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How far reaches the power of personality? Personality predictors of terminal decline in well-being

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How far reaches the Power of Personality?

Personality Predictors of Terminal Decline in Well-Being

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Abstract

Personality is a powerful predictor of central life outcomes, including subjective well-being. Yet, we still know little about how personality manifests in the very last years of life when well-being typically falls rapidly. Here, we investigate whether the Big Five personality traits buffer (or magnify) terminal decline in well-being beyond and in interaction with functioning in key physical and social domains. We applied growth models to up to 10-year longitudinal data from 629 now deceased participants in the nation-wide German Socio-Economic Panel Study (SOEP; age at death: $M = 76$ years; $SD = 11$). Lower neuroticism and higher conscientiousness were each uniquely associated with higher late-life well-being one year prior to death. At the same time, participants low in neuroticism experienced steeper terminal well-being declines. Similarly, individuals high in agreeableness and women high in extraversion reported higher well-being far away from death, but experienced more severe terminal decline, such that personality-related differences in well-being were not discernible anymore at one year prior to death. Interaction effects further revealed that individuals suffering from disability benefit less from higher levels of conscientiousness, while openness to experience appeared particularly beneficial for the less educated. We conclude that in the context of often severe late-life health challenges that accompany the last years of life, adaptive personality-related differences continue to be evident and sizeable for some traits, but appear to diminish and even reverse in direction for other traits. We discuss possible underlying mechanisms and practical implications.

Keywords: terminal decline, well-being, personality, late life, mortality

How far reaches the Power of Personality?

Personality Predictors of Terminal Decline in Well-Being

Conceptual and empirical work highlights the importance of personality as an adaptive capacity that facilitates (or hinders) people's ability to master central developmental tasks throughout the life course (Hutteman, Hennecke, Orth, Reitz, & Specht, 2014; Staudinger & Fleeson, 1996; Staudinger & Kunzmann, 2005). People low in neuroticism and high in extraversion, agreeableness, and conscientiousness have, for example, been found to build stronger social networks (Russell & Booth, 1997; Von Dras & Siegler, 1997; Wagner, Lüdtkke, Roberts, & Trautwein, 2014), to have better romantic relationships (Malouff, Thorsteinsson, Schutte, Bhullar, & Rooke, 2010; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), to lead healthier lives (Hampson & Friedman, 2008; Malouff, Thorsteinsson, & Schutte, 2005), and consequently, to experience greater subjective well-being (DeNeve & Cooper, 1998; Steel, Schmidt, & Shultz, 2008). However, most studies demonstrating the remarkable "power of personality" (Roberts et al., 2007) to predict successful adjustment to life challenges have examined samples of midlife or older adults in their 60s and 70s. In contrast, how personality relates to individuals' function at the very end of life is not well understood. Unlike earlier phases of life, the final years prior to death are characterized by pronounced normative decrements across multiple areas of physical, cognitive, and psychosocial functioning (Gerstorf, Ram, Lindenberger, & Smith, 2013) that are accompanied by steep declines in well-being (i.e., terminal decline: Burns, Mitchell, Shaw, & Anstey, 2014; Berg, Hassing, Thorvaldsson, & Johansson, 2011; Gerstorf & Ram, 2013; Mroczek & Spiro, 2005; Palgi, Shrira, Ben-Ezra, Spalter, & Shmotkin, 2010; Vogel, Schilling, Wahl, Beekman, & Penninx, 2013). Although terminal decline in well-being is normative, there are also substantial individual differences in how people experience their last years of life, with some being able to maintain a relatively stable level of

subjective well-being while others experience drastic decrements. In the context of this heterogeneity, it remains an open question whether – and under which conditions – personality traits that have been linked to higher subjective well-being in earlier life phases continue to operate as an adaptive capacity that facilitates people’s adjustment to the developmental challenges faced in the last years of life.

To address this gap in the literature, we examine whether and how personality traits predict late-life trajectories of subjective well-being beyond and in interaction with key indicators of physical health (i.e., comorbidity, disability, and Instrumental Activities of Daily Living) and social functioning (i.e., social participation). To do so, we apply growth models to up to 10-year longitudinal data from 629 now deceased participants in the nation-wide German Socio-Economic Panel Study (SOEP; age at death: $M = 76$ years; $SD = 11$, $range = 50 - 101$; 40 % women) and test the unique and conjoint predictive effects of personality, physical health, and social resources for late-life well-being and rate of terminal decline.

Challenges for and Trajectories of Well-Being Late in Life

Subjective well-being reflects people’s emotional and cognitive evaluations of their lives (Diener, Oishi, & Lucas, 2003) and is both a key indicator of quality of life and a powerful predictor of mortality (Collins, Gleib, & Goldman, 2009; Wiest, Schüz, Webster, & Wurm, 2011). Developmentally oriented researchers have long studied how well-being changes across the life span, and what drives those changes. One question that has received substantial attention is whether and how subjective well-being changes as people get older and are confronted with an increasingly negative ratio of developmental gains to losses (Baltes & Baltes, 1990). Many empirical reports suggest that average levels of well-being remain relatively stable across adulthood and old age (Charles, Reynolds, & Gatz, 2001; Diener, Lucas, & Scollon, 2006; Diener & Suh, 1998; Kunzmann, Little, & Smith, 2000; Mroczek & Kolarz, 1998), seemingly defying

the sizeable physical, cognitive, and social losses experienced in late life (Gerstorf et al., 2013). Upon closer inspection, however, the situation appears to be more complex: while age-based analyses of well-being often evince relative stability, mortality-based analyses that track changes in well-being as a function of time-to-death rather than age typically find steep decrements in both cognitive evaluative and emotional well-being at the end of life (i.e. terminal decline; Berg et al., 2011; Diehr, Williamson, Burke, & Psaty, 2002; Gerstorf & Ram, 2013; Mroczek & Spiro, 2005; Palgi et al., 2010). These differential findings (age vs. mortality) suggest that although older individuals often exhibit remarkable plasticity and compensatory resources that allow them to remain relatively satisfied further away from death, the heightened physiological vulnerabilities and constraints invoked by mortality-related processes push self-regulatory abilities to their limit and cause well-being to take a precipitous fall (Baltes & Smith, 2003; Charles, 2010).

Although average well-being declines in late-life, there are vast individual differences in how the last years of life proceed, with many people experiencing steep deteriorations in well-being whereas others maintain their well-being or experience rather minor forms of decline (for overview, see Gerstorf & Ram, 2013). To date, only few individual differences factors have been identified to be associated with this heterogeneity in late-life well-being, including physical health and disability (Burns et al., 2014; Schilling, Wahl, & Oswald, 2013) as well as social integration and participation (Gerstorf et al., 2016; Rook, Mavandadi, Sorkin, & Zettel, 2007; Windsor, Gerstorf, & Luszcz, 2014). In this study, we aim to extend this existing body of research by investigating how the Big Five personality traits are related to end-of-life well-being levels and decline. Because some personality traits share substantial variance with positive and negative emotionality (i.e., neuroticism and extraversion), and thus complicate the interpretation of personality–affect associations, our empirical analysis focuses specifically on cognitive-

evaluative (as opposed to emotional) well-being, which we synonymously refer to as life satisfaction. To provide a comprehensive overview, however, we review findings on how personality is related to both aspects of well-being.

Personality as an Adaptive Capacity

Early in the 20th century, Gordon W. Allport defined personality as “the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment” (Allport, 1937, p. 48). To describe this dynamic organization, Allport relied on personality traits, which he conceptualized as neuropsychic structures that have “the capacity to render many stimuli functionally equivalent, and to initiate and guide equivalent (meaningfully consistent) forms of adaptive and expressive behavior” (Allport, 1961, p. 347). While the first definition highlights the capacity of the individual to flexibly adjust to changing opportunity structures and constraints, the second definition asserts that the organization of psychosocial function, described in terms of personality traits, is reflected in relatively stable patterns of thoughts, feelings, and behavior that meaningfully distinguish between individuals.

Since these early days of personality psychology, many researchers have promoted the idea that human well-being may in part be rooted in relatively stable personality traits which interact with the environment in shaping adaptation dynamics and developmental processes across the life span (Friedman, 1990; Friedman, Kern, & Reynolds, 2010; Lucas & Diener, 2008). Specifically, at least two major mechanisms have been proposed to link personality to subjective well-being. First, personality traits might influence peoples’ motivation and capacity to make and pursue positive life-style choices, and thus be instrumental in creating conditions that foster (or undermine) a satisfying life (see McCrae & Costa, 1991). For example, conscientious individuals tend to be responsible, competent, and self-disciplined, and might therefore be both more concerned with being in good physical shape, advancing in their careers, and investing in their

social networks as well as more capable of successfully initiating and maintaining behaviors that promote actual progress in these life domains (Friedman, Kern, Hampson, & Duckworth, 2014; Hill, Turiano, Mroczek, & Roberts, 2012; Judge, Higgins, Thoresen, & Barrick, 1999; Lodi-Smith & Roberts, 2007), ultimately leading to higher satisfaction with life (Gerstorf et al., 2016; Headey, Muffels, & Wagner, 2010; Staudinger, Fleeson, & Baltes, 1999). Similarly, agreeable people – being warm, loving, and cooperative – are predisposed to creating a supportive social environment they can thrive in. Low agreeable individuals, in contrast, have been shown to exhibit social beliefs and behaviors that create interpersonal conflicts and an increased tendency to perceive social interactions as hostile, resulting in stronger exposure and reactivity to social stressors (Smith, 2006; Smith, Glazer, Ruiz, & Gallo, 2004) and lower social and overall subjective well-being (DeNeve & Cooper, 1998; Hill et al., 2012; McCrae & Costa, 1991; Schutte & Ryff, 1997). Evidence also suggests that individuals high in extraversion and low in neuroticism are more successful in building strong and lasting social networks (Russell & Booth, 1997; Von Dras & Siegler, 1997; Wagner et al., 2014) and leading a healthy life (Hampson & Friedman, 2008; Malouff et al., 2005). In contrast, the role of openness is less clear, as it has not been as consistently linked with positive life outcomes (although open people tend to be better at building social networks: Wagner et al., 2014).

