenced the association between LS and self-reported health status. Government expenditure on health care per capita explained 12% of the variance in the association between LS and self-reported health status. The moderating effect of this was negative ($\gamma = -0.05$), meaning that the association between self-reported health status and LS judgements is weaker in countries where governments' expenditure on public health care is larger (and in countries that are also

[1]Please note that in the following models, for technical reasons, LS is treated as the outcome, whereas self-reported health is the predictor, but as this is a cross-sectional study, the actual causal relationship between LS and self-reported health is unknown.

DOI: 10.1002/per

Table 2. The association between life satisfaction and self-reported health in the context of country-level variables: Results from hierarchical linear models

	Fixed		Random	
	Coefficient (*SE*)	*T* ratio	Variance component	χ^2
Model 1: Intercept of LS, γ_{00}	6.76 (0.18)	38.02***	1.04	65 446.59***
Predictor of LS at L1:				
Self-reported health, β_1	**0.71** (0.03)	**25.45*****	0.03	1 271.57***
Model 2: Intercept of LS, γ_{00}	6.78 (0.18)	38.10***	1.05	63 872.83***
Predictors of LS at L1:				
Self-reported health, β_1	**0.74** (0.02)	**31.41*****	0.02	709.92***
Age, β_2	0.01 (0.001)	4.79***	0.00	892.30***
Gender, β_3	0.11 (0.02)	7.17***	0.01	124.09***
Education, β_4	0.02 (0.01)	3.53**	0.00	970.10***
Moderator models of LS—Self-reported health association at L2†:				
Model 3: Intercept of LS, γ_{00}	6.78 (0.13)	52.95***		
For LS intercept: GGHE, γ_{01}	0.44 (0.10)	4.27***	0.55	33 852.42***
For self-reported health slope: GGHE, γ_{11}	**−0.05** (0.02)	**−2.49***	0.02	614.58***
Model 4: Intercept of LS, γ_{00}	6.78 (0.15)	46.82***		
For LS intercept: HEP, γ_{01}	0.38 (0.09)	4.31***	0.70	42 947.84***
For self-reported health slope: HEP, γ_{11}	−0.04 (0.02)	−1.70	0.02	625.40***
Model 5: Intercept of LS, γ_{00}	6.78 (0.10)	66.60***		
For LS intercept: Variance of LS, γ_{01}	−0.64 (0.07)	−9.56***	0.35	20 677.68***
For self-reported health slope: Variance of LS, γ_{11}	**0.07** (0.02)	**2.92****	0.01	505.89***
Model 6: Intercept of LS, γ_{00}	6.78 (0.19)	36.67***		
For LS intercept: Mean variance in self-reported health, γ_{01}	0.13 (0.13)	1.03	1.14	69 674.65***
For self-reported health slope: Mean variance in self-reported health, γ_{11}	−0.03 (0.02)	−1.27	0.02	729.04***

Note: L1, Level 1 or within-country level of the model; L2, Level 2 or between-country level of the models; EM status, ethnic minority status; LS, life satisfaction; GGHE, mean per capita government expenditure on health (at purchasing power parity, in international dollars), mean of 2002–2012 (data source: World Health Organization; retrieved from http://apps.who.int/gho/indicatorregistry/App_Main/view_indicator.aspx?iid=108, 10 June 2015); HEP, public health expenditure (% of GDP), mean of 2002–2012 (data source: World Health Organization Global Health Expenditure database; retrieved from http://data.worldbank.org/indicator/SH.XPD.PUBL/countries, 10 June 2015); post-stratification weight (including design weight) was applied.

†In these models, LS is predicted by self-reported health and control variables (age, gender, and education) at the level of individuals (i.e. Level 1).

*$p < .05$.**$p < .01$.***$p < .001$. Values in bold indicate the statistically significant ($p < .05$) predictors of LS (at Level 1) and moderators of the association between LS and self-reported health (at Level 2).

richer because, as noted earlier, government health expenditure per capita is strongly related to countries' wealth, based on GDP per capita). However, countries' public health spending as a share of GDP was not a significant moderator of the association between LS and self-reported health status[2] (see Model 4 in Table 2). Thus, we found some support for Hypothesis 1, namely, that individuals' self-reported health status and LS are indeed more weakly related in countries where government expenditure on public health care per capita is larger[3] but not in countries with a larger share of GDP spent on public health.

