Longitudinal Profiles of Mental Well-Being as Correlates of Successful Aging in Middle Age

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Abstract

This study analyzed the multidimensional (including emotional, psychological, and social well-being) profiles of mental well-being and their links to various indicators of successful aging (SA; including diseases, cognitive and physical function, and engagement with life). The analyses were based on the Finnish Jyväskylä Longitudinal Study of Personality and Social Development, where the age-cohort participants have been followed from age 8 to 50. Data on 335 participants collected in mid-adulthood were analyzed. Applying Latent Profile Analysis and measures of life satisfaction and psychological well-being at ages 36, 42, and 50 and social well-being at ages 42 and 50, four longitudinal well-being profiles were extracted: high (29% of the participants), relatively high (47%), moderate (22%), and low (3%). ANCOVAs (controlling for gender and education) revealed that the participants in the high, relatively high, and moderate well-being profiles had more satisfying relationships, better labor market success, and fewer diseases at age 50 than those in the low well-being profile. Fewer inter-profile differences were observed in physical or cognitive function. Favorable profiles of mental well-being are related to successful aging in mid-adulthood. Future studies should investigate the causal relations between well-being and SA.

Keywords: Latent Profile Analysis, longitudinal study, mental well-being, multidimensional well-being, successful aging

Longitudinal Profiles of Mental Well-Being: Successful Aging as Their Correlate in Middle Age

Mental well-being has been shown to contribute to crucial aspects of an individual's functioning, such as longevity (e.g., Steptoe & Wardle, 2012), better physical health (e.g., Friedman & Kern, 2014), quality of life (Weber et al., 2015), higher cognitive functioning (e.g., Charles & Carstensen, 2010; Wilson et al., 2013), fewer feelings of loneliness (e.g., Queen, Stawski, Ryan, & Smith, 2014), and less fear of death (e.g., Ardelt, 2003). The specific indicators of mental well-being have varied widely between studies and, along with their outcome variables, have mainly been investigated separately. In this study, we adopted a multidimensional view of mental well-being (e.g., Keyes, 2005) and analyzed the links between multidimensional well-being profiles and various indicators of successful aging (Rowe & Kahn, 1987, 1997). We were especially interested in identifying possible groups of individuals with rather stable differences in well-being. Data on the currently middle-aged participants of the ongoing Finnish Jyväskylä Longitudinal Study of Personality and Social Development (JYLS; Pulkkinen, 2017) were examined to see whether the model of successful aging (SA) also holds for individuals at younger ages.

Until recently, mental well-being has been researched from two distinct perspectives, one hedonistic and the other eudaimonic (Ryan & Deci, 2001; Waterman, 1993). Hedonistic well-being has been indicated by personal happiness, including positive affect and a general satisfaction with life (Diener, 1984), and eudaimonic well-being by personal growth and self-actualization (Ryff, 1989). These two traditions of mental well-being research have become established as subjective (or emotional) and psychological well-being, respectively (Ryff & Keyes, 1995). While the indicators of emotional and psychological well-being correlate with each other, they capture somewhat different aspects of mental well-being: the pursuit of one's true nature may not always be pleasurable but may entail temporary unhappiness (Ryan &

Deci, 2001). Subsequently, a third dimension, namely social well-being, was added to mental well-being (Keyes, 1998). Social well-being describes an individual's success in resolving challenges and tasks encountered in his or her social environment. Based on emotional, psychological, and social well-being, a tripartite model of mental well-being was proposed (Keyes, 2005). Empirical evidence, such as our JYLS-based results, has started to accumulate, showing that these three dimensions capture a latent factor of well-being (Kokko, Korkalainen, Lyyra, & Feldt, 2013b; Kokko, Rantanen, & Pulkkinen, 2015). This latent well-being tends to show high relative stability across the mid-adult years.

Only a few studies have analyzed multidimensional well-being from a person-centered perspective (Morack, Ram, Fauth, & Gerstorf, 2013; Wang, Sinclair, Zhou, & Sears, 2013), where the interest is in the identification of groups of individuals differing in their levels of different well-being indicators. In the longitudinal context, a person-centered approach is applied to identify groups of individuals in whom the levels and possible changes in the different well-being indicators are as similar as possible over time. Prototypical statistical techniques applied in person-centered approaches include profile, class, and cluster analysis (Laursen & Hoff, 2006). The present longitudinal study utilized a person-centered approach with profile analysis. Specifically, our aim was to identify different homogeneous groups of individuals whose levels of and changes in emotional, psychological, and social well-being remained similar between ages 36 and 50. According to the Keyes' (2005) model, the highest level of well-being (i.e., flourishing) is characterized by a high level of functioning (both psychological and social) and general happiness (emotional well-being) whereas the opposite holds for the lowest level (i.e., languishing). In Keyes' analysis of a representative sample of US adults, aged 25 to 74 years, most (65%) manifested a moderate level of well-being, 18% were flourishing and 17% languishing. We further examined how

middle-aged individuals characterized by different profiles of mental well-being function in other areas of life.

In defining functioning in different areas of life, we used Rowe and Kahn's (1997) model of successful aging (SA) in which three components are identified: low risk for disease and disease-related disability, maintenance of high cognitive and physical function, and continued engagement with life. Several well-known longitudinal studies, using both person- and variable-centered statistical methods, have analyzed the links between psychological functioning and different indicators of SA among individuals older on average than those in the present study. Applying Latent Profile Analysis to data from four *Swedish longitudinal studies* (i.e., GENDER, OCTO, OCTO-TWIN, and NONA; total *N* = 1,008; mean age at baseline = 81 years; follow-up duration 8 years), Morack et al. (2013) obtained the following SA profiles based on variables for depressive symptoms as well as for social and cognitive functioning: preserved system integrity (63% of the participants), aging in isolation (18%), compromised memory (15%), and memory failing (4%). The individuals in the preserved system integrity profile maintained their high level of functioning, as indicated by low depression and relatively high social and memory functioning, across the 8-year follow-up, whereas the remaining three profiles showed a decreasing trend in specific areas of functioning. These individuals also had the most favorable sociodemographic background and health and the lowest mortality rate.

Based on *the American Normative Aging Study* (*N* = 1,515 men; mean age at baseline 47 years; mean follow-up duration 19 years), Aldwin, Spiro, Levenson, and Cupertino (2001), first using growth curves and then cluster analysis, examined trajectories of physical and mental health. They found that, on average, the number of physical health symptoms increased across time, whereas psychological health remained stable. However, these trends differed significantly between the different trajectories of health (7 for physical and 5 for

mental health). Moreover, the trajectories further differed from each other in personality and health behaviors. Briefly, the individuals in the trajectories of low and stable physical symptoms (50% of the participants) had higher scores in emotional stability, were more highly educated, and had more advantageous health behaviors (e.g., smoked less and were of normal weight) than those in the trajectories of high and increasing health symptoms (27%; the remainder were in the moderate physical health trajectory). For mental health, the individuals in the trajectory of high and stable mental health (74%), scored higher on emotional stability, whereas the individuals in the low and decreasing mental health trajectory (5%; the remainder were in the moderate mental health trajectory) were more likely to be higher in hostility than the others.

