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Abstract

We examined the influence of personality traits on mean levels and age trends in four single-item measures of self-rated health: General rating, comparison to age peers, comparison to past health, and expectations for future health. Community-dwelling participants (N = 1,683) completed 7,474 self-rated health assessments over a period of up to 19-years. In hierarchical linear modeling analyses, age-associated declines differed across the four health items. Across age groups, high neuroticism and low conscientiousness, low extraversion, and low openness were associated with worse health ratings, with notable differences across the four health items. Furthermore, high neuroticism predicted steeper declines in health ratings involving temporal comparisons. We consider theoretical implications regarding the mechanisms behind associations among personality traits and self-rated health.

Keywords

Personality traits have been linked to important health risk-factors such as smoking and obesity (Bogg & Roberts, 2004; Chapman, Fiscella, Duberstein, Coletta, & Kawachi, 2009; Terracciano, Löckenhoff, Crum, Bienvenu, & Costa, 2008; Terracciano et al., 2009), metabolic and inflammatory markers (Sutin, Terracciano, Deiana, Naitza, et al., 2010; Sutin, Terracciano, Deiana, Uda, et al., 2010), indicators of functional health (Chapman, Lyness, & Duberstein, 2007; Tolea et al., 2010), and – ultimately - mortality (Friedman et al., 1993; Terracciano, Löckenhoff, Zonderman, Ferrucci, & Costa, 2008; Wilson, de Leon, Bienias, Evans, & Bennett, 2004).

In addition to objective health, five-factor traits are also associated with people's subjective perceptions of their health status, henceforth referred to as self-rated health (SRH). Although a broad body of research supports cross-sectional associations among five-factor traits and SRH (for a review see Löckenhoff, Sutin, Ferrucci, & Costa, 2008), little is known about the influence of personality traits on longitudinal trajectories of SRH. Also, as individuals

construe perceptions of their health, they integrate information from multiple perspectives including comparisons with peers as well as perceptions of temporal change and expectations for the future (Eriksson, Unden, & Elofsson, 2001; Jylha, 2009). Conceivably, personality traits may show differential associations with individual components of SRH, but so far, empirical data to support this notion are lacking.

Answers to these open questions have important implications for the mechanisms that link personality traits with SRH. To this end, the present study extends the literature by (1) modeling the influence of five-factor personality traits on mean levels and longitudinal trajectories of SRH in a large life-span sample, and (2) examining the relative association of five-factor traits with generalized, socially comparative, and temporally comparative components of SRH.

To outline the relevant theoretical background, we begin by describing the conceptualizations of personality and SRH adopted in the present work as well as the theoretical framework used to model specific pathways between the two. We then review prior empirical evidence for associations among personality traits, SRH, and objective health and conclude by proposing specific hypotheses for the present study.

We adopt the well-established five-factor taxonomy of personality traits (Goldberg, 1990; McCrae & Costa, 2003; McCrae & John, 1992) according to which personality can be comprehensively described along the following five dimensions: Neuroticism (N) which is characterized by negative emotionality, impulsivity, and vulnerability to stress; extraversion (E) whose hallmarks are an optimistic outlook, a sociable, active lifestyle, and high levels of positive affect; openness to experience (O) which manifests itself in curiosity, unconventionality, and a willingness to consider new ideas; agreeableness (A) which is characterized by altruism, cooperation, and a concern for others; and conscientiousness (C) which reflects the tendency to act in a planful, deliberate, and self-controlled fashion.

Following the previous literature (e.g., Pinquart & Sörensen, 2001), we conceptualize self-rated health as a sub-component of an individuals' self-concept that captures self-evaluations of health. Importantly, SRH was found to predict changes in functional status (Idler & Kasl, 1995; Kaplan, Strawbridge, Camacho, & Cohen, 1993) as well as general well-being and life satisfaction (Angner, Ray, Saag, & Allison, 2009; Okun & George, 1984) above and beyond the influence of objective health. Thus, although self-rated health is linked to objective morbidity and mortality (e.g., DeSalvo, Bloser, Reynolds, He, & Muntner, 2006; Idler & Benyamini, 1997), it can be considered as an important outcome in its own right.

Across the literature, a wide variety of measures have been used to assess SRH, ranging from single items to comprehensive multi-scale assessments such as the SF-36 (Ware, Kosinski, & Keller, 1994). Among single-item Likert-type measures, which are the focus of the present study, at least three main categories of question wording can be differentiated: general or non-comparative framing in which respondents are simply asked to rate their current health; social or age-comparative framing in which respondents are asked to rate their health in relation to their age peers; and temporal or time-comparative framing in which respondents are asked to rate their current health relative to their past (Eriksson, et al., 2001). Although these categories are sometimes used interchangeably (Maddox & Douglass, 1973) or collapsed into a single measure (Svedberg, Gatz, Lichtenstein, Sandin, & Pedersen, 2005), growing evidence suggests that they show divergent age trajectories and differ in their associations with outcome variables. Specifically, the general and time-comparative framing appear to be more sensitive to age effects than the social comparative framing in both cross-sectional (Baron-Epel & Kaplan, 2001; Eriksson, et al., 2001; G. Roberts, 1999;

Sargent-Cox, Anstey, & Luszcz, 2008) and longitudinal studies (Andersen, Christensen, & Frederiksen, 2007; Sargent-Cox, Anstey, & Luszcz, 2010). Also, general health ratings emerged as a more robust correlate of objective health and mortality (Vuorisalmi, Lintonen, & Jylha, 2005, 2006) than comparative ratings.

The proposed association of five-factor traits with SRH is based on the tenets of Five-Factor Theory (FFT, McCrae & Costa, 2003; McCrae & Costa, 2008). According to FFT, personality traits are endogenous basic tendencies whose intrapsychic and interpersonal features develop and interact over time with external influences (e.g., environmental conditions, life events) to yield characteristic adaptations. Characteristic adaptations change over time, in response to biological maturation, social roles and expectations, environmental factors, or deliberate intervention (McCrae & Costa, 2008). One important sub-component of characteristic adaptations is the *self-concept*, a cognitive-affective view of the individual that is accessible to consciousness. A key feature of the self-concept is selective perception, that is, "Information is selectively represented in the self-concept in ways that are consistent with personality traits and it gives a sense of coherence to the individual" (McCrae & Costa, 2008, page 165).

