

Chapter 2

Mental Health and Illness In Relation to Physical Health Across the Lifespan

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The present study examines mental health differences across the adult lifespan from a positive as well as from a traditional perspective as the absence of psychopathology, including physical health as a potential confounder. Nowadays, mental health is not only regarded as the absence of psychopathology, but also as the presence of positive feelings and positive functioning in both individual and social life. According to the two continua model, psychopathology and positive mental health are related but distinct dimensions (Keyes 2005). One continuum reflects the presence or absence of psychopathology, which is only moderately related to the other continuum which reflects the presence or absence of positive mental health. The two continua model holds that an individual with few symptoms of psychopathology may experience high positive mental health with positive feelings and positive functioning in life or may experience low or no positive mental health. Confirmatory factor analyses confirm that psychopathology and mental health belong to two continua (Keyes et al. 2008; Lamers et al. 2011), which partly have independent genetic propensities (Kendler et al. 2011). Moreover, poor positive mental health as well as decrease in positive mental health are predictive of future mental disorders (Keyes et al. 2010; Wood and Joseph 2009). To examine mental health across the lifespan, assessment should not only address age differences in psychopathology but also positive mental health.

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The Two Continua Model of Mental Health and Illness Across the Lifespan

Most studies on the relation between age and mental health investigate mental disorders or symptoms of psychopathology. When mental health is viewed as the absence of psychopathological symptoms, several age differences are found. In general, older adults have the lowest prevalence rates for mental disorders (Bijl et al. 1998; Kessler et al. 2004; The ESEMED/MHEDEA 2000 Investigators 2004). Minor depression, indicating the presence of depressive symptoms not fulfilling the criteria of a major depression, is more common among older adults than major depression (Beekman et al. 1999) and more common among older than younger adults (Newman and Engel 1991). However, studies including the oldest old show a curvilinear relationship between age and psychopathology, indicating an increase of the prevalence of psychopathology in the last life stage (Mirowsky and Ross 1999). Since psychopathology and positive mental health belong to two continua, the World Health Organization (2004) has argued that the assessment of psychopathology is insufficient as an indicator of mental health. With this, an important question remains: do the lower levels of psychopathology mean that older adults also have a better mental health?

Our positive approach to mental health builds on two traditions of studies in well-being, in which three types of well-being can be distinguished (Deci and Ryan 2008; Waterman 1993). Emotional well-being, corresponding to the hedonic tradition, includes the presence of feelings of happiness and life satisfaction (Diener et al. 1999). In the second tradition, the eudaimonic approach, well-being involves optimal functioning in life and consists of two types: psychological and social well-being. Psychological well-being addresses the realization of one's own potentials and is mainly focused on optimal fulfillment in individual lives (Ryff and Keyes 1995). Social well-being is directed at optimal social functioning and involvement in society (Keyes 1998). Emotional, psychological, and social well-being together form the definition of positive mental health (Keyes 2005), hence taking both traditions in well-being research into consideration.

Most studies have addressed only a few aspects of positive mental health when examining age differences. Findings differ depending on the aspects of well-being under study. In a review of international surveys on emotional well-being, Diener and Suh (1998) conclude that life satisfaction is slightly higher among older men, but there are no age differences in women. They also conclude that positive affect is lower among older age groups, although this might be a cohort effect. However, other studies reported that older adults experience more positive affect than younger adults (e.g., Mroczek and Kolarz 1998), found no relation of age to positive affect (e.g., Vaux and Meddin 1987), or found no unique effects of age after controlling for demographics, personality, health, and cognitive functioning (e.g., Isaacowitz and Smith 2003).

With respect to psychological and social well-being, older individuals do better on some aspects and worse on others than younger adults. With regard to psychological well-being, older adults experience more environmental mastery and autonomy, but

less personal growth and purpose in life compared to younger adults, whereas there are no differences on self-acceptance and positive relations to others (Pinquart 2002; Ryff 1995; Ryff and Keyes 1995). Studies on social well-being (Keyes 1998; Keyes and Shapiro 2004) show that older individuals experience more social acceptance and a sense of belonging to a community, but less contribution to society than younger individuals. Moreover, older adults perceive society as less predictable, sensible, and coherent. The feeling that society is developing in a good direction was not related to age.