The causal relations between mental and physical functioning have also been of interest. Using growth curve analysis, the above-mentioned four Swedish longitudinal studies showed that before the onset of a disability, depressive symptoms increased, peaking at disability onset (mean age = 86 years), and decreasing thereafter (Fauth, Gerstorf, Ram, & Malmberg, 2012). Conversely, a study based on an Australian *DYNOPTA* sample (*N* = 1,862; mean age = 70 years; mean follow-up 6 years) and, again, using growth curve analysis, indicated that the presence of physical health problems as such did not contribute to lower mental well-being, whereas a worsening of physical health did (Burns, Mitchell, Shaw, & Anstey, 2014). Finally, the *Berlin Aging Study* I and II (*N* = about 200 per cohort; mean age = 75 years) showed that when drawing conclusions about mental well-being it is important to acknowledge that its different dimensions are likely to show different developmental trends (Kunzmann, Little, & Smith, 2000) and that cohort differences, favoring the younger cohort, may be present (Gerstorf et al., 2015).

To summarize, previous research indicates that, *first*, mental well-being is linked to many crucial areas of functioning, most of which capture various indicators of SA (Rowe &

Kahn, 1997), such as diseases and disability, cognitive and physical functioning, and continued engagement with life (as indexed by social relationships and sociodemographic variables). *Second,* in both the profiles based on the various indicators of SA and profiling based on different dimensions of mental well-being the largest group is likely to be by individuals with a high level of functioning. Most studies on functional profiles have focused on old and very old people. In the present study, we investigated multidimensional well-being profiles over time and their links to SA among individuals in mid-adulthood.

Our interest in middle-aged participants serves several purposes. Understanding of their mental well-being and general functioning can help shed light on the processes of aging. It is claimed that midlife, the years from around age 40 to 60, functions as a pivotal period of life, forming links between the earlier and later life phases (Lachman, Teshale, & Agrigoroaei, 2015). The mental well-being of the middle-aged is important as their functioning affects several people, such as their partner and their own children and aging parents as well as their colleagues at work (Lachman, 2015). Further, despite the considerable theoretical and empirical interest expressed in the SA model (Martin et al., 2015; Rowe & Kahn, 2015), it has also been criticized. These criticisms include the absence of a life-course perspective (e.g., Morack et al., 2013; Rowe & Kahn, 2015; Stowe & Cooney, 2015). In our study, we partially applied a life-course perspective by analyzing whether the SA components traditionally observed among older participants are already linked to mental well-being at an earlier developmental phase, that is, during middle age.

The Present Study

Based on the JYLS, we examined multidimensional mental well-being longitudinally, from age 36 to 50, to capture groups of individuals who are typical (big groups) and atypical (smaller groups) in the development of their emotional, psychological, and social well-being. The different groups of individuals identified as having different longitudinal profiles of

mental well-being were then compared in the components of SA. Mental well-being was profiled using Latent Profile Analysis (LPA) and measures of emotional (indexed by life satisfaction; Diener, 1984; see also Kokko et al., 2013b), psychological (Ryff, 1989), and social well-being (Keyes, 1998) at ages 36, 42, and 50 (social well-being was available only at ages 42 and 50). We conceptualized the three established components of SA as outcome variables. We indexed diseases and disabilities by both subjective (self-assessed health) and objective indicators (diagnosed diseases and body mass index), cognitive function by memory tests, and physical function by exercise and muscle strength, and continued engagement with life both by relations with others (loneliness) and by productive activity (career success). These were all measured by well-known instruments at age 50 in the JYLS.

While acknowledging that the causality between mental well-being and SA may be bidirectional, in this study we took the position that well-being contributes to SA in multiple areas of life. We assumed that two mechanisms might help to explain the associations between well-being and successful aging: *First*, personality has been shown to contribute to both well-being and many of the SA indicators (e.g., health behavior, physical function, relationships, and working career; Kinnunen et al., 2012; Kokko, Tolvanen, & Pulkkinen, 2013a; Lahey, 2009; Friedman & Kern, 2014). *Second*, well-being (e.g., positive feelings) predisposes individuals to experience certain life events as positive (e.g., encounters with other people; Steel, Schmidt, & Shultz, 2008), which may further contribute to SA (e.g., social support).

Our *first aim*, on the assumption that the study population was not homogeneous (Keyes, 2005), was to identify possible latent groups of mental well-being differing in their levels of and changes in the various well-being indicators from age 36 to 50 (Kokko et al., 2013b, 2015). As the person-centered method used for identifying groups – LPA – is exploratory in nature, it is not possible to propose exact hypotheses about the number and

size of the possible emergent longitudinal well-being groups. This was especially the case in our study owing to the design (three age waves, multidimensional well-being construct) and the inductive nature of LPA (see Bennett, Gabriel, Calderwood, Dahling, & Trougakos, 2016). However, in line with Keyes (2005), it was reasonable to expect that we would at least find a group of individuals with high scores in emotional, psychological, and social well-being (labeled flourishing by Keyes). Further, we hypothesized that groups would be found for moderate and low mental well-being (labeled languishing by Keyes). In line with other person-centered analyses (Aldwin et al., 2001; Morack et al., 2013), we assumed the high mental well-being group would form the largest group among the present participants.

Our *second aim* was to compare the mental well-being groups against various SA indicators at age 50. We expected that a group high in mental well-being would also have high scores in SA, particularly for continued engagement in life, which is indexed by the life areas (relations and productivity) considered central for the middle-aged (Lachman, 2015). For diseases and disabilities and cognitive function, which have been shown to dominate the definition of SA among people aged 60 years or over (Depp & Jeste, 2006), we set no specific hypotheses for the present middle-aged participants. Since it has been well established that background factors, such as gender and education, contribute to mental well-being (e.g., Heikkinen, Berg, & Avlund, 1995), these factors were controlled for in all the comparisons.

Method

Participants

The present study utilized data drawn from the ongoing Finnish Jyväskylä Longitudinal Study of Personality and Social Development (JYLS), where the same participants (born 1959) have been followed since age 8 in 1968 (Pulkkinen, 2017). The initial JYLS sample consisted of 12 randomly selected complete second-grade classes from schools in the town of

Jyväskylä in Central Finland. These classes comprised 369 pupils (173 girls and 196 boys) all of whom participated in the study. Since study outset, the major data collections have taken place at ages 14, 20, 36, 42, and 50. In the present study, we used information gathered at ages 36 in 1995, 42 in 2001, and 50 in 2009.

At each age, that is, 36, 42, and 50, the participants were first mailed a Life Situation Questionnaire (LSQ) and then participated in a semi-structured psychological interview during which they filled in several self-report inventories. The data collections at ages 42 and 50 also included health examinations with laboratory tests; the age-50 health data were used in the present study. The numbers of participants who took part in at least one of the data collections were as follows: at age 36, 313 (161 women and 152 men; 85% of the initial sample, excluding two deceased participants); at age 42, 285 (134 women and 151 men; 79%, excluding six deceased participants); and, at age 50, 271 (127 women and 144 men; 76%, excluding 12 deceased participants). Comparison of participants with non-participants at each age has shown that the participants are representative of the Finnish age cohort born in 1959 in, for example, marital status, education, and employment situation as given in Statistics Finland (Pulkkinen, 2017; Pulkkinen & Kokko, 2010). At age 50, 56% of the JYLS participants were married, 18% had a university degree, 72% were employed and a further 9% were self-employed. Moreover, participants and non-participants have not differed in either their child and adolescent behavior or school achievement (Pulkkinen, 2017; Pulkkinen & Kokko, 2010).