Second, biopsychological or temperamental perspectives on personality emphasize the role that reward and punishment sensitivity play in linking extraversion and neuroticism to indicators of well-being. Building on Gray's (1970, 1987) theory of personality, a number of scholars (e.g., Carver, Sutton, & Scheier, 2000; Depue & Collins, 1999; Larsen & Ketelaar, 1991; Tellegen, 1985) argue that extraversion is closely linked to the behavioral activation system, such that extraverts are more sensitive to signals of reward and therefore more prone to the experience of positive feelings than introverts. Neuroticism, in contrast, has been tied to the behavioral

inhibition system, rendering individuals with higher levels of neuroticism more reactive to threats and negative emotional stimuli. Interestingly, empirical evidence supports the assumption that extraversion and neuroticism predict differential attention and reactivity to positive and negative cues (Carver & White, 1994; Elliot & Thrash, 2002; Gomez, Cooper, & Gomez, 2000; Jorm et al., 1998; Larsen & Ketelaar, 1991; Lucas & Diener, 2001), and also indicates that these attentional differences influence the encoding and recall of emotional memories (Haas & Canli, 2008; Rusting, 1998). Specifically, individuals appear to perceive, attend to, and remember trait-congruent information better than incongruent information or experiences, suggesting that personality-related individual differences in positive and negative emotionality may manifest in chronic memory biases that impact peoples' overall assessment of and satisfaction with their lives (DeNeve & Cooper, 1998; Steel, Schmidt, & Shultz, 2008; see also Schwartz & Strack, 1999). Having not yet been strongly linked to biopsychological models of personality, it is unclear whether similar mechanisms might also operate for the other Big Five traits.

In sum, both instrumental and temperamental perspectives on personality and well-being suggest that low levels of neuroticism and high levels of extraversion, agreeableness, and conscientiousness each contribute to higher life-satisfaction, while there is no clear-cut hypothesis for openness to experience. Empirical evidence largely supports these hypotheses, demonstrating that individuals low in neuroticism and high on all other traits (but openness) tend to report better outcomes across a multitude of life domains, including social (Hill et al., 2012), physical (Human et al., 2013), and overall well-being (DeNeve & Cooper, 1998; Schmutte & Ryff, 1997; Steel et al., 2008; see also Harris, Brett, Starr, Deary, & Johnson, 2016; Soto, 2015; Specht, Egloff, & Schmukle, 2013; Tauber, Wahl, & Schroder, 2016). Although openness has been linked to some aspects of well-being (e.g., social well-being and growth), extant evidence does not suggest a strong association with overall life-satisfaction (cf. DeNeve & Cooper, 1998;

McCrae & Costa, 1991). Despite this growing body of empirical research on the role of personality as an adaptive capacity, prior research has primarily relied on young, middle-aged and at most samples of older adults in their 60s and 70s, leaving it an open question whether personality continues to facilitate (or hinder) people's adjustment to the developmental tasks and challenges that characterize the very last years of life.

The Role of Personality for Late-Life Well-Being Trajectories

Given that associations between personality and well-being have been consistently found throughout most of the life span, it seems plausible that personality traits continue to be associated with individual differences in late-life well-being and changes therein. Theoretical notions and empirical evidence presented recently however challenge this assumption, suggesting that the role of personality might change considerably in the last years of life (for overview, see Mueller, Wagner, & Gerstorf, 2017).

First, from an instrumental perspective, the potential of personality traits to shape older individuals' living conditions in ways that effectively promote well-being might be limited by increasing individual and environmental constraints (e.g., declining resources, disability, being moved to a nursing home) and reduced biological plasticity (Baltes, Lindenberger, & Staudinger, 2006). To illustrate, as individuals reach a certain level of frailty, their engagement in physical and social activities can be expected to be increasingly determined by their level of disability or availability of assistance (Birren, 1959), leaving little room for other factors such as personality to operate. Similarly, as individuals suffer from chronic and debilitating conditions, their ability to avoid stressful experiences through selecting themselves actively into and out of certain situations is likely limited due to their reduced mobility and increased dependence on others (Charles, 2010). In addition, older individuals are often subject to involuntary changes in their social networks because close others pass away (Broese van Groenou, Hoogendijk, & van

Tilburg, 2013; Wrzus, Hänel, Wagner, & Neyer, 2013), possibly reducing the relevance of personality for the maintenance of social relationships.

At the same time, however, these late-life changes in individual opportunity structures and constraints may offer new avenues for personality to unfold its adaptive potential: while personality may have less influence on age- and mortality-related physical, cognitive, and social deteriorations or the occurrence of stressful events, it might become increasingly relevant in influencing how people cope with such adversity. Specifically, leading models of successful aging (Baltes & Baltes, 1990; Heckhausen & Schulz, 1995; Heckhausen, Wrosch, & Schulz, 2010) suggest that in the context of increasing frailty, older individuals may maintain higher levels of well-being by being more attentive to resource constraints and health threats (i.e., higher neuroticism) and by disengaging from unattainable goals (i.e., lower conscientiousness) in order to refocus the remaining energy and resources on goals and activities that are still manageable. One example for such adaptive goal selection is provided by the Socioemotional Selectivity Theory (Carstensen, 2006), which proposes that very old adults may increase their emotional satisfaction by capitalizing on a selected circle of close others rather than trying to maintain a vast social network (i.e., lower extraversion). Under a testing-the-limits scenario for adaptive capacity, recovery from perturbations typically takes a heavy toll of time, resources, and energy. Individuals who pay close attention to even minor and preceding signs of such stressors and proactively try to avoid them may thus fare better late in life.

Second, from the temperamental perspective, personality–well-being associations might change late in life due to a shift in the proportion of threats versus rewards. Given the negative ratio of gains to losses in the last years of life (Baltes & Baltes, 1990), threats likely become increasingly plentiful, triggering the behavioral inhibition system of individuals high in neuroticism. In earlier life phases, this heightened threat sensitivity typically comes at a cost

because individuals high in neuroticism tend to be overly sensitive even to the stressors they are well-equipped to handle, and thus they "pay" for their hyper-vigilance with increased negative affect and lower well-being (Barlow, Ellard, Sauer-Zavala, Bullis, & Carl, 2014; McCrae & Costa, 1991). In the last years of life, however, the benefits of being vigilant might outweigh its cost, as this vigilance allows people with higher levels of neuroticism to proactively avoid sources of strain or frustration that are difficult to cope with in the face of severe resource constraints (see Friedman, 2000 for a discussion on healthy neuroticism).

While neuroticism might become increasingly beneficial late in life, extraversion may work in an opposite manner. Given the close ties between extraversion and the behavioral activation system, extraverts seek to gain satisfaction by engaging in (typically social) activities that yield pleasure and reward (e.g., Carver et al., 2000; Carver & White, 1994). In times of high vulnerability and frailty, however, the opportunities for engagement are often limited. These constraints potentially reduce the power of extraversion to elicit high positive affect and satisfaction with life. Initial evidence comes from a study of prison inmates which found that prisoners who were more extraverted reported lower, not higher, levels of well-being than did introverts, suggesting that the lack of opportunities to engage with and express extraverted behavior indeed drags down well-being in extraverted individuals (Kette, 1991). In a similar vein, Wahl, Heyl, and Schilling (2012) reported evidence suggesting that associations between extraversion and positive affect are reduced in individuals suffering from chronic sensory impairment.

On a more general level, similar mechanisms related to shifts in opportunity structures might also apply to other traits: Drawing from notions of behavioral concordance (Moskowitz & Coté, 1995) suggesting that individuals are more happy and satisfied when they are able to behave in sync with their personality, changing resources and environmental affordances may

limit peoples' overall ability to express specific trait-congruent behaviors late in life, which could consequently bring about changes in the relation between the respective personality traits and well-being. Going beyond extraversion, increasing frailty may, for example, make it more and more difficult to express agreeable (i.e., prosocial, altruistic) and conscientious (i.e., diligent, orderly) behavior. As a result, having high levels on these traits could become a source of frustration late in life, resulting in reduced – or even reversed – associations with well-being (for discussion, see Mueller et al., 2017; see also Kandler, Kornadt, Hagemeyer, & Neyer, 2015).

The Role of Resources

Importantly, whether and how personality–well-being associations manifest differently in the last years of life compared to earlier life phases likely not only depends on an individual's distance to death, but also on the specific resources he or she is able to draw from. For example, although most individuals experience severe health deteriorations with approaching death, some individuals maintain relatively high levels of functioning through to the very end of life. Similarly, research suggests that while loneliness peaks late in life, there also is substantial variability in people's social embeddedness (Gerstorf et al., 2013; Luhmann & Hawkey, 2016). The theoretical notions summarized above, which highlight the importance of opportunity structures for late life development, suggest that the role of personality for end-of-life well-being may depend on individuals' specific context and the resources and burdens that shape those last years. Specifically, we hypothesize that among people who were able to maintain a high level of functioning into the last years of life, personality–well-being associations are similar to those found in earlier life phases, whereas personality–well-being associations will be different among individuals suffering from more severe resource constraints. In line with this reasoning, epidemiological studies have shown that while being associated with increased mortality risk in relatively healthy samples (Graham et al., 2017), neuroticism operates as a protective factor in

samples already suffering from health constraints (Gale et al., 2017; Weiss & Costa, 2005), suggesting that resource and burden factors are key moderators of personality–outcome associations.