Since SRH is part of the self-concept, it can be considered as a characteristic adaptation within the FFT framework. Like other characteristic adaptations, SRH is expected to dynamically evolve over time to reflect changes in physical and mental health status in interaction with basic personality traits, objective biography, and the surrounding physical and social environment. Specifically, five-factor traits may exert their influence on SRH along two partly overlapping pathways (e.g., Löckenhoff et al., 2008; Goodwin & Engstrom, 2002). First, personality traits may directly inform people's self-evaluations and subjective interpretations of their health. We argue that this first pathway should be particularly relevant for components of SRH that engage self-evaluative mechanisms via social comparisons with one's peers or temporal comparisons with one's own past or future selves. Second, personality traits may influence objective health status (e.g., via health behaviors and stress responses Booth-Kewley & Vickers, 1994; Carver & Connor-Smith, 2010) and thus exert an indirect effect on SRH ratings. This second pathway is more likely to affect generalized, non-comparative ratings of self-rated health (Vuorisalmi, et al., 2005, 2006). Importantly, there is also reason to assume that the importance of the two pathways varies across five-factor traits since specific traits differ in their relative association with SRH, objective health, and self-evaluative processes. We now review the relevant evidence for each of the five-factor traits in more detail.

The most consistent pattern of associations between personality and SRH is found for N. Across a range of studies, N was found to be linked with lower SRH on both single-item measures (Benyamini, Idler, Leventhal, & Leventhal, 2000; Goodwin & Engstrom, 2002; Moor, Zimprich, Schmitt, & Kliegel, 2006; Quinn, Johnson, Poon, & Martin, 1999) and more comprehensive SRH assessments such as the SF-36 (Duberstein et al., 2003; Jerram & Coleman, 1999; Kempen, Jelicic, & Ormel, 1997; Kempen et al., 1999; Kressin, Spiro, & Skinner, 2000; Löckenhoff, Sutin, et al., 2008; Wasylkiw & Fekken, 2002). In part, lower SRH among individuals high in N may reflect actual health concerns. For example, N is associated with risky health behaviors (Booth-Kewley & Vickers, 1994; Terracciano, Löckenhoff, Crum, et al., 2008), metabolic syndrome (Sutin, Costa, et al., 2010), inflammation (Sutin, Terracciano, Deiana, Naitza, et al., 2010), poor immune responses (Phillips, Carroll, Burns, & Drayson, 2005), and -ultimately - premature mortality (Mroczek, Spiro, & Turiano, 2009; Terracciano, Löckenhoff, Zonderman, et al., 2008; Wilson, et al., 2004). However, regardless of their actual health status, individuals high in N are also prone to evaluate their health more pessimistically (Costa & McCrae, 1987). In particular, high N is associated with more unfavorable social comparisons (Roberts & Good, 2010; van der

Zee, Oldersma, Buunk, & Bos, 1998; van der Zee, Buunk, Sanderman, Botke, & van den Bergh, 1999; van der Zee, Buunk, & Sanderman, 1996) and more pessimistic perceptions of health trajectories over time (Gao, 2009; Harris & Dollinger, 2003; Moor, et al., 2006; Quirouette & Pushkar, 1999). Based on these findings, one would expect that associations of N with SRH operate along both of the pathways outlined above.

Comparatively fewer studies have examined the association between SRH and C. However, the few studies that included this trait have found a consistent association between high C and more favorable scores on single-item and comprehensive measures of SRH (Goodwin & Engstrom, 2002; Jerram & Coleman, 1999; Löckenhoff, Sutin, et al., 2008). Conscientious individuals also engage in more health promoting behaviors such as regular exercise and take fewer health risks, ranging from risky sexual behaviors to substance use (for a meta-analysis see Bogg & Roberts, 2004). These behavioral tendencies are likely to contribute to the well-established link among high C, better objective health, and lower mortality (Friedman, 2000; Kern & Friedman, 2008; O'Cleirigh, Ironson, Weiss, & Costa, 2007; Terracciano, Löckenhoff, Zonderman, et al., 2008; Terracciano, et al., 2009). Although there is little evidence for an association of C with social comparative tendencies (van der Zee, et al., 1999), C is associated with a sense of achievement and competence (Carver & Connor-Smith, 2010; Lee & Klein, 2002) which may contribute to more positive perceptions of temporal health trajectories among individuals high in C (Gao, 2009; Harris & Dollinger, 2003). Taken together, these results suggest that C affects SRH both through self-evaluative pathways and via its influence on objective health.

Regarding E, evidence for effects on SRH is somewhat less pronounced. While some studies have found that higher levels of E are associated with higher scores on single-item SRH measures (Goodwin & Engstrom, 2002; Jerram & Coleman, 1999; Korotkov & Hannah, 2004) as well as better physical functioning (Jerram & Coleman, 1999) other studies have failed to replicate such effects (Löckenhoff, Sutin, et al., 2008; Moor, et al., 2006). Also, prior research links E not only to health promoting habits (e.g., exercise, vitamin supplements; Booth-Kewley & Vickers, 1994) but also to detrimental health behaviors (e.g., alcohol use; Heath et al., 1997). The effects of E on objective health outcomes are similarly mixed. For example, some studies report beneficial effects of E on mortality (Iwasa et al., 2008) while others are not (Weiss & Costa, 2005; Wilson, et al., 2004). At the same time, there is good evidence that E promotes favorable social comparisons (Olson & Evans, 1999; van der Zee, et al., 1996, although see van der Zee, et al., 1999) and more positive expectations about health trajectories (Gao, 2009; Harris & Dollinger, 2003). Based on this pattern of findings, one would expect that effects of E on SRH are primarily operating through self-evaluative pathways.