The specific number of participants in the present analyses varied depending on the measure in question. In the LPA, 335 participants (155 women and 180 men) met the inclusion criterion of data on at least one of the well-being indicators. We compared participants for whom information on life satisfaction was only available at age 36 (n = 36) with those for whom it was available at either all three ages (i.e., 36, 42, and 50; n = 42) or at

age 42 and/or 50 (n = 233). No statistically significant differences between the groups were observed in the life satisfaction score at age 36, $F(2,308) = 0.10$, $p = .902$. The same comparison was performed for psychological well-being (the groups sizes were 42, 49, and 187, respectively), and, again, there were no differences in the psychological well-being score at age 36, $F(2,275) = 0.65$, $p = .521$. For social-well-being, information on which was available at ages 42 and 50, we contrasted two groups: those for whom information was available only at age 42 (n = 200) and those for whom it was available at both ages or only at age 50 (n = 40). No significant differences were found, $t(238) = -1.09$, $p = .275$. It thus seems that the dropouts from the further measurements showed no selection effect. In the ANCOVA, the number of participants was smaller and varied (from 196 to 254) depending on the specific variable in question. However, application of Little's missing completely at random test (Graham, Cumsille, & Elek-Fisk, 2002) showed that our data were missing randomly, χ^2 (85) = 91.73, $p = .290$.

Measures and Variables

Mental Well-Being

Life satisfaction and psychological well-being were measured at ages 36, 42, and 50 and social well-being at ages 42 and 50. *Life satisfaction*, analyzed as an indicator of emotional well-being, was assessed using the LSQ items on satisfaction pertaining to seven life domains: housing, financial situation, choice of occupation, present occupational situation, present intimate relationship or lack of it, content of leisure time, and present state of friendships (Kokko et al., 2013b). The participants rated each item on a scale from *1 = very dissatisfied* to *4 = very satisfied*. The mean score for the seven items was computed. Cronbach's alphas were .55 at age 36, .65 at age 42, and .63 at age 50.

Psychological well-being was self-rated using the 18-item version of the Scales of Psychological Well-Being (Ryff, 1989) during the psychological interview. The items

measured the six components of psychological well-being, i.e., self-acceptance, positive relationships with others, environmental mastery, autonomy, purpose in life, and personal growth. The participants rated each item (e.g., "I think it is important to acquire new experiences that challenge the way I think about myself and the world" for personal growth) on a scale from *1=strongly disagree* to *4 = strongly agree*. The mean score for the 18 items was computed. Cronbach's alphas were .72 at age 36, .75 at age 42, and .77 at age 50.

Social well-being was self-rated using the 15-item version of the Scales of Social Well-Being (Keyes, 1998), also administered during the psychological interview. The items measured five components of social well-being, i.e., social-acceptance, social contribution, social coherence, social integration, and social actualization. The participants rated each item (e.g., "The world is becoming a better place for everyone" for social actualization) on a scale from *1=strongly disagree* to *4 = strongly agree*. The mean score for the 15 items was computed. Cronbach's alphas were .75 at age 42 and .79 at age 50.

Low Risk for Disease and Disease-Related Disability

Self-assessed state of health, a physician-diagnosed diseases or injuries, and body mass index (BMI), measured at age 50 during a health interview, were used in the present study. *Self-assessed state of health* was rated from *1 = very good* to *4 = rather or very poor*. Participants were also asked whether they had *(= 1)* or did not have *(= 0)* any of the following: endocrinological diseases (i.e., diabetes, hypercholesterolaemia), cardiac and circulatory diseases (i.e., high blood pressure or arterial hypertension, coronary heart disease, stroke), mental health problems (i.e., nervousness or anxiety, sleeplessness, depression, other mental health problems), or any other disease. A sum score for diseases was calculated (range 0–10). Participants reporting any of the above were coded as *1 = having a disease or injury*, and those reporting none were coded as *0 = no disease or injury*. *BMI* was calculated as weight (in kilograms) divided by height squared (in meters).

Maintenance of High Cognitive and Physical Function

Cognitive function was measured as a part of the health interview at age 50 using two memory tests: word list recall and digit span. The *word list recall task* was drawn from the Consortium to Establish a Registry for Alzheimer's Disease cognitive battery (Heyman, Fillenbaum & Nash, 1997; Pulliainen, Hokkanen, Salo, & Hänninen, 1999) where the participant was first asked to recall the 10 words he or she had just read. The task was repeated up to three times if all 10 words were not recalled in the first attempt. Then, after a few minutes' pause, the participant was asked to recall as many of the 10 words as he or she was able and the number of correctly recalled words was calculated. In this study, we used a memory retention percentage which was computed by dividing the number of recalled words by the number of the words originally recalled correctly and multiplying the result by 100. The *digit memory span test* was based on the number of correctly recalled digits when read to the participant in sequences of two to seven digits (in sets of two attempts in each case) and in both forward and backward order. If both sets were correctly recalled, then the participant scored 2, if one set was correct 1, and if both attempts were incorrect 0. The sum score was used in the present study.

Exercise frequency and handgrip strength, assessed at age 50, were used as indicators of physical function. *Exercise* was assessed using the following question in the LSQ: "How often do you exercise or do sports in your free time for at least half an hour, so that you are out of breath and sweating?". The response scale varied from *1 = never* to *7 = practically every day*. *Handgrip strength* was measured during the health interview from the dominant hand, using a grip strength dynamometer, clamp model (ForAmps, 1 v 1.3) manufactured by the Department of Biology of Physical Activity in the Faculty of Sport and Health Sciences, University of Jyväskylä. The participant was instructed to stand with the forearm of the measured hand maintained at an angle of 90° and to squeeze the grip using maximum force.

Two practice sessions and at least three actual attempts were conducted. If the result of the third attempt showed improvement, then the participant was asked to continue for as long as his or her result improved. The highest value (displayed in kilograms, output 50 mV/1 kg) was used.

Continued Engagement with Life

Continued engagement with life was indexed by relations with others and productive engagement with life, both measured at age 50. Relations with others were studied by loneliness. *Loneliness* was examined using the 24-item self-administered Social Provision Scale (e.g., "If something went wrong, no one would come to my assistance"; Cutrona & Russell, 1987; Lyyra & Heikkinen, 2006), which was filled in during the health interview. The mean score for the 24 items was computed. Cronbach's alpha was .91.

Productive engagement with life was investigated using the following measures at age 50: stability of career line, occupational status, and income. *Stability of career line* was based on several questions from the LSQ and interview (Pulkkinen, Ohranen, & Tolvanen, 1999) on the main occupational activities between ages 43 and 50. Three categories were formed: *1 = unstable* (frequent changes of job and periods of unemployment), *2 = changeable* (varying jobs, mainly not corresponding to one's field, recently started studies, sudden uncertainty in work situation, other reason for removal from working life), and *3 = stable career line* (working in one's field without many interruptions). *Occupational status* was based on the following question in the LSQ: "What is your latest occupational title (irrespective of whether or not you are currently working)?" (Kokko, Pulkkinen, Mesiäinen, & Lyyra, 2008). Following the categories of Statistics Finland, the titles were classified into: *1 = blue-collar* (e.g., cleaners and factory workers), *2 = lower white-collar* (e.g., nurses and technicians), and 3 = *upper white-collar* (e.g., managers and physicians) occupations. *Income level* was elicited by the following LSQ question: "Which category does your monthly taxable net income fall

into before taxes are deducted? Monthly net income includes all taxable income, pensions, unemployment benefits, etc. Income from capital is not taken into account here.". The response categories varied from *1 = not more than 1,000 euros* to *14 = over 7,000 euros*.