The Present Study

In sum, building on life span developmental notions (Baltes & Baltes, 1990; Heckhausen & Schulz, 1995) and recent proposals to rethink the role of personality in late-life (Mueller et al., 2017; see also Kandler et al., 2015; Wagner, Ram, Smith, & Gerstorf, 2016), we suggest that in the face of late-life adversity, and in contrast to earlier life stages, individuals in their last years of life may benefit from being more attentive to health threats and resource constraints (higher neuroticism), more inclined to find joy in solitary activities or interactions with a selected circle of close others (lower extraversion), and less fixated on maintaining high levels of orderliness and diligence that might be increasingly difficult to achieve (lower conscientiousness).

Hypotheses are less clear for agreeableness and openness. Although it has been argued that focusing more on oneself (i.e., being less agreeable) might preserve important resources and help to avoid frustration late in life (e.g., Kandler et al., 2015), high agreeableness could also be crucial to secure much needed social support (see Gerstorf et al., 2016). As a consequence, associations between agreeableness and well-being are likely to be particularly context dependent (i.e., influenced by physical and social resources). Similarly, some have proposed that retreating to familiar environments and activities (i.e., lower openness) constitutes an adaptive adjustment (e.g., Wagner et al., 2016), while others maintain that preserving a high level of open-mindedness contributes to growth late in life (Staudinger & Kunzmann, 2005).

To disentangle these complex interrelations, we embrace a contextualized approach and not only test the predictive effects of personality traits for late-life well-being and decline, but also investigate how associations between personality and well-being are moderated by other

individual resources and burdens (i.e., physical health, including comorbidity, disability, and the ability to carry out Instrumental Activities of Daily Living, and social participation). Based on recent theorizing and initial empirical evidence (Jokela, Hakulinen, Singh-Manoux, & Kivimäki, 2014; Mueller et al., 2017; Wagner et al., 2016), we expect that in addition to end-of-life frailty, being in poor health might lead individuals to benefit more from higher levels of neuroticism and lower levels of extraversion and conscientiousness. In addition, we expect that individuals who are more socially integrated might be able to afford focusing more on themselves and their own needs without losing their social support, and may thus benefit from lower levels of agreeableness. Finally, we also explore possible interactions with socio-demographic variables (i.e., age at death, gender, and education) that have emerged as moderators of personality and subjective well-being in previous reports (Canada, Stephan, Jaconelli, & Duberstein, 2016; DeNeve & Cooper, 1998; Gerstorf et al., 2016; Jaconelli, Stephan, Canada, & Chapman, 2013; Mueller et al., 2016).

Method

The current study used up to 10 years of longitudinal data obtained from 629 now deceased participants in the nation-wide German Socio-Economic Panel Study (SOEP, 2016). Data collection has been approved by the research ethics officer of the German Institute for Economic Research. Detailed information about this household panel study is reported in Headey et al. (2010) and Wagner, Frick, and Schupp (2007). Below, we provide a brief overview of the SOEP data set focusing on aspects pertinent to our study.

Please note that the larger SOEP data set has been extensively used in psychological research, with prior studies investigating, for example, the development of personality across the life span (Denissen, Ulferts, Lüdtke, Muck, & Gerstorf, 2014; Lucas & Donnellan, 2011; Specht, Egloff, & Schmukle, 2011), psychosocial and physical health predictors of terminal well-being

decline (e.g., Brandmaier et al., 2017; Gerstorf et al., 2014, 2016), or associations between personality and well-being from young adulthood to young old age (Specht et al., 2013).

However, this is the first study to examine the role of personality in the context of terminal well-being decline, beyond and in interaction with key context variables (i.e., socio-demographic, physical, and social characteristics). Such consideration of personality has only recently become possible because sufficient frequencies of relevant data (e.g., people who had provided personality data having died in the meantime) have now accumulated. Variables that had emerged previously as relevant predictors (e.g., physical health: Brandmaier et al., 2017; Gerlach et al., 2017; social participation: Gerstorf et al., 2016) were included as covariates in our report.

Participants and Procedure

As a nationally representative household panel study, the larger SOEP study includes some 50,000 inhabitants of the former West German and East German geographic regions, including resident foreigners as well as immigrants. Participants were recruited at random from a number of randomly selected geographic regions in Germany. Data are collected once per year and primarily through face-to-face interviews. Approximately 10% of long-term participants responded using self-administered mail questionnaires. Rates of death and ages of death of SOEP participants are in line with official life tables, indicating that the SOEP serves as a representative source for mortality-related analyses (e.g., Brockmann & Klein, 2004).

For our report, we used data from participants who (a) had deceased in or before 2015, (b) contributed one or more life satisfaction ratings in the last 10 years of their lives (between 2005, the first year personality was assessed, and 2015, the last available wave with updated death records), (c) provided data on the Big Five personality traits and all covariates, and (d) did not die before age 50 (i.e., mean age in the deceased sample minus two *SD*). The latter criterion was chosen because we were interested in examining how the role of personality for subjective well-

being might change with age- and mortality-related frailty, which might manifest differently in people who die very early. Based on the SOEP death records, 2,511 former participants had died between 2005 and the end of 2015. Of these, 1,337 participants had provided data on personality at the 2005 assessment¹, and 652 of those had also given information on the other covariates of interest. Of these 652, another 33 participants were dropped from the analysis because they had died before age 50, leaving us with a final analysis sample of $N = 629$ participants.

Although the 10-year observation period was primarily dictated by the structure and availability of data (no personality data were available before 2005 and no death records after 2015), previous empirical reports suggest that 10 years are a largely sufficient time frame to examine terminal decline in well-being, which typically is most pronounced in the last 5 to 3 years before death (see Gerstorf & Ram, 2013).

Years of birth for our participants ranged from 1909 to 1963, ages at death from age 50 to age 101 years ($M = 74.92$, $SD = 12.53$), and participants provided a mean of 7.19 ($SD = 1.70$) annual life satisfaction ratings (four or more observations per participant). More than two thirds of the 4,525 available observations (68% or 3,074 observations) were collected in the final five years of life (see Table 1 for details on the data structure and distribution).

To comprehensively describe our analysis sample, we estimated three different sets of selectivity analyses: First, we compared our sample of by-now deceased participants with same-aged but still living participants. As expected, participants included in our deceased subsample were less likely women ($d = -0.26$), had fewer years of education ($d = -0.28$), and had reported lower life satisfaction ($d = -0.13$), openness ($d = -0.18$), and conscientiousness ($d = -0.16$) in 2005. Also in line with what one would expect, deceased participants suffered from more chronic illnesses ($d = 0.66$) and were more likely disabled ($d = 0.47$), had more problems carrying out Instrumental Activities of Daily Living ($d = 0.69$), and reported fewer social participation ($d = -$

0.66) than same-aged participants still alive. In a second step, we contrasted our analysis sample with SOEP participants who are also deceased but were excluded from our analyses because of missing data. Those included in our analyses were, on average, slightly younger in 2005 ($d = -0.13$), died at older ages ($d = 0.13$), were less likely women ($d = -0.12$), and better educated ($d = 0.14$). In a third step, we investigated sample attrition over time within our analysis sample by contrasting participants who had contributed seven and more waves ($n = 373$) with those who had contributed six and fewer waves ($n = 256$). Again consistent with what one would expect, those who contributed more repeated observations were younger in 2005 ($d = -0.32$), but we did not find significant differences on any of the other variables examined.

Measures

Subjective well-being. We measured well-being with a single item on life satisfaction “*How satisfied are you with your life currently, all things considered?*” (in German: *Wie zufrieden sind Sie gegenwärtig, alles in allem, mit ihrem Leben?*). Participants responded using a scale ranging from 0 (*totally unsatisfied*) to 10 (*totally satisfied*). The measure has extensively been used in research (Fujita & Diener, 2005; Headey et al., 2010; Lucas, Clark, Georgellis, & Diener, 2003) and taps into cognitive-evaluative facets (rather than affective facets) of well-being. To make sure our report is immediately comparable to earlier publications examining terminal decline in well-being (e.g., Brandmaier et al., 2017; Gerstorf et al., 2014, 2016), we standardized responses to a T metric ($M = 50$; $SD = 10$) with the total 2002 SOEP sample serving as a reference ($M = 6.90$, $SD = 1.81$).

Time-to-death. To examine terminal decline trajectories, information on mortality status and year of death was obtained from official registries or at the annual assessments (from the remaining household members or neighbors). *Time-to-death* was indexed as the number of years between each assessment and the year a given participant had died.

Personality. Personality was assessed with a widely used short version of the Big Five Inventory (BFI-S; Gerlitz & Schupp, 2005; John & Srivastava, 1999; see also Lang, John, Lüdtke, Schupp, & Wagner, 2011). The BFI-S assesses each of the five traits with three items, each answered using a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The BFI-S was specifically designed to assess personality in large-scale panel studies and shows acceptable reliability and validity compared to the German version of the NEO-FFI and other criteria (Gerlitz & Schupp, 2005). Cronbach's alphas for the five subscales were at the lower end of what is considered acceptable (neuroticism, $\alpha = .60$; extraversion $\alpha = .60$; openness, $\alpha = .66$; agreeableness, $\alpha = .59$; conscientiousness, $\alpha = .61$), which reflects the shortness of the scales and the heterogeneity of the items which were selected to measure relatively broad constructs (for more details, see Lucas & Donnellan, 2011).

Covariates. We included into our models socio-demographic characteristics (age at death, gender, and years of formal education) and indicators of physical health and social participation. If these latter covariates were available at several waves, we made use of the last available observation from each participant because we were interested in investigating the actual (health) constraints people were faced with when they were at the end of their lives as opposed to the resources people bring into the last phase of life.