A broad perspective is needed to investigate whether older adults experience a better mental health than younger adults. First, there are both gains and losses across the lifespan, depending on the aspects of mental health under study. Second, aspects of well-being conceptually belong to each other from our mental health perspective and they are indeed empirically interrelated. For example, aspects of psychological well-being such as self-acceptance and environmental mastery show modest to strong correlations to emotional well-being (Ryff and Keyes 1995). To account for the diverse results and interrelations, investigations of age differences in mental health should examine overall levels of positive mental health in addition to separate aspects of well-being. A broad perspective on positive mental health will provide further insight into whether older adults generally experience better, similar, or worse well-being compared to younger adults.

Even though the two continua model indicates that positive mental health and psychopathology are complementary, there are few representative surveys which examined both positive mental health and the presence of psychopathology across the lifespan in a single study. The study on Midlife Development in the United States (Keyes 2007; Keyes and Westerhof 2012) and a previous study in the Dutch population (Westerhof and Keyes 2010) both found that a lower level of mental illness in later life was not accompanied by a higher level of mental health, thereby providing further evidence for the two continua model. However, it is important to also include physical health as a potential confounder in the relation of age to mental health and illness.

Physical Health and the Aging Paradox

The prevalence of almost every chronic illness and of the simultaneous presence of multiple chronic diseases increases with age (van den Akker et al. 1998). Older adults report more functional limitations (House et al. 1990) and lower self-evaluations of their health than younger adults (Pinquart 2001). Moreover, several studies show relations of positive mental health and psychopathology to physical health. This relation is mutual: mental health and illness influence physical health conditions, but physical health also affects mental health and illness. For example, depressive symptoms are closely related to physical health, mainly to physical disability (Kivela and Pakkala 2001) and subjective health (Beekman et al. 1997). Positive well-being is related to physical health (Lyubomirsky et al. 2005), and has a salutary impact

on physical health (Howell et al. 2007; Lamers et al. 2012a). Aspects of well-being such as happiness and optimism are related to longer life, decreased risk of illness, and to increased resistance to illness (Veenhoven 2008).

Despite the increases in health problems with age and the relation of physical health to psychopathology and positive mental health, older adults do not experience higher levels of psychopathology or lower levels of well-being. This phenomenon has been labeled as the aging paradox (Staudinger et al. 1999; Westerhof et al. 2003). Adaptation theories have provided explanations for this paradox. Socioemotional selectivity theory states that perceived limitations on time remaining increase the motivation to maintain and improve emotional experiences and lead to greater complexity and better regulation of emotions in everyday life (Carstensen et al. 2003). Furthermore, older adults may have a more acceptant attitude towards health problems, because they expect to be confronted with physical problems with advancing age (Steverink et al. 2001). Moreover, older adults could be more resilient since they use other strategies, for example more readjustments of personal goals and aspirations, to regulate their development than younger adults, thereby maintaining the same level of self-integrity, self-efficacy, and meaning in life (Brandstädter and Greve 1994; Westerhof et al. 2003).

Given the increase in physical health problems with age, physical health may act as a confounder in the relation between age and mental health: age-related increases in health problems rather than age per se may cause age differences in mental health. If physical health operates as a confounder, controlling for levels of physical health might result in similar levels of positive mental health across age groups, or even in better mental health in older adults (Kunzmann et al. 2000). Moreover, if older adults maintain their levels of mental health despite increased physical health problems in line with the aging paradox, it indicates that the relation of physical health and mental health is less strong among older than younger adults.

The Present Study

We expand current research by broadly assessing positive mental health as well as symptoms of psychopathology in the context of age differences in physical health. We include the presence of physical diseases, the maintenance of normal functioning, and self-assessments of health in the assessment of physical health. This is important as the gap between perceived and objective health status widens with age (Henchoz et al. 2008).

The aim of our study is threefold. First, we examine the relation of age to psychopathology and positive mental health, investigating both linear and curvilinear relations. We hypothesize that age is differentially associated with psychopathology and positive mental health in line with earlier studies and the two continua model (Keyes 2007; Keyes and Westerhof 2012; Westerhof and Keyes 2010). We expect that older adults experience fewer symptoms of psychopathology than younger adults,

with the exception of the oldest old in accordance with the curvilinear relations reported in earlier studies. Since we examine positive mental health in a broad context including multiple dimensions of well-being, we expect that the gains will counterbalance the losses, resulting in similar levels of positive mental health across the age groups. Second, we investigate physical health as a confounder in the relation of age to psychopathology and to positive mental health. In line with earlier studies on the aging paradox, we expect that the negative relation of age with psychopathology is stronger and that the relation of age with positive mental health turns positive after controlling for physical health. Third, we assess whether the relations of physical health with positive mental health and psychopathology differ according to age. Again, in line with the aging paradox, we hypothesize that physical health shows weaker relations to psychopathology and positive mental health in older than in younger adults.