Control Variables

We controlled for the effects of education on the links between the mental well-being profiles and indicators of successful aging. *Educational level* was determined by the LSQ question on the highest educational qualification at age 42, supplemented and verified by information obtained during the psychological interview at the same age and at ages 36 and 50. Four categories were formed: *1 = no occupational education or short courses only*, *2 = vocational school*, *3 = vocational college or polytechnic*, and *4 = university degree*. We also controlled for the possible role of *gender* in the mental well-being profiles: *1 = women* and *2 = men*[1].

Data Analysis

For descriptive purposes, mean level differences between women and men in both the mental well-being and successful aging indicators were analyzed using a t-test for independent samples. Latent Profile Analysis (LPA) was used to identify possible latent homogeneous groups of longitudinal profiles of mental well-being (life satisfaction and psychological and social well-being). Latent groups produced by LPA refer to subpopulations in the data that are not known beforehand but can be identified with various mixture modeling techniques (Lubke & Muthén, 2005; Sterba, 2013). LPA also allows for the probability of an individual's membership in a well-being profile to be estimated in the same model as the estimation of that profile. LPA was performed with Mplus (version 7.3; Muthén & Muthén, 1998–2012). The method of estimation was maximum likelihood with robust standard errors. Missing data were handled through full information maximum likelihood (FIML). FIML does not exclude participants with incomplete data in the variables of interest but instead estimates the model using all the available data. Thus, missing values were not excluded or imputed in

the present analyses. Rather, parameter estimates and standard errors were estimated directly from the observed data (Enders, 2010; Schafer & Graham, 2002) and the significance of each estimate in the model was based on the observed number of cases. Thus, all participants who responded at any of the three age waves of the study were included in the LPA.

We entered the mean scores for life satisfaction and psychological well-being measured at ages 36, 42, and 50 and social well-being measured at ages 42 and 50 simultaneously into the LPA. The within-profile LPA models were specified so that the variances of the well-being indicators were constrained to be equal across the profiles. The latent group solutions were estimated from one group onwards until the model fit with the data was no longer improved by the addition of yet another group. In deciding on the appropriate number of latent profile groups, model fit was evaluated using log likelihood, entropy, the Bayesian information criterion (BIC), and the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR). When comparing different group solutions, smaller log likelihood and BIC values and higher entropy values reflect a better fit to the data for any given group solution (Muthén, 1998−2004; Nylund, Asparouhov, & Muthén, 2007). LMR compares neighboring group solutions (i.e., one vs. two groups, two vs. three groups etc.), where a significant *p*-value indicates improvement in the model fit as the number of groups is increased by one. As well as log likelihood, BIC, entropy, and LMR values, selection of the final latent group solution was based on the substantive meaningfulness and interpretability of the solution (Lubke & Muthén, 2005).

After identifying the latent longitudinal well-being profiles, we investigated the demographic differences between them using cross-tabulation with χ^2-test (gender, education) and adjusted standardized residuals for the identification of typical cell frequencies (> 1.96). Finally, differences between the latent groups in the indicators for successful aging (i.e., disease and related disability, maintenance of high physical and cognitive function, and

continued engagement with life) at age 50 were examined using analysis of covariance (ANCOVA), in which gender and education were set as covariates. These further analyses were done using the SPSS 22 program.

Results

Descriptive Results

Table 1 presents the descriptive statistics for the present study variables. Only three statistically significant gender differences were observed: BMI, handgrip strength, and income at age 50 were higher among men than women.

Identifying Latent Longitudinal Profiles of Mental Well-Being

The fit indices and statistical tests for the alternative multi-group solutions (1–8) for the latent profiles of mental well-being, based on life satisfaction as well as psychological and social well-being, at ages 36, 42, and 50 (social well-being at ages 42 and 50) and the LPA, are shown in Table 2. These data did not clearly favor any one of the estimated group solutions. The lowest BIC value was observed for the four-group solution. The LMR only weakly supported the two-group solution. The entropy values across the group solutions were very similar (.72–.74). Consequently, we chose the four-group solution as it had the best BIC value and meaningful interpretability. The four groups differed by size and mental well-being profile.

As shown in Table 3, the four profiles of mental well-being mainly differed from each other in the level of the mental well-being indicators at the ages studied, not in their developmental course. The first profile, labeled “low well-being” (comprising 3% of the participants), showed the lowest level of life satisfaction and psychological and social well-being at all ages, except for psychological well-being at ages 36 and 42, in which it resembled the moderate well-being group. The remaining three profiles, while identical in the developmental course of the mental well-being indicators across time, differed in their levels.

The increasing levels of the mental well-being indicators in these profiles are reflected in their labels: the second profile was labeled “moderate well-being” (22%), the third “relatively high well-being” (47%), and the fourth “high well-being” (29%).

Characterizing the Mental Well-Being Profiles by Gender and Education

Occupational education was significantly associated with mental-well-being (Table 4). Typically, individuals with no occupational education were in the moderate well-being profile (adjusted standardized residual, ASR = 2.2) and those with either a vocational college or university degree in the high well-being profile (ASRs = 2.8 and 2.4, respectively). Generally, most of the participants in all the educational categories, except for those with a university degree, had relatively high mental well-being. Women and men were equally distributed across the different profiles. However, in the subsequent analyses we controlled for the effects of both education and gender, since, even if not related to the well-being profiles, gender might nevertheless be linked to some of the present indicators of successful aging.[1]

Comparisons of the Mental Well-Being Profiles in the Indicators of Successful Aging

The ANCOVA results for the differences between the mental well-being profiles in the indicators of successful aging (adjusted by gender and educational level) are reported in Table 5. Most of the differences were observed in continued engagement with life; fewer differences concerned diseases or the maintenance of cognitive or physical function. Further, the comparisons showed that, in contrast to those low in well-being, the individuals in the highest profile of mental well-being also had the highest level of functioning.

Compared to the other profiles, the individuals with high mental well-being were the least lonely. They also had higher occupational status and better self-assessed health than those in the low and moderate well-being profiles. Further, relatively high well-being also seemed to be linked to favorable functioning, since these individuals reported fewer feelings

of loneliness than those low in well-being. Compared to those moderate in well-being, they exercised more and were less lonely. In turn, the individuals in the low mental well-being profile had the least stable working careers and lowest income and had the highest number of diseases.

Discussion

This study was designed, *first*, to identify the possible longitudinal profiles of mental well-being (emotional, psychological, and social) among middle-aged individuals and, *second*, to investigate the links between the well-being profiles found and various indicators of successful aging (disease and disability, maintenance of function, and continued engagement with life). In line with our first hypothesis, formulated by applying Keyes' (2005) multidimensional view of mental well-being, we obtained distinct profiles of mental well-being which differed in the levels of the well-being indicators at ages 36, 42, and 50. The groups identified were as follows: a group with high well-being (29% of the participants), groups with relatively high (47%) and moderate (22%) well-being, and a (small) group with low well-being (3%). As also found by Keyes in the USA, individuals with a moderate level of well-being (who were moderate in positive psychological and social functioning as well as in general life satisfaction) formed the largest single categories (one category for moderate well-being in Keyes' study, moderate and relatively high well-being in this study). In both studies, the individuals high in well-being, termed flourishing by Keyes, included between one-fourth and one-fifth of the participants. However, in the present study, which was based on a representative sample of a Finnish age cohort group born in 1959, the languishing group (low in all the well-being indicators) was smaller than the corresponding group reported by Keyes.