To begin with, we operationally defined *morbidity* as the number of medical conditions participants endorsed on a 9-category medical symptom checklist (diabetes, asthma, cardiopathy, cancer, apoplectic stroke, high blood pressure, migraine, dementia, and other chronic illnesses), assessed in 2009, 2011, 2013, and 2015. Second, we measured *disability* asking whether participants had been “officially certified as having a reduced capacity to work or being severely handicapped” (Lucas, 2007). Thus, our disability indicator was based on self-reported information, but pertains to official certifications. Disability information was obtained at every

wave from 2005 thru 2015. Our variable compares those who had been disabled at any point in the study (coded = 1) with those who have never been disabled during the duration of the study (coded = 0). Third, we indexed difficulties to carry out *Instrumental Activities of Daily Living* (IADL; Lawton & Brody, 1969) by asking participants to indicate how their health compromised (a) their ability to climb stairs or (b) to carry out everyday activities that require heavy lifting or mobility, each answered using a 3-point scale ranging from 1 (*not at all*) to 3 (*very*). IADL information was available in the years 2006, 2008, 2010, 2012, and 2014. Using the last available observation from each participant, we combined answers to both items into one composite, contrasting individuals who did report health-related difficulties in carrying out IADLs (coded = 1) with those who did not (coded = 0). Finally, we assessed *social participation* asking participants how often (1 = at least once a week, 2 = at least once a month, 3 = seldom, 4 = never) they attended or engaged in social networking or community activities: (a) visit cultural events including concerts, theaters, and lectures, (b) active sport participation, (c) honorary activities in clubs, organizations and social service, and (d) participation in citizen initiatives, parties, community politics (for details, see Infurna, Gerstorf, Ram, Schupp, & Wagner, 2011). The structure of this scale is highly comparable to frequently used measures of social participation (Parslow, Jorm, Christensen, & Mackinnon, 2006). Social participation was assessed in 2005, 2007, 2008, 2009, 2011, 2013, and 2015. We reverse-coded and averaged items from the last available social participation rating (i.e., closest to death) to obtain an index with higher scores indicating more social participation.

Descriptive statistics and intercorrelations among all study variables are reported in Table 2. Two aspects are of note. First, looking at zero-order correlations, lower neuroticism and higher levels on all other Big Five traits were associated with higher end-of-life well-being. Second, intercorrelations among the three health indicators ranged from $r = .25$ to $r = .33$, suggesting that

these variables assess different facets of the overarching physical health construct space and might differentially moderate associations between personality traits and late-life well-being.

Data Analysis

To investigate our research questions, we estimated growth models using repeated measures of well-being over time-to-death as the time variable. Our basic model took the following form:

$$\text{Well-being}_{it} = \beta_{0i} + \beta_{1i}(\text{time-to-death}_{it}) + \beta_{2i}(\text{time-to-death}_{it}^2) + e_{it}, \quad (1)$$

where person i 's subjective well-being at time t , well-being_{it} , is modeled as a function of an individual-specific intercept parameter, β_{0i} , individual-specific slope parameters, β_{1i} and β_{2i} , that model linear and quadratic rates of terminal change in well-being per year over time-to-death , and residual error, e_{it} . Following usual practice (Ram & Grimm, 2015), we modeled individual differences in intercepts, β_{0i} , and slopes, β_{1i} and β_{2i} , (from the Level 1 model given in Equation 1) as a function of personality variables, the covariates, and their interaction (Level 2). For model parsimony, we trimmed the final model to remove main effects on the quadratic slope and interaction terms that were not reliably different from zero. The Level 2 portion of the final model took the following form:

$$\begin{aligned} \beta_{0i} = & \gamma_{00} + \gamma_{01}(\text{age at death}_i) + \gamma_{02}(\text{women}_i) + \gamma_{03}(\text{education}_i) + \gamma_{04}(\text{morbidity}_i) + \gamma_{05}(\text{disability}_i) \\ & + \gamma_{06}(\text{IADL}_i) + \gamma_{07}(\text{social participation}_i) + \gamma_{08}(\text{neuroticism}_i) + \gamma_{09}(\text{extraversion}_i) \\ & + \gamma_{010}(\text{openness}_i) + \gamma_{011}(\text{agreeableness}_i) + \gamma_{012}(\text{conscientiousness}_i) \\ & + \gamma_{013}(\text{openness}_i \times \text{education}_i) + \gamma_{014}(\text{conscientiousness}_i \times \text{disability}_i) + u_{0i}, \quad (2) \end{aligned}$$

$$\begin{aligned} \beta_{1i} = & \gamma_{10} + \gamma_{11}(\text{age at death}_i) + \gamma_{12}(\text{women}_i) + \gamma_{13}(\text{education}_i) + \gamma_{14}(\text{morbidity}_i) + \gamma_{15}(\text{disability}_i) \\ & + \gamma_{16}(\text{IADL}_i) + \gamma_{17}(\text{social participation}_i) + \gamma_{18}(\text{neuroticism}_i) + \gamma_{19}(\text{extraversion}_i) \\ & + \gamma_{110}(\text{openness}_i) + \gamma_{111}(\text{agreeableness}_i) + \gamma_{112}(\text{conscientiousness}_i) \\ & + \gamma_{113}(\text{neuroticism}_i \times \text{age at death}_i) + \gamma_{114}(\text{extraversion}_i \times \text{women}_i) + u_{1i}, \quad (3) \end{aligned}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}. \quad (4)$$

where γ_{00} to γ_{20} are sample-level regression parameters and the u_{0i} through u_{2i} are residual unexplained individual differences, which are assumed to be multivariate normally distributed with variances $\sigma_{u_{0i}}^2$, $\sigma_{u_{1i}}^2$, and $\sigma_{u_{2i}}^2$ and covariances $\sigma_{u_{0i},u_{1i}}$, $\sigma_{u_{0i},u_{2i}}$ and $\sigma_{u_{1i},u_{2i}}$. We centered the time-to-death variable at one year prior to death, z-standardized the personality variables, and effect-coded/centered all other covariates. As a consequence, our regression parameters indicate the average trajectory and the extent of differences associated with a given personality trait and/or covariate (rather than for a particular group). A negative parameter can be interpreted to mean that a given personality trait or covariate relates to lower level, steeper decline, or steeper curvature in well-being.

We fitted all models to the data using SAS Proc Mixed (Littell, Milliken, Stroup, Wolfinger, & Schabenberger, 2006) with the typical assumption that incomplete data were missing at random (Little & Rubin, 1987). The personality traits and covariates incorporated in our models (e.g., chronological age, gender, physical health) are known to be attrition-informative and thus facilitate accommodating longitudinal selection in subjective well-being (McArdle, 1994).

Results

Trajectories of Well-Being Late in Life

Results of the growth models are reported in Table 3. In line with prior research, we found that the average late-life well-being trajectory in this sample is characterized by steep linear decline and some degree of acceleration, with the linear component of decline amounting to almost one and a half standard deviations per decade ($\gamma_{10} = -1.48$, $p < .001$), which combined with some concave curvature ($\gamma_{20} = -0.11$, $p < .001$) resulted in an average well-being level one

year prior to death ($\gamma_{00} = 43.94, p < .001$) that was more than half a standard deviation below the mean of the nationally representative SOEP sample in 2002 ($M = 50, SD = 10$).

Also mirroring previous reports, we found significant interindividual differences in levels and rate of change in well-being, which were associated with multiple covariates. Individuals who died at a younger age reported lower levels of well-being one year prior to death ($\gamma_{01} = -0.14, p < .001$), as did people suffering from disability ($\gamma_{05} = -3.15, p < .001$) or difficulties with IADL ($\gamma_{06} = -5.60, p < .001$). In contrast, people who were more socially engaged reported higher levels of well-being one year prior to death ($\gamma_{07} = 3.77, p < .001$). As well, greater difficulties in IADL were associated with steeper terminal declines ($\gamma_{16} = -0.60, p < .001$).

The Role of Personality for Late-Life Well-Being Trajectories

Most important for our research question, results revealed that above and beyond the socio-demographic, physical health, and social participation variables, the Big Five personality traits were also associated with individual differences in levels of and terminal decline in well-being. Specifically, lower neuroticism ($\gamma_{08} = -1.74, p < .001$) and higher conscientiousness ($\gamma_{012} = 0.96, p = .021$) were each associated with higher well-being one year prior to death (see Figures 1 and 2)². However, the association between conscientiousness and level of late-life well-being was moderated by disability ($\gamma_{014} = -1.47, p = .010$), such that differences between those high vs. low in conscientiousness were considerably smaller among those with disability (Figure 2, Panel B) compared to those without disability (Figure 2, Panel A). One interpretation is that participants suffering from disability benefited considerably less from higher levels of conscientiousness than did those in better health. Similarly, the association between openness to new experience and level of well-being one year prior to death was moderated by level of education ($\gamma_{013} = -0.39, p = .002$). As can be obtained from Figure 3, differences between those high vs. low in openness were considerably larger for the low-educated (Panel A) relative to the high-educated (Panel B),

suggesting that openness to new experience may be particularly beneficial for less educated population segments.

Looking at associations between personality traits and rate of terminal well-being decline, lower neuroticism ($\gamma_{18} = 0.14, p = .035$) and higher agreeableness ($\gamma_{111} = -0.21, p = .003$) were associated with steeper rates of decline (see Figures 1 and 4), with neuroticism being most strongly linked to well-being trajectories among individuals who died at younger ages ($\gamma_{113} = -0.01, p = .018$). As illustrated in Figure 1, among participants who had died prior to reaching age 76 years, the difference in reports of well-being between those $+1 SD$ vs. $-1 SD$ in neuroticism was $0.93 SD$ at five years prior to death, but only $0.56 SD$ in the year of death. As well, higher levels of extraversion were linked to steeper terminal well-being declines in women (but not in men; $\gamma_{114} = -0.27, p = .009$; see Figure 5).