Finally, A and O were found to show little association with measures of SRH. Although two studies reported a significant positive association between these traits and a single-item measure of SRH (Jerram & Coleman, 1999; Goodwin & Engstrom, 2002), other studies have failed to replicate this effect (Wasylkiw & Fekken, 2002) or even reported effects in the opposite direction (Löckenhoff, Sutin, et al., 2008). Associations with objective health outcomes are similarly tenuous (Sutin, Terracciano, Deiana, Naitza, et al., 2010; Sutin, Terracciano, Deiana, Uda, et al., 2010; Terracciano, et al., 2009; Wilson, et al., 2004) although there is some evidence that low A may be a cardiovascular risk factor (Sutin, Scuteri, et al., 2010).

Overall, previous research paints a relatively consistent picture indicating that low scores on N and high scores on C and E are associated with better SRH. However, existing research is almost exclusively cross-sectional in nature, and little is known about the influence of personality traits on longitudinal trajectories of SRH. This is a serious gap in the research

record because there is empirical evidence suggesting that the influence of personality on SRH varies with age (Duberstein, et al., 2003; Löckenhoff, Sutin, et al., 2008; Quinn, et al., 1999). Within the framework of FFT (McCrae & Costa, 2008), the association between SRH and traits is expected to dynamically evolve over time as health-related expectations and behaviors interact with objective health-related challenges. For example, the planful and health-promoting life-style that characterizes individuals high in C may be of particular adaptive value in late life when multiple medical conditions accumulate. Thus, the effects of personality traits on health outcomes may compound over time. Moreover, positive or negative expectations about temporal trajectories of health could turn into self-fulfilling prophecies by determining whether health decrements are seen as an inevitable consequence of aging or as surmountable obstacles that can be addressed through lifestyle changes and medical interventions. Importantly, because FFT conceptualizes traits as biologically-based basic tendencies that are primarily subject to maturational changes (McCrae & Costa, 2008), we focus on the effects of personality traits on trajectories of SRH (not vice versa). With regard to specific sub-components of SRH, we would expect to see the strongest effects of personality on SRH trajectories for temporally comparative question frames as well as generalized ratings. As mentioned above, social comparative SRH ratings remain fairly stable over time (Andersen, et al., 2007; Sargent-Cox, et al., 2010) and are therefore not likely to show an influence of personality on longitudinal trajectories.

Another open question concerns the relative association among personality traits and specific aspects of SRH. To the best of our knowledge, no prior studies have examined whether the association between personality traits and SRH differs across generalized, socially, and temporally comparative question frames. However, as discussed above, there is theoretical reason to expect differential effects. Personality traits are thought to influence SRH through multiple pathways with E (and possibly O and A) operating primarily through self-evaluation, and N and C operating through both self-evaluation and objective health. Further, the pathway through objective health should be more relevant for general SRH assessments whereas the self-evaluator pathway should be more relevant for comparative ratings. From this perspective, N and C would be expected to show associations with SRH across question formats whereas E, O, and A should be most closely associated with socially and temporally comparative SRH.

To empirically assess the proposed pattern of associations, the present study employed hierarchical linear modeling to examine the influence of personality traits on mean-levels and age trajectories of SRH in a large life-span sample followed over a period of up to 19 years. To address the role of question framing, we compared patterns of results across four single-item SRH assessments: General (or open-ended), comparison to age peers, comparisons to past health, and comparison with future health. Because previous research has shown that trajectories and correlates of self-rated health are influenced by demographic factors (Delpierre, Lauwers-Cances, Datta, Lang, & Berkman, 2009; Wolinsky et al., 2008), gender, ethnicity, and education levels were statistically controlled.

In terms of specific hypotheses, we expected to replicate previous findings regarding age trajectories of SRH and the association among personality traits and SRH such that:

Hypothesis (1): longitudinal declines in SRH are more pronounced for general SRH ratings and temporal comparisons than for social-comparative SRH;

Hypothesis (2): mean levels of SRH are negatively associated with N, positively associated with C and E, and largely unrelated to O and A;

More importantly, we extended the previous literature by testing hypotheses regarding the relative association of personality traits with specific components of SRH and the role of five-factor traits in longitudinal trajectories of SRH:

Hypothesis (3): across the four SRH components, N and C show associations with both general and comparative SRH, whereas E (and possibly A and O) show selective associations with comparative SRH;

Hypothesis (4): the associations of personality traits with longitudinal trajectories of SRH mirror cross-sectional results, in that N predicts steeper age-related declines whereas E and C serve a protective function.

Method

Participants and Procedure

Participants (N = 1,683) were community-dwelling volunteers drawn from the Baltimore Longitudinal Study on Aging (BLSA), an ongoing multidisciplinary study of late life development hosted by the National Institute on Aging. Originating in 1958 as a convenience sample of White males, the study was later balanced by including women and minorities. For the present analyses, we included participants who had completed both the SRH items and the personality questionnaire at least once. In the final sample, mean age was 53 years (SD = 16.5, age range 18 to 93) at the first administration of the health measure. Participants were 52.3% female and tended to be highly educated (M = 17 years of education, SD = 2.6). The ethnic distribution was 76.7% European-Americans, 17.9% African-Americans, and 5.4% other or unknown.

All data were collected at regularly scheduled BLSA visits. Health assessments were collected from 1981 to 2000 and personality was assessed from 1989 to 2009. Participants completed from 1 to 10 administrations of the health measure (M = 4.4, SD = 2.7; 7,474 in total across participants) and from 1 to 14 administrations of the personality measure (M = 3.5, SD = 2.5; 5,799 in total across participants).

Compared to the rest of the sample, individuals with only one administration of the health measure (n = 353) were younger, $t(1681) = -2.7$, $p < .01$, $d = 0.16$, more likely to be male, $\chi^2(1, N = 1,683) = 5.5$, $p = 0.02$, (23.4% of male vs. 18.8% of females), and more likely to be African-American, $\chi^2(1, N = 1,683) = 184.2$, $p < 0.01$, (49.8% of African-Americans vs. 14.7% of others), but there were no difference in education, $t(1681) = -0.7$, $p > .05$, $d = 0.04$. After controlling for age and gender, the two groups did not differ on SRH ratings or personality measures. The main reason that 353 participants had only one SRH rating was that the SRH assessment was terminated in 2000, so many participants did not have a chance to fill-out the SRH items more than once. In addition, there were a few dropouts due to loss to follow-up (n = 56) or death (n = 26).