The differences between the present Finnish and previous USA studies may be explained by several factors. Our well-being groups were formed using longitudinal data

(across ages 36, 42, and 50) whereas the USA study was based on a single cross-sectional measure of well-being. Our analysis was arguably less sensitive in detecting temporarily low well-being (i.e., the group of languishing individuals), as the interest was in locating rather stable individual differences across three measurement points. Further, the classification criteria were different: Keyes used the number of "positive symptoms" (i.e., scores on the well-being indicators) as the grouping criterion whereas we used latent profile analysis. Thus, our study focused on identifying naturally occurring latent homogeneous subgroups of individuals from heterogeneous data instead of applying pre-defined criteria based on scores for different well-being indicators. Finally, Keyes' (2005) study was based on a nationally representative sample of adults aged 25 to 74 years whereas the present participants represented a single age cohort whose well-being was studied from age 36 to 50. There is likely to be more variation – also in the negative direction – in well-being when a wider age-range of individuals is included. Cultural difference is also a possibility that could not be controlled for in the present study.

Our mental well-being groups can also be compared to those found in person-centered analyses based on well-known longitudinal studies of older participants using various indicators of well-being and SA. As in the Swedish studies (Morack et al., 2013) and the US Normative Aging Study (Aldwin et al., 2001), high functioning groups, labeled "preserved system integrity" (low depression and moderate social and cognitive functioning) and "high and stable mental health" (high emotional stability), respectively, were found. In the Swedish and US studies these high functioning groups contained the largest numbers of individuals, i.e., 63–74%. Thus a higher proportion of individuals were in the high mental well-being group than in our study (29%). The high mean age of the Swedish participants (81 years at baseline, followed for 8 years on average), means that the participants who remained in the person-centered analyses until follow-up can be considered rather selected. In contrast,

both the participants in the Normative Aging Study (mean age 47 years at baseline, followed for 19 years on average) and those in the present study (36 years at baseline, followed for 14 years) were representative of the initial sample. The large proportion of highly functioning older individuals may be partly explained by that the fact that they were more likely to remain in the study than age peers with physical and/or mental health problems. The difference between the present Finnish study and the US study may be attributable to the different variables used to assess mental health (various mental well-being indicators in the JYLS and more symptom-free indicators in the US study) and the differences in statistical methods. However, the two highest mental well-being groups (high and relatively high) in the present study comprised 76% of the sample, thus resembling the size of the high and stable mental health group found in the Normative Aging Study. More research is needed to assess the consistency of the high psychological functioning of this group of individuals.

The present mental well-being groups showed significant differences in the various components of successful aging at age 50. We included the traditional three markers of SA proposed by Kahn and Rowe (1987), i.e., low risk for disease and disease-related disability, maintenance of high cognitive and physical function, and continued engagement with life. The ANCOVA comparisons revealed two main results: In line with our second hypothesis, the individuals in the high mental well-being profile generally scored highest on SA; the opposite was true for those in the low well-being profile. Further, most of the differences between the well-being groups pertained to engagement with life and fewer to cognitive and physical function. The high well-being group reported both the lowest level of loneliness and the highest occupational status. They also diverged from most of the other groups in having better self-assessed health. However, the moderate and relatively high mental well-being groups differed in several of the same indicators (e.g., stability of career line and income) as those separating the high well-being group from the low well-being group. Thus, the

functioning of the individuals in the moderate, relatively high, and high well-being profiles was in contrast to the functioning of those in the low well-being profile who, according to several of the SA indicators, were aging the least well. Compared to the other groups, those in the low well-being group had the highest number of diseases, the most unstable working careers, and the lowest income level.

Altogether, the present findings indicate that reasonably good mental well-being across the mid-adult years (i.e., from age 36 to 50), studied from a person-oriented perspective and using multiple dimensions, is strongly linked to continued engagement with life at age 50. It is to be noted that in addition to social well-being as such, life satisfaction (i.e., satisfaction with the present state of friendships) and psychological well-being (i.e., positive relations with others) included components related to social relations which may have contributed to the associations observed between high mental well-being and low loneliness. A significant, but weaker, association of high mental well-being with good self-assessed health was also found. These observations are in line with many other findings on the contribution of single indicators of mental well-being to various outcome measures among older participants, such as lack of loneliness (Queen et al., 2014) and good physical health (Friedman & Kern, 2014).

In this study, we analyzed mental well-being as a predictor of SA. It has been shown that heritable personality traits, such as low neuroticism and high extraversion, contribute strongly to well-being (Kokko et al., 2013a; Steel et al., 2008), suggesting that well-being precedes good functioning in other areas of life. However, we acknowledge the possibility of reverse causality between mental well-being and SA, as shown in the meta-analysis by Pinquart and Sörensen (2000) and more recently reported by Cho, Martin, and Poon (2015). Among older participants, problems of physical health and disability in particular contribute to lower mental well-being (Burns et al., 2014; Fauth et al., 2012). Finally, it is possible that

mental well-being and SA form mutual cycles, such that high well-being predisposes an individual to a high level of functioning further supporting increased well-being. These different causal issues remained outside the scope of the present study, the most important finding of which is that self-reported mental well-being appears to be closely linked with the traditional components of SA.

It is noteworthy that the groups showed no differences in BMI, memory tests, or handgrip strength, and that only a minor difference was found in physical exercise. These observations confirm previous JYLS-based results on the non-significant links of personality traits (ages 33 to 50) with objective health indicators (at ages 42 and 50; Kinnunen et al., 2012) but run contrary to previous observations that the absence of disability and cognitive disability are among the most prominent factors in distinguishing successfully aging people over age 60 (Depp & Jeste, 2006). An exception to these links was that the individuals with low well-being had the highest number of diseases. A closer examination revealed that they only differed significantly, F (3,218) = 13.60, p <.001, from the other groups in having a higher number of mental health problems, but not other diseases, F (3,218) = 0.95, p = n.s. Some possible explanations can be offered for the non-existent associations found in the present study between mental well-being and the SA indicators. *First,* both mental well-being and the SA indicators of self-assessed health and continued engagement with life were based on self-reports whereas maintenance of function was based on objective measures. However, we do not expect shared variance to be a major issue here as some of the mental well-being measures were obtained well before (age 36) the SA indicators (age 50). *Second,* it may be that despite the many health risks present among the 50-year-old participants (Pulkkinen & Kokko, 2010), they were generally in relatively good physical shape. Also, it may be that cognitive functioning is generally good in mid-adulthood. Another possibility is that the present word list was not sensitive enough to capture cognitive problems among the middle-

aged informants. Conversely, a favorable physical condition and good cognitive abilities leave less room for mental well-being as a contributory factor. On the other hand, the link between low well-being and mental health problems is theoretically meaningful. *Third*, it should be noted that the present measures of physical exercise (i.e., exercise frequency and handgrip) differ from those traditionally used among older participants (e.g., activities of daily living, balance, and lower extremity movements) and thus render direct comparisons of the results difficult.

The present study has some shortcomings. The sample was relatively small compared to samples in many cross-sectional and epidemiological studies. However, considering the length of this longitudinal study and the many types and waves of data collected (questionnaires, interviews, objective health measures), the sample size can be considered adequate. Further, for some variables, the number of participants ranged widely, from the maximum of 335 in the well-being profiles to just around 200 in the memory tests. This can be explained by the fact that more participants answered the questionnaires than attended the health interview (when the memory tests were administered). Because the low mental well-being group was small, accounting for about 3% of the population, the number of participants in this group in the ANCOVA comparisons was also rather low for some variables (e.g., memory tests). The varying numbers of participants might have affected the statistical power of our analyses. It should also be acknowledged that the Cronbach's alpha reliabilities for the life satisfaction variable were somewhat low (.55–.65). However, its correlations with other well-being indicators have been consistent and as expected (Kokko et al., 2013b, 2015). Finally, our participants represented a single age-cohort of 50-year-olds, drawn from one country, which limits the generalizations of the findings to other cultures.