Next, we test Hypothesis 2, according to which we expect a potentially weaker within-country association between LS and self-reported health status to be related to smaller variance in LS and self-reported health status ratings. The intercept and slope models at Level 2 were identical to those described earlier, except for the different moderators (average *SD*s of LS and self-reported health). Results for Models 5 and 6 are presented in Table 2 and demonstrate that the average variance in LS judgements significantly influenced the association between LS and self-reported health status, explaining about 25% of the variance in that association. The moderating effect of variance in LS was $\gamma = 0.07$, meaning that the association between LS and self-reported health status is indeed weaker in countries with less inequality (or smaller variance) in LS ratings. The country-level mean variance in self-reported health ratings was unrelated to the association between LS and self-reported health status, and did not significantly relate to any of the other country-level indicators (see Table 3 for the correlations between country-level indicators). Thus, we found only partial support also for Hypothesis 2, with the association between LS and self-reported health status being weaker only in countries with smaller inequality in LS ratings but not in self-reported health status ratings.

Next, we were interested in which of the two significant country-level moderators—health expenditure per capita and mean variance (*SD*) in LS judgements—was more strongly related to the association between LS and self-reported health. As these two nation-level indicators were

[2]However, when Turkey (i.e. the country with the weakest within-country association between LS and self-reported health, $r = .18$) was left out of the multilevel analysis, as a potential outlier, this indicator showed a tendency towards a negative moderating effect ($\gamma = -0.04$, $p = .054$). Thus, in countries where spending on public health care as a share of GDP was smaller, individuals' self-reported health was slightly more strongly associated with being satisfied with life.

[3]It should be noted, however, that there were also a couple of important exceptions to this general trend, as the highest within-country correlation between LS and self-reported health was, contrary to our expectations, in Sweden, which spends relatively large amounts of money on public health per capita (ranks 10th in GGHE among the 32 countries), and the weakest was in Turkey, where the government's expenditure on public health per capita is one of the lowest (29th) among the 32 European countries.

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Table 3. The associations between country-level indicators

	1	2	3	4
1. Mean GGHE per capita	–			
2. Mean HEP (% of GDP)	.81*	–		
3. Mean variance in LS ratings	−.68*	−.61*	–	
4. Mean variance in self-reported health	−.24	−.16	.33	–

Note: LS, life satisfaction; GGHE, mean per capita government expenditure on health (at purchasing power parity, in international dollars), mean of 2002–2012 (data source: World Health Organization; retrieved from http://apps.who.int/gho/indicatorregistry/App_Main/view_indicator.aspx?iid=108, 10 June 2015); HEP, public health expenditure (% of GDP), mean of 2002–2012 (data source: World Health Organization Global Health Expenditure database; retrieved from http://data.worldbank.org/indicator/SH.XPD.PUBL/countries, 10 June 2015).
*$p < .001$.

rather strongly correlated with each other ($r = -.68$, $p < .001$; see Table 3), it is, unfortunately, difficult to disentangle their effects. However, when these indicators were tested in the same multilevel model, only the effect of the variance in LS ratings remained significant ($\gamma = 0.06$, $p < .05$).

DISCUSSION

SWB is a measure of the quality of life of an individual and of a society (Diener, et al., 2003), and satisfaction with important life domains is one of the components of SWB (Diener, 2000). The goal of the present study was to carry out a cross-national analysis of the association between satisfaction with life and one of the important life domains—subjective health. As ratings of global subjective health are used in several major surveys (the ESS, The Midlife Development in the U.S. Survey, The U.S. National Health Interview Survey, etc.), it is important to understand those aspects that influence the association between ratings of self-reported health status and being satisfied with life. Consistent with our expectations as well as with previous research (e.g. Diener et al., 1999; Røysamb et al., 2003), self-rated good health was significantly related to being more satisfied with life. According to the top–down model of LS, happy people tend to be satisfied with all aspects of their lives (Lucas & Diener, 2008), including their health.