Measures

Self-rated health—SRH was assessed with a set of four single items differing in question framing. The *general health item* read "Overall, would you say your health is:" and the *social-comparative item* read "Compared to others your age, your health is:" For these two items, the response options were 4 = "excellent", 3 = "good", 2 = "fair", 1 = "poor". The *past-comparative item* read "Compared to the last visit, your health is:" and the response options were 5 = "much better now", 4 = "somewhat better now", 3 = "about the same", 2 = "somewhat worse now", 1 = "much worse now". Finally, the *future-comparative item* read "Your health at the next visit will be: 5 = "much better", 4 = "somewhat better", 3 = "about the same", 2 = "somewhat worse", 1 = "much worse". Because the past-comparative item was rated in reference to the most recent visit, it was only included for participants who had completed at least one previous BLSA assessment. Thus, there are comparatively fewer data points (6,329 from n = 1368 individuals) for this item.

Personality—Personality was assessed with the revised version of the NEO Personality Inventory (NEO-PI-R, Costa & McCrae, 1992). This measure was designed to assess the five-factor model of personality (McCrae & John, 1992) and consists of 240 items answered on a 5-point Likert scale from "strongly disagree" to "strongly agree". It is hierarchically structured into five broad personality traits (N, E, O, A, and C) which are each composed of 6 facet scales for a total of 30 facets.

The present analyses use factor scores (i.e., weighted averages of the 30 facet scores) that were standardized to T-scores (M = 50, SD = 10) based on combined sex norms (Costa & McCrae, 1992). Protocols were screened out if participants failed to endorse two items asking if they had responded honestly and accurately to all questions.

The NEO-PI-R has good convergent and discriminant validity (Costa & McCrae, 1992). In the present BLSA sample, internal consistencies for the five NEO-PI-R factors were high (Cronbach's $\alpha > .85$) and previous research has shown high levels of stability, with corrected $r_{tt} > .90$ over 10-year interval (Terracciano, Costa, & McCrae, 2006). To further increase reliability, average scores were used if more than one NEO-PI-R assessment for a given participant was available.

Analyses

The design of the BLSA can be considered as cross-sequential since simultaneous longitudinal data are collected for members of different birth cohorts. This allows for the estimation of long-range age trajectories based on data collected over shorter time frames.

Our analyses employed hierarchical linear modeling (HLM, Raudenbush & Bryk, 2002) because the number and spacing of observations varied across individuals with some individuals only providing a single data point. In contrast to conventional repeated measures analysis, HLM can readily accommodate these characteristics.

Within the hierarchical structure of HLM, Level 1 estimated the trajectories for each SRH item at the within-subject level. Because age trajectories of SRH may be curvilinear, both linear and quadratic effects were tested. Age was centered at the grand mean across individuals and assessments.

The equation for the Level 1 model was as follows:

$$\text{Health rating} = \pi_0 + \pi_1*(AGE) + \pi_2*(AGE^2) + e$$

For the "intercepts-as-outcomes" and "slopes-as-outcomes" analyses, at Level 2 demographic variables (gender, ethnicity, and education) as well as personality traits were added to explain between-subjects variation in Level 1 intercept and linear slope. The equations for this model were as follows:

1. $\pi_0 = \beta_{00} + \beta_{01}*(SEX) + \beta_{02}*(ETHNICITY) + \beta_{03}*(EDUCATION) + \beta_{04}*(NEUROTICISM) + \beta_{05}*(EXTRAVERSION) + \beta_{06}*(OPENNESS) + \beta_{07}*(AGREEABLENESS) + \beta_{08}*(CONSCIENTIOUSNESS) + r_0$

2. $\pi_1 = \beta_{10} + \beta_{11}*(SEX) + \beta_{12}*(ETHNICITY) + \beta_{13}*(EDUCATION) + \beta_{14}*(NEUROTICISM) + \beta_{15}*(EXTRAVERSION) + \beta_{16}*(OPENNESS) + \beta_{17}*(AGREEABLENESS) + \beta_{18}*(CONSCIENTIOUSNESS) + r_1$

3. $\pi_2 = \beta_{20}$

All HLM analyses were conducted with HLM 6.0 software (Raudenbush, Bryk, Cheong, & Congdon, 2004). For further details on the assumptions and underlying mathematical

concepts of HLM see (Raudenbush & Bryk, 2002). Preliminary analyses report descriptive information and raw correlations among the variables under consideration.

Results

Preliminary Analyses

Table 1 provides descriptive information for the initial assessment of SRH items and for aggregated personality traits. On the general SRH item, participants rated their health as "good". Compared to the general framing, health was rated as slightly better on the social-comparative item; paired samples t-Test: $t(1679) = -9.1$, $p < .01$. For framings involving temporal comparisons, participants reported that their health had remained or was expected to remain "about the same".

Intercorrelations among SRH items indicate that only the general and social-comparative item were strongly associated with each other ($r = .72$). The past-comparative item, in contrast, was only moderately associated with both general ($r = .18$) and social-comparative SRH ($r = .19$). Comparisons with the future, in turn, were moderately associated with past comparisons ($r = .22$), but inversely related to general ($r = -.13$) and social-comparative ratings ($r = -.10$, all ps < .01). This indicates that in spite of some shared variance, the four SRH items assess distinct concepts that warrant separate analyses. Intercorrelations among personality traits were generally small (all $|r| < .16$).