Notwithstanding these limitations, we consider our study an important attempt to combine the models of multidimensional well-being (Keyes, 2005) and successful aging

(Rowe & Kahn, 1987, 1997). In this study, mental well-being complemented the traditional SA indicators. Mental well-being profiles were examined using an advanced statistical method, namely, Latent Profile Analysis, where we simultaneously investigated three well-being indicators (i.e., emotional, psychological, and social) at three measurement points (social well-being at two) with the aim of locating stable aspects of individual differences in well-being. We sought, further, to generalize the model of successful aging to the younger age cohorts and to respond to the call to view SA as a life-course process. It would be interesting to see whether the present results are replicated in other studies, with individuals of various ages and from different cultures. It would be particularly worthwhile to investigate whether the present SA indicators need modification to capture the aging processes of younger individuals, such as those in early middle-age, and whether they would show profiles resembling those obtained by Aldwin et al. (2001) and Morack et al. (2013) for much older participants.

The present findings on profiles of mental well-being can be utilized, for example, in the occupational health domain and other health services. It is important to identify middle-aged individuals who might be at risk for decreased functioning owing to impaired mental well-being. In this endeavor, in addition to mental health problems, it is important to pay attention to the potential absence of positive signs of mental well-being. Considering their stability across time, there is a strong case for intervening in cases of lowered emotional, psychological, and/or social well-being. One possibility, with long-standing implications extending to old age (Lang & Carstensen, 1994; Seeman, Lusignolo, Albert, & Berkman, 2001) is to support an individual's social relations and support, as these seem to link mental well-being and continued engagement in life. It seems that higher-educated individuals have more resources to obtain high well-being than those with a lower level of education.

Footnote

[1]The correlations between the SA indicators, after controlling for gender and education, are available from the first author upon request.

References

Aldwin, C. M., Spiro III, A., Levenson, M. R., & Cupertino, A. P. (2001). Longitudinal findings from the normative aging study: III. Personality, individual health trajectories, and mortality. *Psychology and Aging*, *16,* 450– 465.

Ardelt, M. (2003). Effects of religion and purpose in life on elders' subjective well-being and attitudes toward death. *Journal of Religious Gerontology*, *14*, 55–77.

Bennett, A. A., Gabriel, A. S., Calderwood, C., Dahling, J. J., & Trougakos, J. P. (2016). Better together? Examining profiles of employees recovery experiences. *Journal of Applied Psychology*, *101,* 1635–1654.

Burns, R. A., Mitchell, P., Shaw, J., & Anstey, K. J. (2014). Trajectories of terminal decline in the well-being of older women: The DYNOPTA project. *Psychology and Aging*, *29*, 44–56.

Charles, S., & Carstensen, L. L. (2010). Social and emotional aging. *Annual Review of Psychology*, *61*, 383–409.

Cho, J., Martin, P., Poon, L. W., & Georgia Centenarian Study. (2015). Successful aging and subjective well-being among oldest-old adults. *The Gerontologist*, *55*, 132–143.

Cutrona, C. E., & Russell, D. W. (1987). The provisions of social relationships and adaptation to stress. *Advances in personal relationships*, *1*, 37–67.

Depp, C. A., & Jeste, D. V. (2006). Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. *The American Journal of Geriatric Psychiatry*, *14*, 6–20.

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95,* 542–575.

Enders, G. K. (2010). *Applied missing data analysis.* New York: The Guilford Press.

Fauth, E. B., Gerstorf, D., Ram, N., & Malmberg, B. (2012). Changes in depressive symptoms in the context of disablement processes: Role of demographic characteristics, cognitive function, health, and social support. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 67,* 167–177.

Friedman, H. S., & Kern, M. L. (2014). Personality, well-being, and health. *Annual Review of Psychology, 65,* 719–742.

Gerstorf, D., Hülür, G., Drewelies, J., Eibich, P., Duezel, S., Demuth, I., Ghisletta, P., Steinhagen-Thiessen, E., Wagner, G. G., & Lindenberger, U. (2015). Secular changes in late-life cognition and well-being: towards a long bright future with a short brisk ending? *Psychology and Aging, 30,* 301–310.

Graham, J. W., Cumsille, P. E., & Elek-Fisk, E. (2002). Methods for handling missing data. In J. A. Schinka & W. F. Velicer (Eds.), *Research methods in psychology. 2nd volume of Handbook of Psychology* (pp. 87–114). New York, NY, USA: John Wiley & Sons.

Heikkinen, R.-L., Berg, S., & Avlund, K. (1995). Depressive symptoms in late life. *Journal of Cross-Cultural Gerontology, 10,* 315–330.

Heyman, A., Fillenbaum, G. G., & Nash, F. (1997). *Consortium to Establish a Registry for Alzheimer's Disease: the CERAD experience*. Philadelphia, PA, USA: Lippincott-Raven Publishers.

Keyes, C. L. M. (1998). Social well-being. *Social Psychology Quarterly,* 121–140.

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology, 73,* 539–548.

Kinnunen, M.-L., Metsäpelto, R.-L., Feldt, T., Kokko, K., Tolvanen, A., Kinnunen, U., Leppänen, E., & Pulkkinen, L. (2012). Personality profiles and health: Longitudinal

evidence among Finnish adults. *Scandinavian Journal of Psychology, 53*,512–522.

Kokko, K., Korkalainen, A., Lyyra, A.-L., & Feldt, T. (2013b). Structure and continuity of well-being in mid-adulthood: A longitudinal study. *Journal of Happiness Studies, 14*, 99–114.

Kokko, K., Pulkkinen, L., Mesiäinen, P., & Lyyra, A.-L. (2008). Trajectories based on postcomprehensive and higher education: Their correlates and antecedents. *Journal of Social Issues, 64*, 59– 76.

Kokko, K., Rantanen, J., & Pulkkinen, L. (2015). Associations between mental well-being and personality from a life span perspective. In M. Blatny (Ed.), *Personality and well-being across the life-span* (pp. 134–159). New York, NY, USA: Palgrave Macmillan.

Kokko, K., Tolvanen, A., & Pulkkinen, L. (2013a). Associations between personality traits and psychological well-being across time in middle adulthood. *Journal of Research in Personality, 47*, 748–756.

Kunzmann, U., Little, T. D., & Smith, J. (2000). Is age-related stability of subjective well-being a paradox? Cross-sectional and longitudinal evidence from the Berlin Aging Study. *Psychology and Aging, 15*, 511–526.

Lachman, M. E. (2015). Mind the gap in the middle: A call to study midlife. *Research in Human Development, 12*, 327–334.

Lachman, M. E., Teshale, S., & Agrigoroaei, S. (2015). Midlife as a pivotal period in the life course: Balancing growth and decline at the crossroads of youth and old age. *International Journal of Behavioral Development, 39*, 20–31.

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist, 64*, 241–256.

Lang, F. R., & Carstensen, L. L. (1994). Close emotional relationships in late life: further support for proactive aging in the social domain. *Psychology and Aging, 9*, 315–324.

Laursen, B. P., & Hoff, E. (2006). Person-centered and variable-centered approaches to longitudinal data. *Merrill-Palmer Quarterly, 52,* 377–389.