Our findings showed that the strength of the association between LS and self-reported health status varied significantly across nations—in some countries (e.g. in Portugal), self-reported health ratings had a smaller role in LS judgements, whereas in others (e.g. in Estonia), the association was somewhat stronger. Multilevel linear modelling suggested that one country-level indicator that to some degree influences the strength of this association is how much money (per capita) governments in different countries spend on public health. As noted earlier, income or GDP per capita has been identified as an important factor in explaining differences across countries at the level of government healthcare expenditure (Xu & Saksena, 2011). More specifically, we found that the more countries' governments invest in health care (and the richer they are), the weaker the association between LS and self-reported health ratings. Our second contextual variable, the share of GDP spent on public health, however, did not significantly moderate the association between LS and self-reported health status.[4] Therefore, we found partial support for our first hypothesis. Nevertheless, our results are, to some degree, in accordance with previous studies showing that, at high levels of economic development and greater egalitarianism, the relationship between wealth and health (Semyonov et al., 2013), as well as between income and SWB (Diener & Biswas-Diener, 2002), weakens. Considering the fact that residents of wealthy and highly developed countries are likely to have good (as well as equal) access to health care, their overall outlook on life might not be dramatically influenced by subjectively deteriorating health. Effective welfare systems seem to make people more resistant to health setbacks. As a result, a person can maintain a good outlook on life and a decent standard of living even in the face of illness. But, if a country struggles to provide the necessary health services to its residents, falling ill could have catastrophic consequences for an individual, because all of his or her out-of-pocket resources might be put into health care.

However, the second hypothesis of this study stated that cross-national differences in the association between LS and health ratings are associated with different variances of the variables under study. Indeed, similarly to previous research (Kalmijn & Veenhoven, 2005; Veenhoven, 2005; Ott, 2005), we found that within-country variances in LS judgements were systematically different across nations—the dispersion of LS ratings was the most restricted in countries where satisfaction with life was very high. And when variance in variables (such as the variance in LS in highly developed countries) is restricted, it can result in significant reductions in correlations (cf. Allik et al., 2010; Sackett & Yang, 2000; etc.). Therefore, it is possible that the weaker associations between LS and self-reported health status in some of the highly developed countries in our study were at least partly caused by their small (i.e. restricted) within-country variances in LS judgements. The second hypothesis also seems to be confirmed by the finding that country-level inequality (or equality) in LS judgements explained an even greater proportion of variance in the association between LS and health ratings than government expenditure on health care. Cummins (2003) has provided a somewhat different explanation, arguing that under normal conditions, there is a very weak association between external life conditions and LS, because under normal circumstances, most people maintain their LS by means of internal homeostatic control. But this changes as the level of LS for a population sample falls below 70% of the scale maximum scores. When some external conditions gain control of LS, both start to share

[4]There was a tendency towards a significant effect at $p < .05$, but only when Turkey—a country only marginally European—was left out of the analysis as a potential outlier. In the case of Turkey, the association between LS and self-reported health was unexpectedly weak. It can be speculated that there are some contextual factors—related to religion, cultural traditions, or the situation of human rights—that differentiate Turkey from most of the other European countries and, at the same time, also significantly influence the association between overall LS and self-reported health status.

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variance, and so the correlation becomes manifest or increases in size (Cummins, 2003). As a result, the correlation between a population's LS and an external variable is stronger when the mean LS is lower, and the variance in LS is larger. However, it was intriguing to find that the country-level variance in self-reported health ratings did not seem to follow a similar systematic pattern—it was not related to the association between LS and self-reported health, nor was it related to governments' spending on health care. Thus, the effect of variance on self-ratings (regardless of what is rated) cannot be the only explanation. It is interesting that although self-rated health is theoretically closely related to SWB and LS, these do have some important differences, which became apparent in this cross-country analysis. While the country-level mean variance in self-reported health status seems not to be very systematic or meaningful, the large variances in LS ratings should not be considered merely a methodological issue—these may also refer to the level of social inequity (Ott, 2005; Veenhoven, 2005), income inequality (Delhey & Kohler, 2011), or a country's lower standard of living in terms of GDP per capita (Clark et al., 2014). Thus, many people in the countries where differences in LS judgements are large are, on average, worse off than the people in countries with narrow LS inequality.