Correlations among SRH items at first assessment and demographic characteristics as well as average personality traits are presented in Table 2. Consistent with prior research, age was negatively associated with general, past-, and future-comparative SRH but positively associated with social-comparative SRH. In addition, females had slightly more positive expectation for their future health, and more educated individuals scored higher on general and social-comparative SRH. Compared to Whites, Blacks scored lower on general and social-comparative SRH, but higher on temporal comparisons. With regard to personality traits, N was negatively associated with three of the SRH items; E and O were positively associated with all SRH items; C was positively associated with three of the SRH items, and A showed marginal associations with two of the SRH items.

To control for the observed associations among demographic factors and SRH as well as small but significant intercorrelations among personality factors, subsequent HLM analyses entered all five personality traits as well as the demographic predictors simultaneously.

HLM analyses

Drawing on basic one-way ANOVAs with random-effects models (Raudenbush & Bryk, 2002), also known as intercept-only or unconditional means model, we estimated the proportion of stable variance in the four SRH items as the ratio of between-subjects variance (intercept variance) relative to the total variance (intercept variance + within-subjects variance). This intraclass correlation indicated that of the total variability across individuals and assessments, about half was between-subjects for general SRH (53%) and social-comparative SRH (52%). Stability levels were lower for past-comparative SRH (21%), and future-comparative SRH (45%). Overall, stability for SRH items was substantially lower than for personality traits where proportions of between-subject variance of up to 85% have been reported in the BLSA (Terracciano, McCrae, Brant, & Costa, 2005).

Table 3 summarizes estimates for basic Level 1 models describing intercept, linear, and quadratic terms along with standard errors. Figure 1 depicts the estimated slopes for the general and social-comparative (Figure 1a) as well as the two temporal-comparative items (Figure 1b), respectively. Consistent with previous research, the slope for general SRH

showed the strongest linear decline with advancing age whereas social-comparative SRH showed only a slight decline. Age-related declines in past- and future-comparative SRH were intermediate in size. However, significant quadratic effects indicate that these trajectories were curvilinear, with relative stability in middle age and accelerated decline at older age.

Table 4 summarizes estimates for the full intercepts- and slopes-as-outcomes models in which intercept and linear slope for each SRH item are predicted by demographics and personality factors. With regard to demographic characteristics, gender was a significant predictor of the intercept for general SRH with women reporting better health. However, this association did not reach significance for any of the comparative SRH items. Education, in turn, was positively associated with the intercepts for general SRH, social-comparative SRH, and past-comparative SRH. For ethnicity, a more differentiated pattern emerged with Blacks (as compared to Whites and other ethnicities) showing *lower* intercepts for general and social-comparative SRH but *higher* intercepts for past- and future-comparative SRH. Effects of demographic variables on slopes of SRH items were limited to future-comparative SRH with Black ethnicity predicting more negative changes and education predicting more positive changes over time.

With regard to personality traits, N was negatively associated with the intercept of the general, social-comparative, and past-comparative SRH items. However, it had no effect on the intercept of future-comparative SRH. Higher scores on E, in turn, were associated with significantly more positive intercepts on all three comparative SRH items, but not on the general SRH item. A comparable pattern of effects was found for O. A was not associated with the intercept of any of the SRH items. C, finally, was positively associated with intercepts for general, social-comparative, and past-comparative SRH but unrelated to future-comparative SRH.

Among the five personality factors, only N was a significant predictor of SRH slopes with higher scores on N predicting steeper declines in past- and future-comparative SRH. This effect is depicted in Figures 2a (past-comparative SRH) and 2b (future-comparative SRH). Each of these figures contrasts groups of individuals scoring one SD above and below the mean on N while setting demographic variables at average values.

Supplemental analyses examined the influence of demographic and personality variables on quadratic age effects and tested for interactions among gender and personality traits. There was no evidence for such effects.

Discussion

The present findings extend the literature on SRH and personality by modeling the association of five-factor traits with intercepts and slopes of SRH in a large life-span sample. Our findings also elucidate how the specific framing of SRH questions may affect the pattern of associations between personality and SRH. We now review the evidence for each of our initial hypotheses in more detail.

Consistent with our predictions, age-related declines in SRH were more pronounced for the general SRH rating, whereas SRH ratings that were based on comparisons with age peers remained comparatively stable over time. Furthermore, there was a tendency at the cross-sectional level to provide slightly higher SRH ratings in comparisons with age peers than in general ratings. In the past, this phenomenon has been explained as the result of social comparison processes. Specifically, older adults are thought to selectively compare their own status to negative stereotypes of their age peers and thus maintain high levels of SRH in spite of age-related declines in objective health (Cheng, Fung, & Chan, 2007; Ferring &

Hoffmann, 2007). While many previous studies have reported such discrepancies in age-effects for general versus social-comparative SRH (Andersen, et al., 2007; Baron-Epel & Kaplan, 2001; Eriksson, et al., 2001; G. Roberts, 1999; Sargent-Cox, et al., 2008), our findings add to the scarcer evidence for longitudinal trajectories of temporal-comparative SRH items (Leinonen, Heikkinen, & Jylha, 1998, 2001; Sargent-Cox, et al., 2010). Our results suggest that, other than comparisons to age peers, comparisons to past or future selves do not result in more stable SRH ratings over time.

Our prediction that SRH would be negatively associated with N but positively associated with E and C was supported as well. As expected, we further found a differential pattern of effects across the four SRH items. N and C, which are thought to influence SRH through both their association with objective health and through their influence on self-evaluation, showed the most consistent pattern of effects: Individuals high in N and low in C had lower intercepts for general, social-comparative, and past-comparative SRH. Moreover, N had more negative slopes for past- and future-comparative health. In further support of our hypotheses, E had significant effects on the intercepts of social-, past-, and future-comparative items but not on general SRH. This is consistent with the notion that E is primarily relevant for self-evaluative components of SRH that are captured in items with comparison framing. Somewhat surprisingly, O was also found to be associated with SRH ratings. Like E, it only predicted the intercept in social- and temporal-comparative SRH items but not in general SRH items. This suggests that O exerts its influence on SRH primarily via self-evaluatory mechanisms.