Lubke, G. H., & Muthén, B. (2005). Investigating population heterogeneity with factor mixture models. *Psychological Methods, 10,* 21–39.

Lyyra, T. M., & Heikkinen, R. L. (2006). Perceived social support and mortality in older people. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 61,* S147–S152.

Martin, P., Kelly, N., Kahana, B., Kahana, E., Willcox, B. J., Willcox, D. C., & Poon, L. W. (2015). Defining successful aging: A tangible or elusive concept? *The Gerontologist, 55,* 14–25.

Morack, J., Ram, N., Fauth, E. B., & Gerstorf, D. (2013). Multidomain trajectories of psychological functioning in old age: A longitudinal perspective on (uneven) successful aging. *Developmental Psychology, 49,* 2309–2324.

Muthén, B. O. (1998−2004). *Mplus technical appendices.* Los Angeles, CA, USA: Muthén & Muthén. https://www.statmodel.com/download/techappen.pdf

Muthén, L. K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th ed.). Los Angeles, CA, USA: Muthén & Muthén.

Nylund, K. L., Asparouhov, T., & Muthén, B. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14,* 535–569.

Pinquart, M., & Sörensen, S. (2000). Influences of socioeconomic status, social network, and competence on subjective well-being in later life: a meta-analysis. *Psychology and Aging, 15,* 187–224.

Pulkkinen, L. (2017). *Human development from middle childhood to middle adulthood:*

Growing up to be middle-aged. (In collaboration with Katja Kokko.) London: Routledge.

Pulkkinen, L., & Kokko, K. (Eds.) (2010). *Keski-ikä elämänvaiheena* [Middle age as a stage of life]. Jyväskylä, Finland: Department of Psychology, University of Jyväskylä.

Pulkkinen, L., Ohranen, M., & Tolvanen, A. (1999). Personality antecedents of career orientation and stability among women compared to men. *Journal of Vocational Behavior, 54,* 37–58.

Pulliainen, V., Hokkanen, L., Salo, J., & Hänninen, T. (1999). *CERAD-kognitiivinen tehtäväsarja. Käsikirja* [Manual of the Finnish version of the CERAD neuropsychological battery]. Kuopio, Finland: Suomen Alzheimertutkimusseura ry.

Queen, T. L., Stawski, R. S., Ryan, L. H., & Smith, J. (2014). Loneliness in a day: Activity engagement, time alone, and experienced emotions. *Psychology and Aging, 29,* 297–305.

Rowe, J. W., & Kahn, R. L. (1987). Human aging: usual and successful. *Science, 237,* 143–149.

Rowe, J. W., & Kahn, R. L. (1997). Successful aging. *The Gerontologist, 37,* 433–440.

Rowe, J. W., & Kahn, R. L. (2015). Successful aging 2.0: Conceptual expansions for the 21st century. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 70,* 593-596.

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology, 52,* 141–166.

Ryff, C. D. (1989). Happiness is everything or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57,* 1069–1081.

Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited.

Journal of Personality and Social Psychology, 69, 719–727.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7,* 147–177.

Seeman, T. E., Lusignolo, T. M., Albert, M., & Berkman, L. (2001). Social relationships, social support, and patterns of cognitive aging in healthy, high-functioning older adults: MacArthur studies of successful aging. *Health Psychology, 20,* 243–255.

Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychological Bulletin, 134,* 138–161.

Steptoe, A., & Wardle, J. (2012). Enjoying life and living longer. *Archives of Internal Medicine, 172,* 273–275.

Sterba, S. K. (2013). Understanding linkages among mixture models. *Multivariate Behavioral Research, 48,* 775–815.

Stowe, J. D., & Cooney, T. M. (2015). Examining Rowe and Kahn's concept of successful aging: Importance of taking a life course perspective. *The Gerontologist, 55,* 43–50.

Wang, M., Sinclair, R., Zhou, L., & Sears, L. (2013). Person-centered analysis. Methods, applications, and implications for occupational health psychology. In L. Tetric, M. Wang, & R. Sinclair (Eds.), *Research methods in occupational health psychology: Measurement, design, and data analysis* (pp. 249–373). New York: Routledge.

Waterman, A. S. (1993). Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment. *Journal of Personality and Social Psychology, 64,* 678–691.

Weber, K., Canuto, A., Giannakopoulos, P., Mouchian, A., Meiler-Mititelu, C., Meiler, A., Herrman, F. R., Delaloye, C., Ghisletta, P., Lecerf, T., & de Ribaupierre, A. (2015). Personality, psychosocial and health-related predictors of quality of life in old age. *Aging & Mental Health, 19,* 151–158.

Wilson, R. S., Boyle, P. A., Segawa, E., Yu, L., Begeny, C. T., Anagnos, S. E., & Bennett, D. A. (2013). The influence of cognitive decline on well-being in old age. *Psychology and Aging, 28,* 304–313.

Table 1

Means (M) and Standard Deviations (SD) for the Study Variables (Age in Parentheses at the Time of Measurement) in Women (n = 105–151) and Men (n = 97–160): T-Test for Independent Samples, Mean Differences and Their 95% Confidence Intervals (CI), and Effect Sizes

Variable	Women		Men						
	M	*SD*	*M*	*SD*	*t* statistic	*df*	*Mean difference*	95% CI	Cohen's *d*
Mental well-being									
Emotional well-being									
Life satisfaction[a] (36)	3.01	0.35	3.03	0.37	-0.47	309	-0.02	-0.10, 0.06	0.06
Life satisfaction (42)	3.11	0.37	3.06	0.43	0.87	277	0.04	-0.05, 0.14	0.13
Life satisfaction (50)	3.08	0.39	3.08	0.39	-0.02	261	0.00	-0.10, 0.09	0.00
Psychological well-being									
Psychological well-being (36)	3.21	0.29	3.15	0.33	1.40	278.22	0.05	-0.02, 0.13	0.19
Psychological well-being (42)	3.18	0.34	3.10	0.33	1.73	242	0.07	-0.01, 0.16	0.24
Psychological well-being (50)	3.20	0.39	3.16	0.33	0.92	222	0.04	-0.05, 0.13	0.12
Social well-being									
Social well-being (42)	2.83	0.39	2.81	0.38	0.36	238	0.02	-0.08, 0.12	0.05
Social well-being (50)	2.97	0.38	2.95	0.40	0.29	221	0.02	-0.09, 0.12	0.05
Successful aging									
Disease and disability									
Self-assessed poor health (50)	2.22	0.82	2.37	0.95	-1.49	274.74	-0.16	-0.37, 0.05	0.17

Diseases (50)	1.70	1.38	1.71	1.41	-0.06	229	-0.01	-0.34, 0.32	0.01
Body mass index (50)	26.66	5.27	28.15	4.30	-2.26*	205.63	-1.49	-2.79, -0.19	0.31
Maintenance of function									
Word list recall (50)	95.34	10.95	92.85	12.26	1.58	216	2.49	-0.62, 5.59	0.21
Digit memory span (50)	6.32	1.66	6.64	1.68	-1.34	200	-0.32	-0.78, 0.15	0.19
Exercise (50)	4.40	1.62	4.09	1.76	1.46	256	0.31	-0.11, 0.73	0.18
Handgrip strength (50)	34.94	7.76	57.60	10.37	-18.44***	201.86	-22.66	-25.08, -20.23	2.47
Continued engagement									
Low loneliness (50)	3.66	0.29	3.58	0.35	1.79	230	0.08	-0.01, 0.16	0.25
Stability of career line (50)	2.61	0.71	2.61	0.77	-0.01	261	0.00	-0.18, 0.18	0.00
Occupational status (50)	2.15	0.59	1.83	0.87	3.52**	222.48	0.33	0.14, 0.51	0.43
Income (50)	5.90	3.05	7.01	3.15	-2.83**	250	-1.11	-1.88, -0.34	0.36