In summary, our results suggest that, depending on personal context (age, gender, education, and health), people high in conscientiousness and openness to experience consistently report higher levels of well-being during their last years of life, while those low in neuroticism and high in extraversion and agreeableness had higher levels of well-being five years prior to death, but also experienced steeper well-being declines in the last years of life. Consequently, personality-related differences in well-being were diminished (neuroticism) or not discernible anymore (agreeableness, extraversion in women) at one year prior to death. Interestingly, and in line with our hypotheses, these results stand in contrast to studies focusing on earlier periods of the adult life span, which typically report positive associations of emotional stability (low neuroticism), extraversion, and agreeableness with levels and changes in subjective well-being. Our findings suggest that such associations may partly reverse in direction at the end of life.

To put these findings into perspective and further illustrate the role of mortality-related processes for late-life development, we also conducted a follow-up analysis using chronological

age (centered at 70 years) rather than time-to-death as the underlying time-metric. In the model of age-related processes, we found a pattern of results more similar to previous reports focusing on midlife or individuals in their 60s and 70s (e.g., Harris et al., 2016; Tauber et al., 2016): lower neuroticism ($\gamma = -1.82$) as well as higher extraversion ($\gamma = 0.84$), agreeableness ($\gamma = 0.39$), and conscientiousness ($\gamma = 0.76$) were each positively associated with levels of well-being at age 70 years. Moreover, in line with other studies comparing age- and mortality-related trajectories (see Gerstorf & Ram, 2013), age-related changes in well-being were less than half the size ($\gamma = -0.64$) compared to mortality-related changes ($\gamma = -1.48$). Of the Big Five traits, only agreeableness was linked to age-related rates of change in well-being, with individuals high in agreeableness showing slightly steeper decreases ($\gamma = -0.07$). Interestingly, associations between neuroticism and extraversion with rates of well-being change were not significant in the age-based model. Overall, the results from this follow-up analysis thus converge with our expectations and underline conceptual arguments proposing that the role of personality for late-life well-being differs when looking at the last years before death. In contrast, effects of education and disability on associations between personality and well-being were also present in the age-based model, suggesting that already in their 70s, individuals with lower education benefit more from higher openness ($\gamma = -0.35$) while individuals faced with disability benefit less from higher conscientiousness ($\gamma = -1.46$).

Discussion

In the current report, we applied growth models to multi-year longitudinal data from more than six hundred already deceased participants from the SOEP to investigate how personality traits are associated with levels and rates of decline in late life well-being and how these associations are moderated by known socio-demographic, physical health, and social correlates. Converging with prior evidence, we found that people who died at younger ages, were less

socially active, and suffered from disability or a compromised ability to carry out Instrumental Activities of Daily Living reported lower levels of well-being close to death (see Brandmaier et al., 2017; Gerstorf et al., 2016; Windsor et al., 2014). Moving beyond previous reports and demonstrating the power of personality to predict important life outcomes across the entire life span, our results further revealed that personality traits predict late-life well-being above and beyond these well-established predictors. Importantly, however, the magnitude and direction of personality effects found in our end-of-life sample differed in several respects from prior investigations focusing on earlier life periods.

The Role of Personality for Late-Life Well-Being Trajectories

Our results provide initial empirical evidence for recent theoretical developments in personality research suggesting that the role of personality changes late in life (Kandler et al., 2015; Mueller et al., 2017; Wagner et al., 2016). Specifically, personality traits or trait constellations that are associated with favorable outcomes in young adulthood and midlife may not be adaptive anymore in later life stages (for overviews of similar perspectives voiced for other psychosocial variables, see M. M. Baltes, 1996; Rodin, 1986). In line with these notions, our results indicate that while being linked to higher well-being when people are far away from death, lower levels of neuroticism and higher levels of agreeableness and extraversion are associated with steeper well-being declines in the last years of life. Initial benefits may thereby be reduced (neuroticism, but mainly in people who die at younger ages) or even eliminated (agreeableness, extraversion in women). Converging with theories of successful aging (Baltes et al., 2006; Carstensen, 2006; Ebner, Freund, & Baltes, 2006; Heckhausen et al., 2010) and the instrumental perspective on personality and well-being (McCrae & Costa, 1991), these findings suggest that in the face of scarce resources and an increasingly negative ratio of developmental gains to losses that characterize the last years of life (Baltes & Baltes, 1990), individuals might

benefit from being more selective in the activities and relationships they invest in (i.e., be and/or behave less extraverted and agreeable) and more attentive to their resource constraints (i.e., more neurotic). Our results are also in line with predictions drawn from the temperamental perspective suggesting that a lack of engagement opportunities late in life might drag down well-being in extraverts (at least in women), while the high threat sensitivity and behavioral inhibition tendencies of individuals high in neuroticism might become increasingly adaptive and thus outweigh the emotional costs of worrying. Future, more mechanism oriented research is needed to determine which specific pathways are driving the observed associations between personality and well-being and to illuminate whether certain mechanisms might be more relevant for some traits than for others.

The Role of Resources

Above and beyond the overall end-of-life frailty associated with approaching death, we also found evidence that specific resources and burden factors play an important role in moderating associations between personality and well-being. Specifically, our results suggest that the seemingly omnipotent trait of conscientiousness, which has frequently and consistently been linked to a wide variety of positive life outcomes (Friedman et al., 2014; Judge et al., 1999; Roberts et al., 2007) might lose some of its power in the context of late-life disability: while having higher levels of conscientiousness was associated with substantially higher well-being in healthy individuals, associations of conscientiousness with late-life well-being were considerably less pronounced in those disabled, indicating that although high conscientiousness maintains a positive overall association with well-being late in life, it seems to be less beneficial in individuals suffering from more severe end-of-life adversity. Drawing from the congruence principle (cf., Heckhausen et al., 2010), this could mean that high levels of orderliness, diligence, and achievement-striving might not be as instrumental for maintaining high levels of well-being

in individuals suffering from severe resource constraints that compromise their ability to perform all activities to the highest standard. Instead, these individuals might increasingly benefit from so-called secondary control strategies (Heckhausen et al., 2010) that involve disengaging from goals that have become costly (sometimes even unachievable) and refocusing one's energy on goals and activities that are still manageable (even if that means not being on top of everything all the time; see also Wagner, Lang, Neyer, & Wagner, 2014, for a parallel argument on self-esteem late in life). A similar argument could be made based on notions of behavioral concordance (Moskowitz & Côté, 1995): individuals who are less conscientious to begin with might suffer less from late-life disability (at least in terms of life satisfaction), because it does not prohibit them from expressing their personality as much compared to individuals high in conscientiousness, who can be expected to be more frustrated by their increasing inability to put their high achievement-striving and diligence into practice.

In addition to disability, several socio-demographic characteristics emerged as moderators of personality–well-being associations. To begin with, neuroticism was linked to steeper rates of terminal well-being decline in individuals who died at younger ages, but not in those who died in their 80s and 90s. This finding might seem somewhat counterintuitive in the light of theoretical notions and empirical evidence suggesting that neuroticism is particularly protective in individuals faced with more pronounced resource constraints, which could be expected to increase as people get older (see Mueller et al., 2017; Mueller, Wagner, Smith, Voelkle, & Gerstorf, 2017). It is possible, however, that people who die younger simply suffer from more aggressive forms of (lethal) disease. Being more attentive to potential threats (i.e., more neurotic) could thus foster their ability to proactively avoid situations or activities that place a high burden on their already scarce resources. An alternative explanation could be that older individuals have already established routines that prevent them from engaging in activities and behaviors that do

not promote their well-being, while those who die at younger ages benefit more from the risk-awareness and threat-sensitivity associated with higher neuroticism.

Another interesting finding was that high extraversion did drag down well-being in women, but not in men. Drawing from research on gender differences in social networks (Antonucci & Akiyama, 1987), this could indicate that extraverted women suffer more from late-life decreases (Broese van Groenou et al., 2013; Wrzus et al., 2013) in social network size and social contact than do men (who have smaller networks to begin with), but future research is needed to corroborate and extend our initial findings and test such post-hoc speculation.

Future research is also needed to replicate and better understand our finding that openness is associated with higher well-being in individuals with fewer years of formal education but not in those highly educated. One potential explanation might be that among individuals with lower education, those who are more open to experience are more likely to explore different ways to cope with and adjust to late-life adversity that they would otherwise not have known about. For example, people with lower education might not be as aware of different housing opportunities, care services, medication plans, or diets as are individuals with higher education and socioeconomic status. In this context, openness may act as a buffer for low education and help people reduce potential information deficits (for an example on the role of openness for health behaviors, see Möttus et al., 2013).

Finally, it should be noted that contrary to our expectations, social participation did not have an effect on the role of personality for late life well-being. Given the breadth of research highlighting the importance of social context for individual development (e.g., Antonucci & Akiyama, 1987; Gerstorf et al., 2016; Hill et al., 2012), it is possible that our measure of social participation was not ideally suited to capture those social resources most crucial at the end of life. Based on recent reports (Drewelies, Wagner, Tesch-Römer, Heckhausen, & Gerstorf,

2017; Victor et al., 2002; see also Luhmann & Hawkley, 2016), indicators of subjective perceptions of social integration (e.g., loneliness) may be more central in shaping individual adjustment than are more quantitative indicators of network size or contact frequency. It thus remains an open question whether the relation of personality and well-being is not moderated by social resources, or only by some.