To the best of our knowledge, this study was the first to examine the association of personality traits with longitudinal trajectories of SRH. Among the five factors, only N showed a significant effect on age slopes such that higher levels of N were linked to greater age-related declines in SRH. Thus, the negative emotionality, impulsivity, and vulnerability associated with of N may not only influence average SRH levels, but become increasingly deleterious as individuals get older. Interestingly, this effect was limited to SRH items that involved comparisons with past and future health. As reflected in the comparatively lower stability levels for these items (see results section), their wording may make them more sensitive to changes in SRH over time.

In addition to the effects of personality on SRH, there are some noteworthy effects of demographic variables. Consistent with prior research (Delpierre, et al., 2009; Wolinsky, et al., 2008), more educated individuals showed a more positive intercept in general, social-comparative, and past-comparative SRH as well as a more positive slope in future-comparative SRH. This is not surprising, given that higher education levels are associated with access to financial resources as well as greater perceived control over one's environment (Bobak, Pikhart, Rose, Hertzman, & Marmot, 2000) which may translate into benefits for objective and self-rated health. More noteworthy is the pattern of findings for ethnicity. Among the U.S. population, health status is substantially worse among Blacks (Orsi, Margellos-Anast, & Whitman, 2010) and, consistent with this finding, Blacks (as compared to Whites and other ethnicities) showed substantially lower intercepts on general and social-comparative SRH. However, the pattern was reversed for temporal comparisons with Blacks comparing their current health more favorably to their own past and future health than other ethnic groups. Apparently, in spite of unfavorable assessments of their *current* health status, Blacks are fairly optimistic about their health trajectories over time. If corroborated in other samples, this interesting phenomenon warrants closer examination.

When interpreting the results of the present study, several limitations need to be considered. For one, we relied on single-item measures of the different aspects of SRH. Ideally, future studies should include multiple items corresponding to each aspect of generalized and

comparative SRH. Also, the social comparison item in the present study involved comparisons with age peers, regardless of gender. In contrast, at least one previous study (e.g., Baron-Epel & Kaplan, 2001) elicited comparisons with others of the same age and gender. Future studies might compare the age trajectories for social comparative ratings of SRH across multiple comparison targets.

Another concern is the lag time between the assessment of SRH items and personality. The first personality assessment was collected up to 8 years after the first SRH assessment. However, personality traits, as measured by the NEO-PI-R, were previously shown to be highly stable in the BLSA (Terracciano, et al., 2005) with normative changes amounting to a single T-score point (0.1 SD) per decade. Stability is particularly high in the age range above age 30 which represents 89% of the present sample. Consistent with this view, supplemental analyses showed that the pattern of findings is comparable when using the first of several personality assessments as opposed to an average of multiple assessments. This suggests that discrepancies in assessment time have little influence on the observed association between personality traits and SRH.

Moreover, the BLSA is not representative of the U.S. population which limits the generalizability of the findings. Most importantly, participants were predominantly White or Black, disproportionately well educated, and mostly recruited from the greater Baltimore area. Since both personality traits and SRH differ across ethnic groups and education levels (Löckenhoff, Sutin, et al., 2008; Löckenhoff et al., 2008), future studies need to examine if the observed pattern of associations generalizes to more diverse samples.

In spite of these limitations, the present findings extend our understanding of the association between personality traits and SRH in several important ways. First, we replicate previously reported associations between five-factor traits and SRH in a large life-span sample followed over two decades. Second, our findings suggest that the observed pattern of associations between personality and SRH differs across specific aspects of SRH. For example, this may account for some of the inconsistencies in previous research examining the effects of E and O on SRH: Depending on whether SRH questions employed general versus comparison framing, researchers may have been more or less likely to observe significant associations. Further, our findings indicate that at least one personality trait (i.e., N) affects not only mean levels but also longitudinal trajectories of SRH. The steeper negative declines in temporally comparative SRH (past and future), indicate that individuals scoring high on N have increasingly negative expectation on their health, which might further fuel self-fulfilling prophecies that influence attitudes and behaviors, and ultimately, might contribute to a less favorable health outlook.

In conclusion, although the differential pattern of personality effects on specific SRH items is consistent with multiple pathways between personality traits and subjective health, future research needs to examine the underlying mechanisms in more detail. As outlined above, FFT predicts that the influence of traits on SRH unfolds over time in interaction with aspects of mental and physical health as well as the surrounding environment. Ideally, future studies would therefore assess not only personality traits and diverse measures of SRH, but employ mediation analyses to link these variables to self-evaluatory strategies, health behaviors, and the multitude of medical and physiological markers of objective health.