Therefore, although governments' investments in public health care are to some degree responsible for the finding that the strength of the association between LS and self-reported health varies across countries, this is only part of the explanation. Our findings imply that it is important to look at the broader context and examine how large the gap in people's overall well-being in a country is. In the more economically, politically, and socially developed societies, disparities in the ratings of LS are the smallest, because most people are satisfied with their lives—even when life is not going well across many domains. Lower satisfaction with health status would thus not be detrimental to their overall evaluation of life, because there are plenty of opportunities to compensate for the difficulties associated with an illness or a disability. Services provided by public health care are apparently just one of the many available resources. Yet, in countries where the gap in individuals' well-being is large—meaning that not everyone has equal opportunities to fulfil their needs and feel secure about the future—any additional increases in health status (as in other important life domains) are more likely to be accompanied by extra satisfaction.

Limitations and conclusions

There were several limitations to the present study. First, both variables at the individual level (ratings of LS and self-reported health status) were measured by single items, which could influence the validity of results. Several earlier studies have suggested that when LS is measured by a single item, ratings are somewhat less stable than in multiple-item scales (Diener, Inglehart, & Tay, 2013). However, a recent study by Cheung and Lucas (2014) showed that single-item LS measures perform very similarly to multiple-item scales, and they argue that researchers get virtually identical answers to substantive questions regardless which measure they use. So, this provides strong support for our approach.[5] The second limitation is related to the use of only subjective or self-reported health ratings in the current study. The ESS is a sociological survey and does not include any information about specific illnesses or diagnoses; therefore, we know nothing about the objective health status of participants. Nevertheless, earlier research has shown that the connection between SWB and ratings of self-reported health is stronger than to the objective or 'true' health status (Diener et al., 1999; Røysamb et al., 2003). And finally, although this study was based on data for 32 countries across the six rounds of the ESS from 2002 to 2012, it is unclear whether the results obtained would have been more robust (or evident at all) if it had included samples from other world regions with completely different healthcare systems and economic development levels.

In conclusion, this study provides evidence that although self-reported health status is positively and significantly related to LS judgements in all 32 European countries (which have participated at least twice in the ESS during the years of 2002 to 2012), this association is moderated by government healthcare expenditure per capita and by the overall LS equality of countries. Accordingly, this study is relevant from a societal as well as from a policy-related perspective for different reasons. First, our findings show that the often-reported positive association between LS and self-reported health status is not equally strong across countries, even within Europe, which, in comparison to other world regions, comprises a relatively small and homogeneous set of countries. Second, our study supports earlier research suggesting that it is especially in the less wealthy countries that policies should be targeted at reducing the negative impact of health care and inequality-related indicators—for example, it is, in most of these countries, necessary to develop better provisions for health insurance for the most vulnerable social groups (Self & Grabowski, 2003). But, investing large amounts of money into ineffective systems is surely also not the answer—governments also need to make sure that health interventions reach their intended beneficiaries (Gupta, et al., 2003) and monitor, as well as tackle, other forms of social and economic inequalities. If everyone feels secure about receiving support from the social system and accessing quality health services when hard times arise in life without being forced into financial hardship, even people who perceive having rather poor health might still have a chance to be quite satisfied with their life in general.

[5]The ESS core questionnaire includes only one item about overall LS. It would have been possible to construct a two-item scale of SWB by adding the item about overall happiness level, but this was not carried out because scales consisting of only two items are even more problematic than single-item instruments. This has to do with measurement equivalence testing, which is needed to meaningfully compare countries to each other (Davidov, Dülmer, Schlüter, Schmidt, & Meuleman, 2012). Equivalence guarantees that items are perceived in a similar way and that constructs are represented on the same measurement scale (Byrne & van de Vijver, 2010). The problem is that at least three items are needed in order to properly conduct measurement invariance testing. As it was not possible to establish cross-cultural equivalence of a two-item scale, we decided to use only the single-item measure of overall LS.

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SUPPORTING INFORMATION

Supporting information may be found in the online version of this article at the publisher's web-site.

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