Conceptual Implications: A Refined View on Personality Maturation

In the context of accumulating evidence for notions suggesting that increases in maturity-related traits (i.e., emotional stability, agreeableness, and conscientiousness) from young adulthood to midlife are reversed late in life (Möttus, Johnson, & Deary, 2012; Wagner et al., 2016; Wortman, Lucas, & Donnellan, 2012), these current findings not only challenge traditional conceptions of more or less desirable traits, but also provide a new perspective on the sources and consequences of end-of-life personality changes: A reversal of the maturation principle late in life could reflect processes of adaptation to increasing resource constraints through the selection of resource-congruent goals and activities that may ultimately help to maintain higher levels of well-being. To test this hypothesis, future inquiry should reexamine associations between personality and end-of-life well-being in a more dynamic fashion by, for example, simultaneously modeling late-life changes in personality and well-being as well as their interplay. Once the appropriate data (e.g., more personality waves in large-scale panel data sets) become available, such analyses may provide valuable information refining our current understanding of what constitutes adaptive personality late in life and answer questions that go beyond our current report. For example: Are increases in neuroticism and decreases in agreeableness and extraversion (in women) linked to higher end-of-life well-being? At what point (and under which conditions) do predictive effects of personality for well-being decrease or change direction? To illustrate, it is conceivable that having higher levels of agreeableness far away from death is beneficial for well-being (e.g.,

because it helps building and maintaining a reliable social network), whereas decreases in agreeableness close to death help individuals to maintain higher levels of well-being by focusing more on their own needs in their last years of life.

Limitations and Outlook

Analyzing a sample of SOEP decedents who provided up to 10 years of within-person longitudinal well-being data, the current report was in a position to offer new insights and perspectives on personality-related differences in end-of-life well-being levels and trajectories. At the same time, we note several limitations. To begin with limitations of our measures, we note that the personality measure used in the SOEP comprises only three items per trait that capture the personality factors at a broad level, but do not allow for more specific facet-level analyses that might have revealed a more differentiated pattern of results. For example, it is well possible that some aspects of a trait (e.g., extraversion: excitement-seeking) are less beneficial for late-life well-being, while others (e.g., extraversion: warmth, positive emotions) remain protective. Similarly, our one-item measure of well-being was designed to assess the overall cognitive-evaluative component of well-being (i.e., satisfaction with life which has been widely used in other reports, see Fujita & Diener, 2005; Headey et al., 2010; Lucas et al., 2003), but did not capture the more affective aspects of well-being (cf. Vogel et al., 2013) or other sub-facets (Ryff & Keyes, 1995) that could be expected to show differential associations with personality (see Schmutte & Ryff, 1997).

Second, our study design assessed associations between personality and well-being at a macro time-scale. Based on recent theoretical and empirical advancements, personality–well-being transactions can be expected to also manifest at faster time-scales (e.g., months, weeks, or even days; see Ram et al., 2014; Wrzus & Roberts, 2017). Zooming into such short-term links could thus be a promising avenue for future research to shed light onto the specific processes and

mechanisms that link personality to subjective well-being late in life. Moreover, because the predictive effects of personality for well-being trajectories in the last years of life are not well understood, we put an emphasis on including a wide variety of potential moderators (e.g., three different health indicators). Our analysis of archival data is, however, limited by the SOEP's study design, in that there might be other important moderators that were not measured. For example, it is possible that the role of personality for late life well-being is also dependent on the cause of death. Dying from a chronic degenerative disease can be expected to bring about different challenges compared to a sudden death, and although we tried to at least partially account for this by including individual differences in health status, controlling for cause of death might reveal even more nuanced findings (unfortunately, this information is not available in the SOEP for the full time period under consideration). As a general caution on generalization, effects reported here require replication, and should be interpreted with caution until other 10+ year data are available. Although we had sufficient statistical power ($> .80$) to detect medium to large effects, the sample size ($N = 629$) and number of repeated measures ($T = 10$ annual assessments) is not overly large. We may have missed some smaller, more nuanced, associations. Future studies, with larger sample sizes, more and higher density repeated measures, and broader coverage of individual and contextual factors (i.e., additional variables) will be able to parse the nuanced ways that personality operates on well-being in end-of-life contexts.

Furthermore, as noted above, our report considered predictive effects of personality traits for levels and changes in late-life well-being, but could not examine more dynamic transactions between *changes* in personality and changes in well-being. Once more waves of personality data become available (only very few individuals in the current sample of decedents had provided more than one or two waves), future investigations may extend our efforts by embracing a more dynamic approach toward personality–well-being associations. With multiple closely-spaced

observations available for a large number of participants, it will in the future also be possible to apply multi-phase models that thoroughly test whether personality traits operate for terminal decline in well-being in similar ways to how cognitive reserve and education presumably operate for terminal decline in cognitive functioning. Specifically, clinical disease onset is often delayed for more educated individuals, but they typically experience more rapid declines after being diagnosed (e.g., Stern, Albert, Tang, & Tsai, 1999). It is thus possible that the adaptive power of personality helps people push back the onset of terminal declines in well-being and so compresses the time of deteriorations into a shorter period (Fries, 1980); but once well-being decrements have set in, these are more severe (because people have more room for change).

Finally, it remains to be seen whether the personality–well-being associations observed in our current sample of decedents in Germany also generalize to other historical contexts (e.g., earlier- or later- born cohorts), populations, or (sub-)cultures. It is well possible, for example, that personality traits that appear beneficial in Westernized societies are less adaptive in collectivistic cultures in which older individuals are embedded into a stronger intergenerational network (see Galinha, Garcia-Martin, Oishi, Wirtz, & Esteves, 2016).

Conclusions

Taken together, the present results indicate that personality-related differences in well-being that have been documented across adulthood continue to be evident and sizeable into the very last years of life for some traits, but appear to decrease or even reverse in direction for other traits, partly dependent on individual-level characteristics such as gender, education, and physical health. As such, the current study is one of the first to provide evidence for a refined view on what constitutes adaptive personality late in life and speaks to the role of individual resources and burdens in shaping personality–well-being associations.

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Footnotes

¹ Although personality was assessed in 2005, 2009, and 2013, only the 2005 personality assessment was used in the current report because, first, our interest was in predicting late-life trajectories of well-being across the last 10 years prior to death and, second, longitudinal information on personality was too scarce to also consider changes in personality as additional predictors.

² Because most observations were available for the last 5 years prior to death and because terminal well-being decline also becomes most visible in these last few years, well-being trajectories are only depicted for the last 5 years prior to death in all following figures.

Table 1
Descriptive Statistics for Well-Being Over Time-to-Death

Year	<i>n</i>	Age range	Well-being over time-to-death	
			<i>M</i>	<i>SD</i>
-10	84	45–88	50.82	10.07
-9	183	42–91	50.37	10.74
-8	298	42–92	48.18	11.45
-7	390	43–93	48.53	10.62
-6	496	44–94	48.57	10.54
-5	625	45–96	47.80	10.57
-4	626	46–97	47.05	11.74
-3	615	47–98	46.39	11.39
-2	622	48–99	45.97	11.55
-1	582	49–100	42.79	13.56
0	4	52–83	45.03	9.02

Note. *N* = 629 participants who provided 4,525 observations. *M* = mean. *SD* = standard deviation. Scores for well-being were standardized to a *T* metric (*M* = 50, *SD* = 10) using the 2002 national German Socio-Economic Panel Study sample as the reference frame (*M* = 6.90, *SD* = 1.81; scale range: 0–10).

Table 2
Intercorrelations among Study Variables

	<i>M</i>	<i>SD</i>	Intercorrelations														
			1	2	3	4	5	6	7	8	9	10	11	12	13		
1. Well-being (T Score)	48.78	10.50		-.32	.18	.18	.24	.26	.19	.01	.12	-.07	-.15	-.14	.16		
<i>Personality</i>																	
2. Neuroticism (1–7)	4.05	1.32			-.21	-.07	-.09	-.10	-.07	.15	-.13	.09	.07	.09	-.10		
3. Extraversion (1–7)	4.70	1.13				.42	.10	.23	-.05	-.00	.04	.04	.05	.07	.09		
4. Openness (1–7)	4.24	1.33					.12	.23	-.09	.06	.27	.03	.06	.04	.27		
5. Agreeableness (1–7)	5.50	1.05							.38	.11	.17	.04	.04	.00	.09	-.01	
6. Conscientiousness (1–7)	5.88	0.98								.04	.05	.06	-.03	.01	.00	.02	
<i>Covariates</i>																	
7. Age at death (50–101)	76.34	11.04									.16	-.12	.12	-.07	.10	-.20	
8. Women (0–1)	0.40	0.49										-.19	-.04	-.04	.05	-.07	
9. Education (7–18)	11.45	2.44											-.02	-.06	-.09	.31	
10. Morbidity (0–6)	1.79	1.24													.25	.33	-.10
11. Disability (0–1)	0.58	0.50														.28	-.03
12. IADL (0–1)	0.66	0.48															-.19
13. Social participation (1–4)	1.34	0.47															

Note. *N* = 629 participants. *M* = mean. *SD* = standard deviation. IADL = Instrumental Activities of Daily Living. Personality was assessed in 2005. Descriptive statistics for all other covariates and for well-being are based on last observations before death. Scores for well-being were standardized to a *T* metric (*M* = 50, *SD* = 10) using the 2002 national German Socio-Economic Panel Study sample as the reference frame (*M* = 6.90, *SD* = 1.81; scale range: 0–10). Intercorrelations of $r = |.08|$ or above statistically significantly different from zero at $p < .05$ (highlighted in bold).