Acknowledgments

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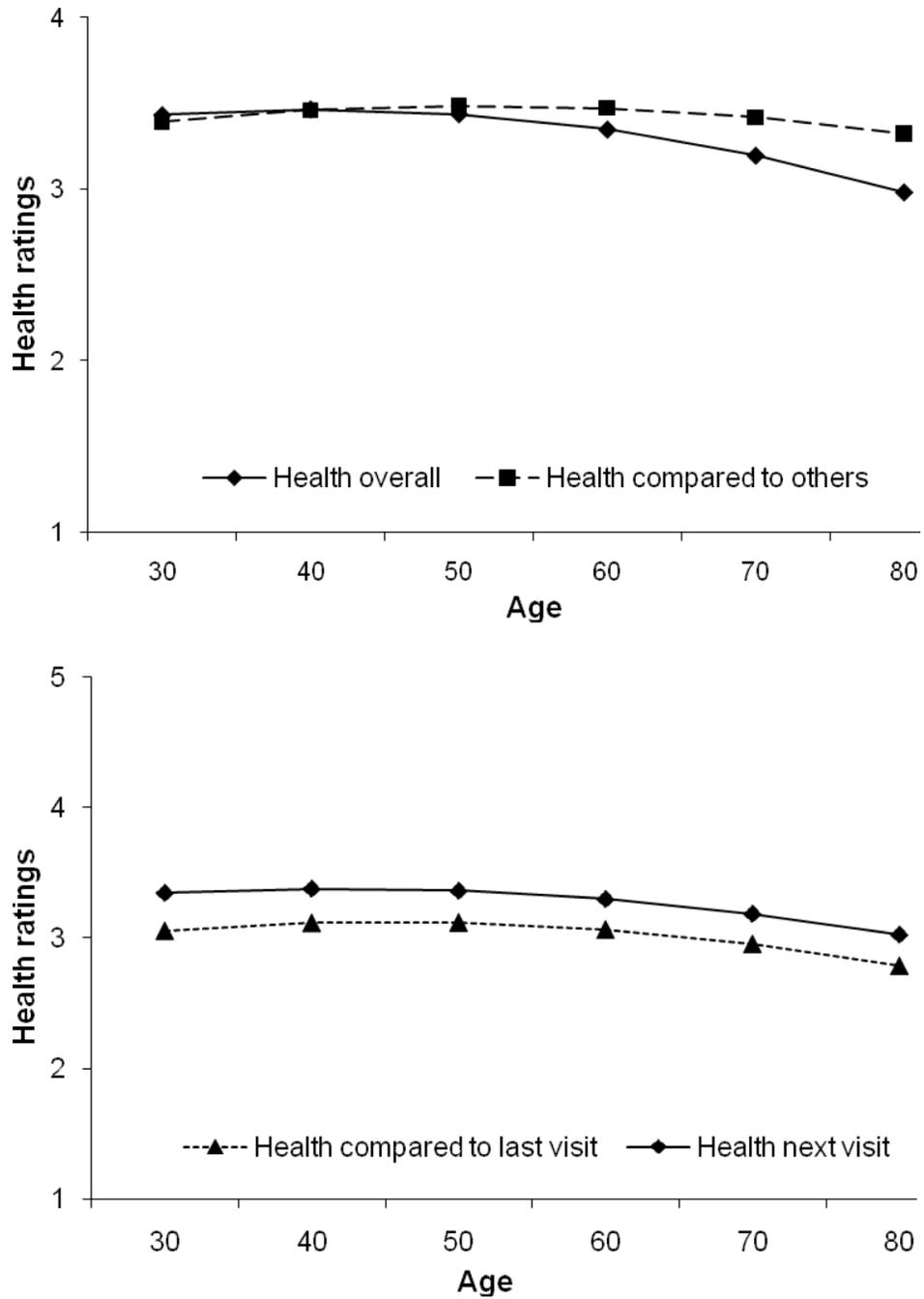
Figure 1.
Age trajectories of general, social-comparative, past-comparative, and future-comparative self-rated health in the Level 1 model. Estimates are based on the Level I model including no demographic or personality predictors.
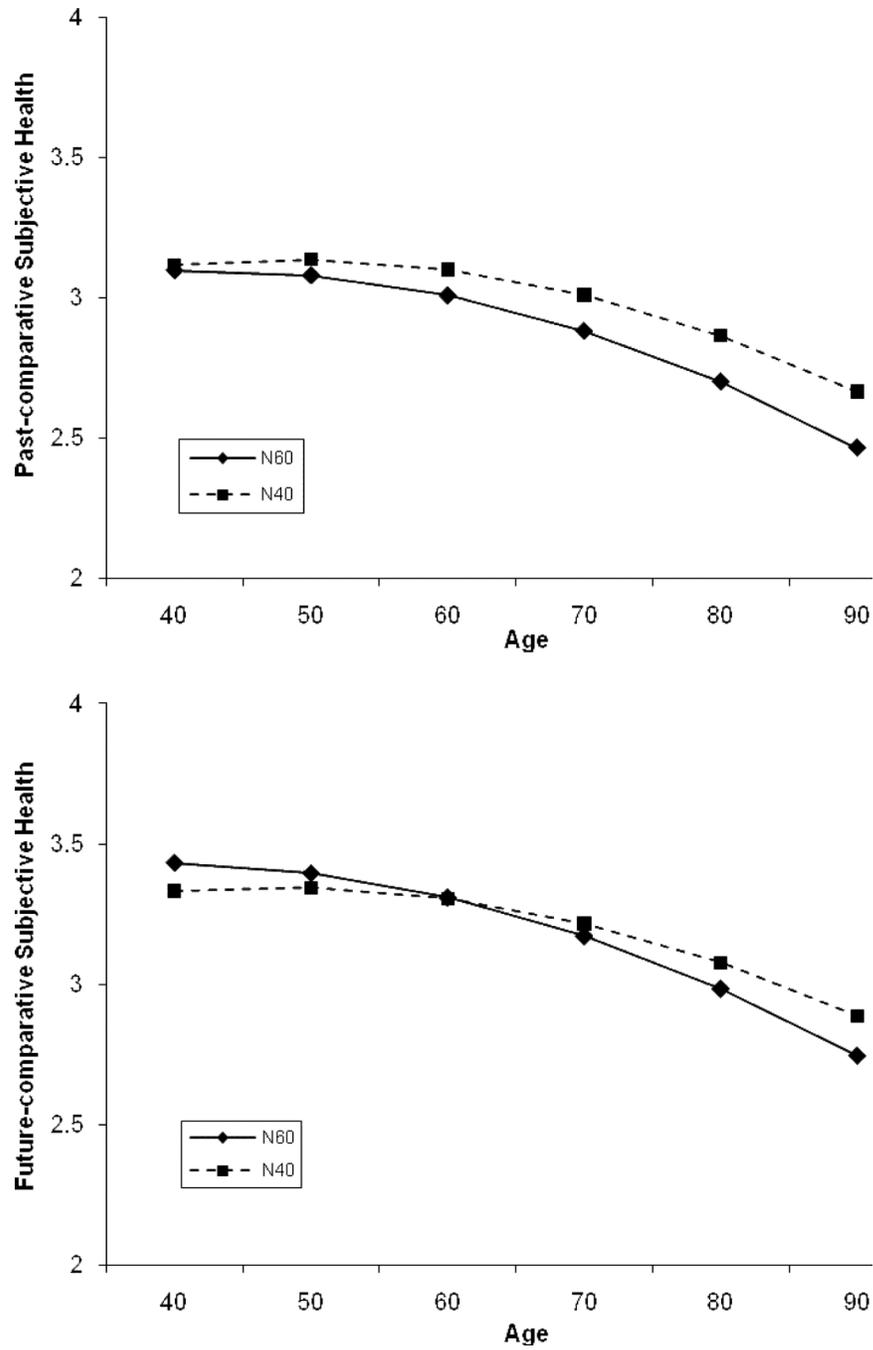
Figure 2.
Effect of neuroticism on trajectories of past- and future-comparative self-rated health in the Level 2 model. N60 and N40 = individuals scoring one SD above and below the mean on N, respectively.