Note. [a]Life satisfaction was used as an indicator of emotional well-being.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 2

Fit Indices for Mental Well-being with Different Numbers of Latent Classes: Latent Profile Analyses

No. of classes	Log L	Entropy	BIC	LMR	Latent class proportions *n* (%)
1	-827.97		1748.97	-	320 (100)
2	-603.24	0.74	1351.82	.006	133 (40) / 202 (60)
3	-532.65	0.73	1262.98	.566	128 (38) /165 (49) / 42 (13)
4	-497.71	0.73	1245.42	.113	9 (3) / 96 (28) / 73 (22) / 157 (47)
5	-472.03	0.73	1246.40	.062	54 (16) / 81 (24) / 163 (49) / 28 (8) / 9 (3)
6	-448.15	0.72	1250.96	.386	52 (15) / 35 (10) / 156 (47) / 36 (11) / 47 (14) / 9 (3)
7	-425.34	0.73	1257.68	.394	35 (10) / 145 (43) / 31 (9) / 14 (44) / 53 (16) / 48 (14) / 9 (3)
8	-404.32	0.74	1267.96	.280	103 (32) / 76 (24) / 57 (18) / 43 (13) / 13 (4) /12 (4) / 11 (3) / 5 (1)

Note. BIC = Bayesian information criterion; LMR = Lo-Mendell-Rubin test

Table 3

The Longitudinal Four-class Solution for the Mental Well-being Profiles at ages 36, 42, and 50 (n = 335): Latent Profile Analysis

		Emotional well-being						**Psychological well-being**						**Social well-being**			
		36		42		50		36		42		50		42		50	
	n (%)	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI
Mental well-being profile																	
1. Low well-being	9 (3)	2.48	2.30, 2.66	2.07	1.85, 2.29	2.40	2.15, 2.65	2.80	2.55, 3.05	2.54	2.17, 2.96	2.37	2.08, 2.66	2.05	1.60, 2.50	2.13	1.94, 2.32
2. Moderate well-being	73 (22)	2.84	2.72, 2.96	2.87	2.73, 3.01	2.86	2.76, 2.96	2.86	2.80, 2.96	2.77	2.63, 2.91	2.84	2.70, 2.98	2.55	2.39, 2.71	2.66	2.50, 2.82
3. Relatively high well-being	157 (47)	3.02	2.92, 3.12	3.11	2.97, 3.25	3.11	2.99, 3.23	3.17	3.03, 3.31	3.14	3.02, 3.26	3.18	3.08, 3.28	2.82	2.74, 2.90	2.93	2.83, 3.03
4. High well-being	96 (29)	3.22	3.12, 3.32	3.32	3.22, 3.42	3.30	3.20, 3.40	3.45	3.37, 3.53	3.47	3.39, 3.55	3.43	3.31, 3.55	3.10	2.96, 3.24	3.27	3.15, 3.39

Table 4

Distribution of the Profiles of Mental Well-Being by Gender and Education: χ^2 –test and Cramer's V -test.

	Mental well-being profile				
	1. Low well-being	2. Moderate well-being	3. Relatively high well-being	4. High well-being	Total
Gender					
Female	4 (2.6)	29 (18.7)	69 (44.5)	53 (34.2)	155 (100)
Male	5 (2.8)	44 (24.4)	88 (48.9)	43 (23.9)	180 (100)
Education					
No education	3 (4.8)	20 (32.3)	28 (45.2)	11 (17.7)	62 (100)
Vocational school	3 (3.0)	28 (28.3)	48 (48.5)	20 (20.2)	99 (100)
Vocational college	2 (2.5)	10 (12.5)	35 (43.8)	33 (41.3)	80 (100)
University degree	1 (2.5)	4 (10.0)	17 (42.5)	18 (45.0)	40 (100)

Note. For the gender and mental well-being profiles: $X^2(3, N = 335) = 4.695$, Cramer's V$(3, N = 335) = 0.118$, $p = .196$. For the education and mental well-being profiles: $\chi^2(9, N = 281) = 24.589$, Cramer's V$(3, N = 335) = 0.171$, $p = .003$. Number of participants (percentages by gender and education) are shown.

Table 5

Comparison of the Profiles of Mental Well-Being at Ages 36, 42, and 50 in the Indicators of Successful Aging at Age 50: ANCOVA with Bonferroni Pairwise Test

	Mental well-being profile										
	1. Low well-being		2. Moderate well-being		3. Relatively high well-being		4. High well-being				
	M	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*df*	*F*	Bonferroni
Disease and disability											
Self-assessed poor health (*n* = 254)	3.09	2.52, 3.66	2.51	2.29, 2,73	2.27	2.11, 2.42	1.98	1.79, 2.17	3,248	7.07***	1 > 3, 4 2 > 4
Diseases (*n* = 224)	3.67	2.57, 4.77	1.94	1.56, 2.32	1.61	1.34, 1.89	1.57	1.23, 1.91	3,218	4.92**	1 > 2, 3, 4
Body mass index (*n* = 208)	30.37	26.51, 34.22	27.33	25.94, 28.73	27.50	26.49, 28.50	27.09	25.90, 28.27	3,202	0.87	
Maintenance of function											
Word list recall (*n* = 212)	97.78	88.57, 106.99	94.72	91.46, 97.98	92.75	90.37, 95.13	94.88	92.04, 97.73	3,206	0.77	
Digit memory span (*n* = 196)	6.46	5.01, 7.92	6.40	5.91, 6.88	6.34	5.98, 6.70	6.66	6.24, 7.08	3,190	0.45	
Exercise (*n* = 243)	4.03	2.88, 5.18	3.54	3.10, 3.99	4.42	4.11, 4.74	4.32	3.93, 4.71	3,237	3.61*	3 > 2
Handgrip strength (*n* = 217)	49.05	41.75, 56.35	43.86	41.32, 46.41	45.53	43.66, 47.39	47.36	45.13, 49.59	3,211	1.62	
Continued engagement											
Low loneliness (*n* = 225)	3.16	2.94, 3.38	3.38	3.31, 3.46	3.63	3.57, 3.68	3.82	3.76, 3.89	3,219	28.40***	4 > 1, 2, 3 3 > 1, 2
Stability of career line (*n* = 247)	1.15	0.68, 1.62	2.52	2.34, 2.71	2.68	2.55, 2.81	2.72	2.57, 2.88	3,241	13.51***	4, 3, 2 > 1
Occupational status (*n* = 250)	1.49	1.10, 1.88	1.84	1.69, 2.00	1.97	1.86, 2.07	2.18	2.05, 2.31	3,244	5.84**	4 > 1, 2
Income (*n* = 238)	1.79	0.41, 3.54	6.29	5.59, 6.99	6.41	5.92, 6.89	7.26	6.67, 7.85	3,232	11.55***	4, 3, 2 > 1

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. The analyses are adjusted for gender and educational level; adjusted means and standard errors are shown.

Footnote

[1]We compared the participants who were either married or cohabiting with those who did not have a marital relationship at age 50 in social well-being measured at ages 42 and 50. The partnered participants had statistically significantly higher social well-being scores at both age 42 ($p < .001$) and 50 ($p < .01$) than the unpartnered.