Table 3

Growth Model for Well-Being Over Time-to-Death, Including the Big Five Personality Traits and Health Covariates as Predictors of Levels and Rate of Change

	Well-being					
	Level ^a		Linear slope ^b		Quadratic slope	
	Est.	SE	Est.	SE	Est.	SE
<i>Fixed Effects</i>						
Intercept	43.94**	0.45	-1.48**	0.19	-0.11**	0.02
Age at death	0.14**	0.04	-0.01	0.01		
Women	1.33	0.80	0.25	0.13		
Education	0.16	0.18	-0.02	0.03		
Morbidity	-0.21	0.32	0.04	0.05		
Disability	-3.15**	0.80	-0.13	0.13		
IADL	-5.60**	0.87	-0.60**	0.14		
Social participation	3.77**	0.87	0.15	0.14		
Neuroticism	-1.74**	0.39	0.14*	0.07		
Extraversion	0.65	0.43	-0.06	0.07		
Openness	0.42	0.44	-0.03	0.07		
Agreeableness	0.10	0.41	-0.21**	0.07		
Conscientiousness	0.96*	0.42	0.04	0.07		
Openness × education	-0.39**	0.13				
Conscientiousness × disability	-1.47**	0.57				
Neuroticism × age at death			-0.01*	0.00		
Extraversion × women			-0.27**	0.10		
	Level ^a		Linear slope ^b		Quadratic slope	
	Est.	SE	Est.	SE	Est.	SE
<i>Random Effects^c</i>						
Variances	80.21**	6.85	8.68**	1.35	0.08**	0.02
Covariance with intercept			16.81**	2.57	1.34**	0.28
Covariance with linear slope					0.80**	0.15
Residual, σ^2_e	54.24**	1.39				
<i>AIC</i>	32,601					
<i>-2LL</i>	32,525					

Note. $N = 629$ participants who provided 4,525 observations. Unstandardized estimates and standard errors are presented. IADL = Instrumental Activities of Daily Living. Scores for well-being were standardized to a T metric ($M = 50$, $SD = 10$) using the 2002 national German Socio-Economic Panel Study sample as the reference frame ($M = 6.90$, $SD = 1.81$; scale range: 0–10). Personality variables were z-standardized; covariates were centered. Two-way and three-way interactions of the quadratic slope and of the Big Five personality traits were tested, but only retained if significant. ^a Intercept is centered at one year before death. ^b Slope or rate of change is scaled in T score units per year. ^c Significance of random effects was assessed in two ways: using the approximate standard error based significance tests implemented in SAS, and through

comparison of models with and without each random effect term. In all cases the random effects were significant and improved model fit. Est. = Estimate, SE = standard error.

* $p < .05$.

** $p < .01$.

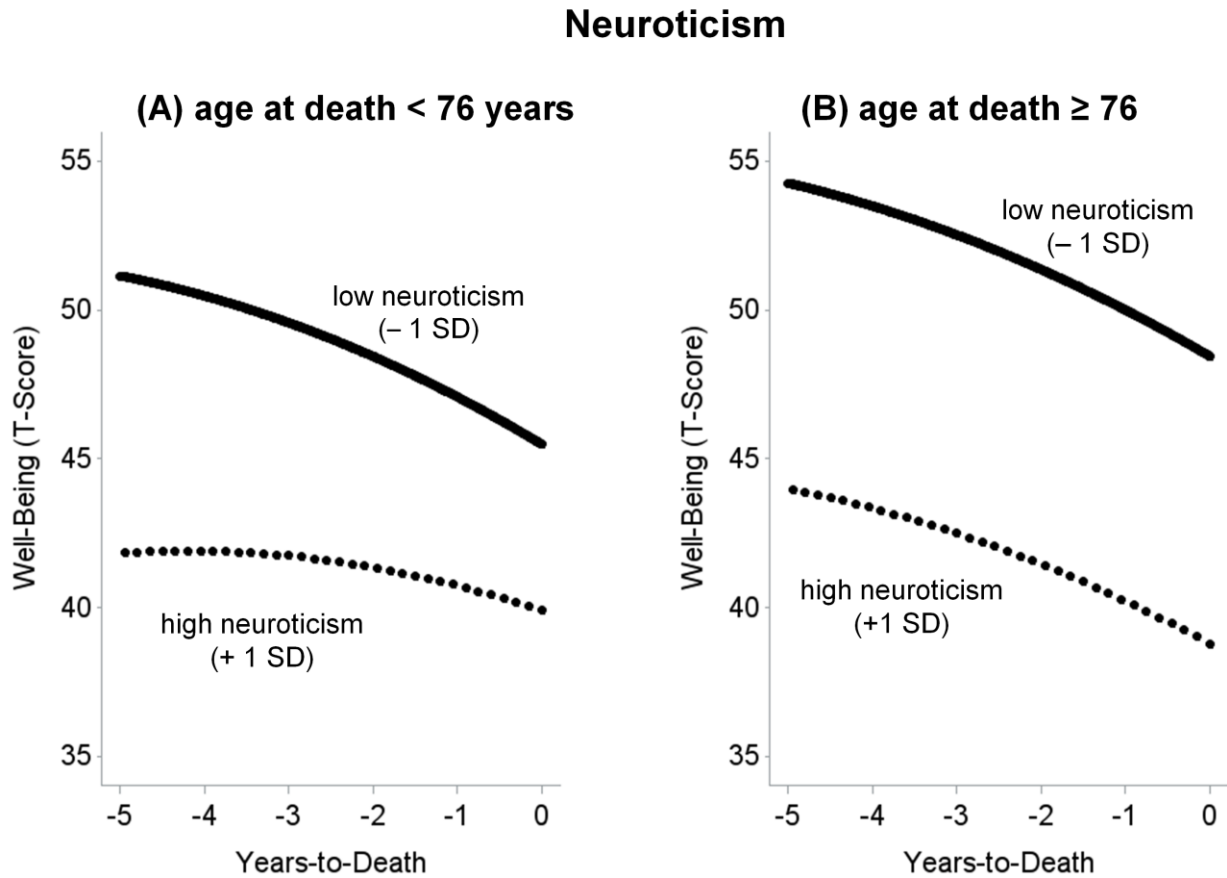


Figure 1. Graphical illustration of the significant two-way interaction between neuroticism and age at death in predicting individual differences in the rate of terminal decline in well-being. It can be obtained that among participants who died in their late seventies or older, personality-related differences in levels of late-life well-being for neuroticism remained stable as people approached death, with basically parallel rates of change in the two groups (Panel B). In contrast, among those who died at younger ages, neuroticism made a difference for the rate of change (Panel A): Individuals with higher levels of neuroticism experienced less severe terminal decline in well-being than those with lower levels of neuroticism.

Conscientiousness

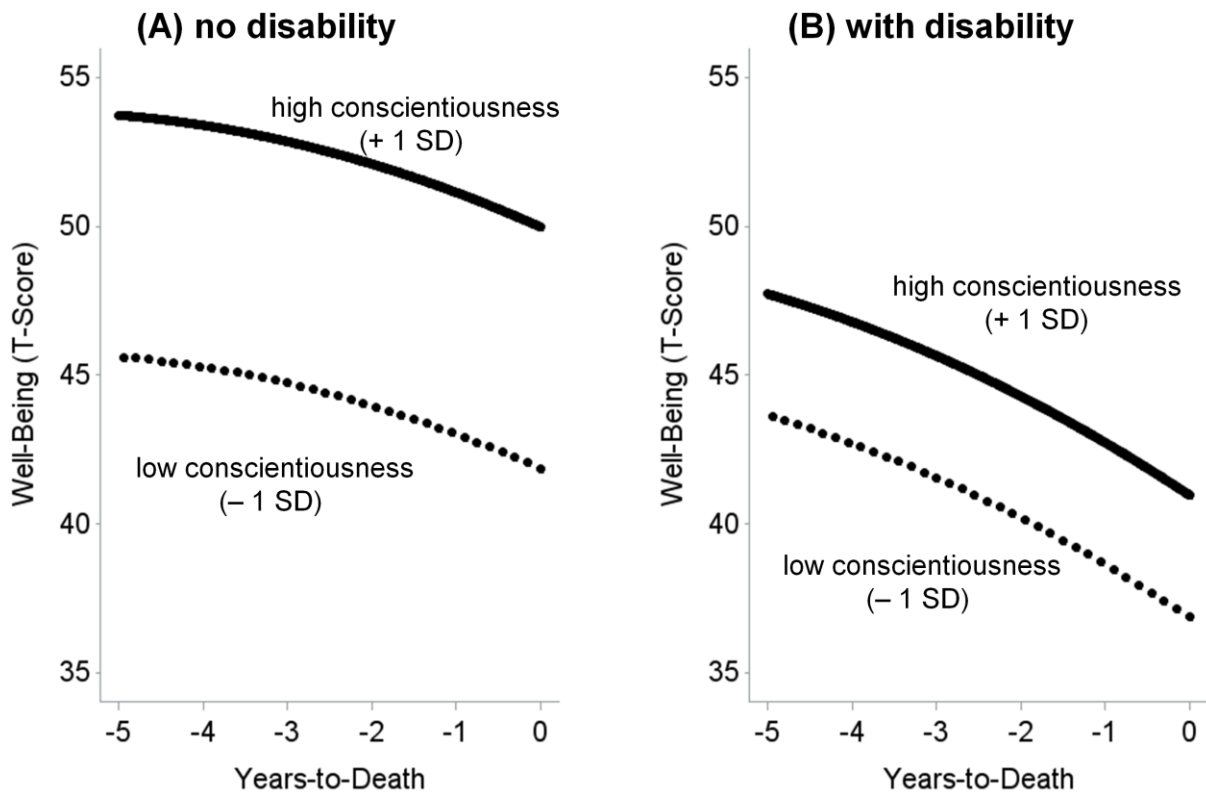


Figure 2. Graphical illustration of the significant two-way interaction between conscientiousness and disability in predicting individual differences in levels of well-being close to death. It can be obtained that differences between those high vs. low in conscientiousness were considerably smaller for those suffering from disability (Panel B) relative to those without disability (Panel A), suggesting that participants suffering from disability benefited less from higher levels of conscientiousness than did those in better health.