Table 1

Descriptive Information for Measures of Personality and Subjective Health

Variable	M (SD)	Range
Self-Rated Health Items		
General	3.4 (.6)	1-4
Social	3.5 (.6)	1-4
Past	3.0 (.6)	1-5
Future	3.3 (.7)	1-5
Personality		
Neuroticism	47.9 (9.8)	12-83
Extraversion	49.4 (9.9)	0-80
Openness	53.3 (10.6)	17-86
Agreeableness	50.0 (9.9)	9-82
Conscientiousness	49.8 (10.4)	10-83

Note. Personality scores are averaged across assessments, subjective health scores refer to the first assessment.

Table 2

Correlations among Demographic Characteristics, Personality Traits, and Self-Rated Health

	Self-Rated Health Items			
Variable	**General**	**Social**	**Past**	**Future**
Demographics				
Age	-.11[**]	.08[**]	-.10[**]	-.09[**]
Gender (female)	.03	.00	.02	.08[**]
Ethnicity (Black)	-.10[**]	-.07[**]	.11[**]	.26[**]
Education	.15[**]	.15[**]	.00	-.04
Personality				
Neuroticism	-.16[**]	-.19[**]	-.03	.05[*]
Extraversion	.10[**]	.09[**]	.09[**]	.14[**]
Openness	.11[**]	.09[**]	.10[**]	.08[**]
Agreeableness	-.06[**]	-.03	-.02	.06[*]
Conscientiousness	.12[**]	.14[**]	.09[**]	.03

Note.

Personality scores are averaged across assessments and presented as T-scores (M = 50, SD = 10), subjective health scores refer to first assessment.

[*]
p < .05

[**]
p < .01.

Table 3

HLM Coefficients and Variance Estimates of Intercept, Linear, and Quadratic Equations Predicting Self-Rated Health Variables from Age in Decades

Predictors	Self-Rated Health Items			
	General	Social	Past	Future
σ^2: Residual within-subject variance	.162	.169	.337	.234
Intercept				
γ_{00}: Mean	3.347 (.014)[**]	3.471 (.014)[**]	3.063 (.014)[**]	3.297 (.015)[**]
u_0: Variance	.169[**]	.170[**]	.075[**]	.154[**]
Linear Slope				
γ_{10}: Mean	-.121 (.007)[**]	-.034 (.007)[**]	-.081 (.007)[**]	-.088 (.007)[**]
u_1: Variance	.012[**]	.014[**]	.002[**]	.008[**]
Quadratic Slope				
γ_{20}: Mean	-.031 (.003)[**]	-.020 (.003)[**]	-.028 (.003)[**]	-.024 (.003)[**]

Note. $N = 1683$.

Standard errors are shown in parentheses. HLM = hierarchical linear modeling. Coefficients are applied to centered age (age – grand mean age) in decades.

[**] $p < .01$.

Table 4

Demographic and Personality Predictors of the Intercept and Slope of Self-Rated Health Items

Predictors	Self-Rated Health Items			
	General	Social	Past	Future
Intercept	2.976 (.167)**	2.926 (.169)**	2.910 (.156)**	2.556 (.166)**
Demographics				
Sex (Female)	.079 (.026)**	.040 (.027)	.003 (.025)	.004 (.026)
Ethnicity (Black)	-.218 (.036)**	-.143 (.036)**	.134 (.041)**	.320 (.036)**
Education	.020 (.005)**	.022 (.005)**	-.013 (.005)**	-.008 (.005)
Personality				
Neuroticism	-.013 (.001)**	-.012 (.001)**	-.005 (.001)**	.000 (.001)
Extraversion	.002 (.001)	.003 (.001)*	.003 (.001)*	.008 (.001)**
Openness	.001 (.001)	.003 (.001)*	.004 (.001)**	.007 (.001)**
Agreeableness	.000 (.001)	-.001 (.001)	.001 (.001)	.002 (.001)
Conscientiousness	.009 (.001)**	.009 (.001)**	.004 (.001)**	-.001 (.001)
Age (slope)	-.044 (.090)	.066 (.092)	.006 (.089)	-.110 (.090)
Demographics				
Sex (Female)	.006 (.015)	-.009 (.015)	-.009 (.015)	.001 (.015)
Ethnicity (Black)	-.018 (.023)	-.003 (.023)	-.020 (.027)	-.083 (.023)**
Education	-.004 (.003)	-.003 (.003)	.002 (.003)	.006 (.003)*
Personality				
Neuroticism	-.001 (.001)	-.001 (.001)	-.002 (.001)**	-.003 (.001)**
Extraversion	.000 (.001)	-.001 (.001)	.000 (.001)	.000 (.001)
Openness	.000 (.001)	.001 (.001)	.000 (.001)	.000 (.001)
Agreeableness	.001 (.001)	-.001 (.001)	.001 (.001)	.001 (.001)
Conscientiousness	.001 (.001)	.000 (.001)	-.001 (.001)	.001 (.001)
Age^2	-.029 (.003)**	-.017 (.003)**	-.026 (.004)**	-.024 (.003)**
Variance				
σ^2: Residual within-subject	.162	.170	.336	.233
u_0: Intercept	.141**	.140**	.070**	.133**
u_1: Linear Slope	.012**	.013**	.002**	.005**

Note. N = 1683.

Standard errors are shown in parentheses. Coefficients are applied to centered age (age – grand mean age) in decades.

*
$p < .05$

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$p < .01$.