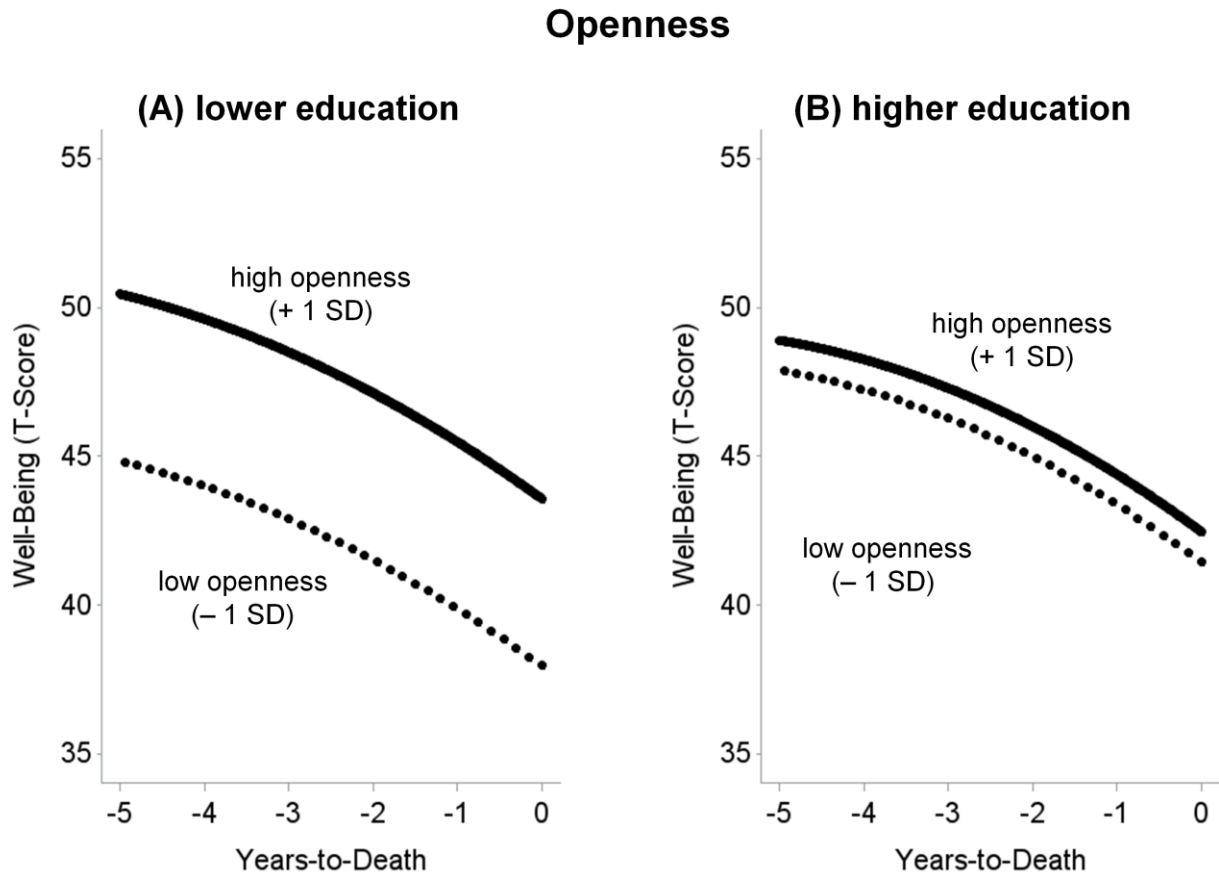


Figure 3. Graphical illustration of the significant two-way interaction between openness and years of education in predicting individual differences in levels of well-being close to death. It can be obtained that the association between openness and late-life well-being is negligible in better educated individuals (Panel B). Among those less educated, in contrast, being more open was associated with higher end-of-life well-being consistently throughout people’s last years of life (Panel A).

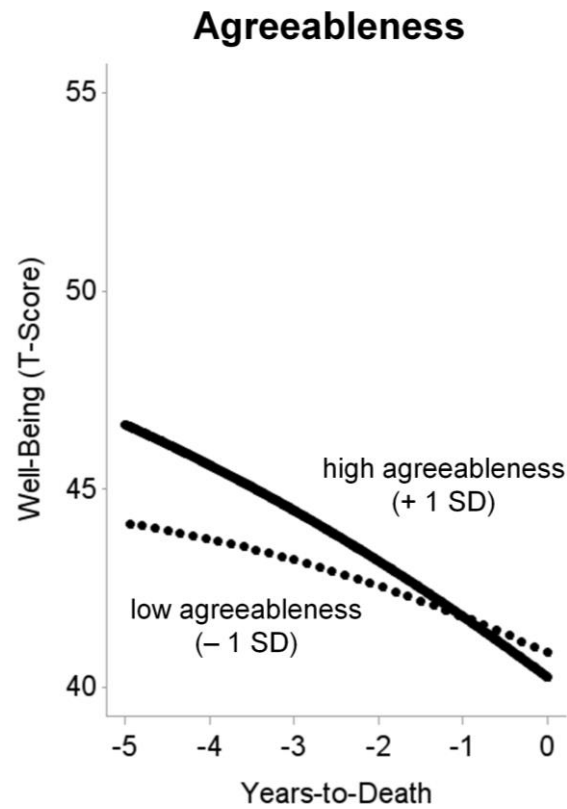


Figure 4. Graphical illustration of the association between agreeableness and rates of terminal decline in well-being. It can be obtained that despite reporting higher levels of well-being far away from death, more agreeable individuals experienced more severe declines in well-being than those less agreeable, such that agreeableness-related differences in well-being that were sizeable at five years prior to death were not discernible anymore one year prior to death.

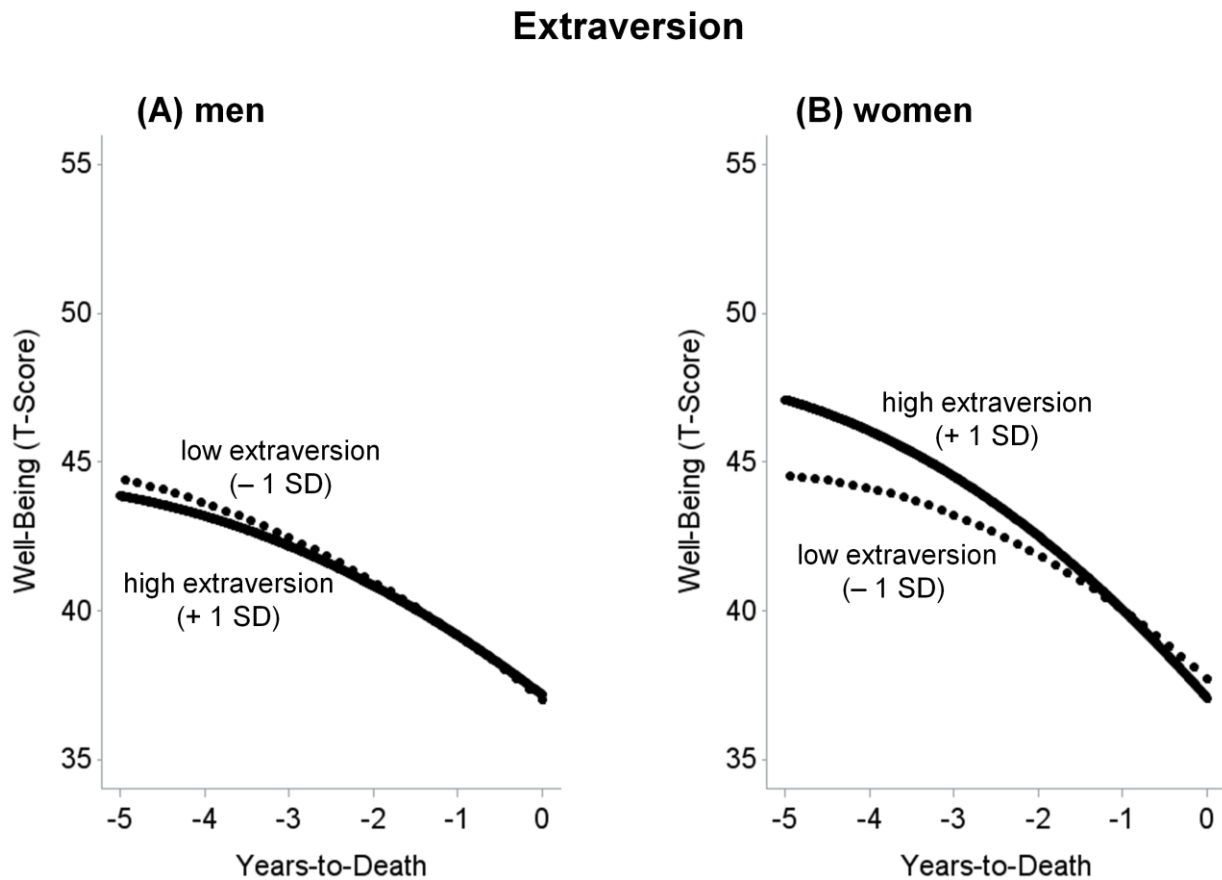


Figure 5. Graphical illustration of the significant two-way interaction between extraversion and gender in predicting individual differences in the rate of terminal decline in well-being. It can be obtained that while extraversion was not associated with late-life well-being trajectories in men (Panel A), women with higher extraversion had higher levels of well-being five years prior to death, but experienced more severe terminal decline in well-being than those less extraverted (Panel B). As a consequence, extraversion-related differences in well-being that had existed far away from death were not discernible anymore at one year prior to death.