Method

Participants

A representative sample of 1,506 Dutch participants between the ages of 18 and 87 participated in this study. The sample was stratified by gender (50 % male), migration status (83 % native Dutch, versus having been born abroad, or with at least one parent born abroad), and age (23 % 18–29; 28 % 30–49; 27 % 50–64; 22 % 65+ years). The oldest age group ranged from 65 to 87, with a mean of 71.3 ($SD = 5.3$). Of the respondents, 10 % had primary education, 26 % lower vocational, 12 % secondary, 21 % middle vocational, 23 % higher vocational, and 8 % had university education. Half of the respondents (53 %) were married.

Procedure

This paper draws on data of the LISS panel of CentERdata, an internet panel for Longitudinal Internet Studies in the Social Sciences, managed by CentERdata in Tilburg, The Netherlands. The LISS panel is a representative panel of 5,000 households, which are randomly selected from the municipal registers in the Netherlands. Household members are invited to fill out online questionnaires every month and are provided with internet access and a personal computer when necessary. Compared to Dutch national statistics, the LISS panel shows a small underrepresentation of older, single, never married and widowed persons, persons living in regions with high and low levels of urbanization, and nonwestern and first generation immigrants (Knoef and De Vos, under review). In one-third of the households, one member was selected by CentERdata to fill out a module on mental health in December 2007. This module included measures of positive mental health and psychopathology, and was

completed by 1,662 respondents. We also used a core module on physical health, developed by CentERdata, consisting of various health questionnaires. 1,506 participants (91 %) filled out both, the mental health module and the core module on physical health and were included in the present study.

Measurements

Demographics Questions were asked about age, gender, marital status, education, income, and migration status (Dutch versus being born abroad or having a parent born abroad).

Physical health Measures of physical health consisted of physical diseases, functional limitations, and subjective health. *Physical diseases* were measured by asking participants whether or not a doctor had told them in the past year that they had one or more of the following twelve diseases and health problems: angina, pain in the chest; heart attack including infarction or coronary thrombosis or another heart problem or failure; high blood pressure or hypertension; high cholesterol content in blood; stroke or brain infarction or a disease affecting the blood vessels in the brain; diabetes or a too high blood sugar level; chronic lung disease such as chronic bronchitis or emphysema; asthma; arthritis, including osteoarthritis, rheumatism, bone decalcification, and osteoporosis; cancer or malignant tumor, including leukemia or lymphoma, but excluding less serious forms of skin cancer; Parkinson's disease; other diseases or health problems. The number of diseases was computed as 0, 1, 2, and 3 or more physical diseases. *Functional limitations* were measured by asking the participants whether they experienced difficulties when performing nine activities of daily living (ADLs), which applied only to problems that were expected to last longer than 3 months. The questions concerned the following activities: walking a hundred meters; getting up from a chair; walking up a staircase without resting; dressing and undressing, including shoes and socks; walking across the room; bathing or showering; eating, such as cutting one's food into small bits; getting in and out of bed; using the toilet, including sitting down and standing up. The nine items were rated on a 4-point scale, indicating whether the participants could perform the activities without any trouble, with some trouble, with a lot of trouble, or only with the help of others. Cronbach's alpha was 0.86. We transformed these ratings into a dichotomous scale: no trouble when performing the activity (rated as 0) versus some or a lot of trouble or need help (rated as 1). The number of difficulties was computed, resulting in a score of 0, 1, 2, and 3 or more functional limitations. *Subjective health* was measured by asking the participants to rate their own health on a 5-point Likert scale (*poor* to *excellent*). A higher score indicated a better self-evaluated health.

Psychopathology Psychopathology was measured using the *Brief Symptom Inventory* (BSI; Dutch version: de Beurs and Zitman 2006), which is among the most commonly used instruments for screening and assessing psychopathology in mental

health services in the USA. Respondents indicated the degree to which they had experienced 53 psychological symptoms in the past week using a 5-point Likert scale (*not at all to a lot*). An average score of psychopathology was computed, with higher scores indicating more symptoms of psychopathology. Cronbach's alpha was 0.95 in the present study.

Positive mental health Positive mental health was measured using the *Mental Health Continuum-Short Form* (MHC-SF; Keyes et al. 2008), consisting of 14 items which represent the various theoretically derived feelings of well-being. Respondents rated the frequency of each feeling in the past month on a 6-point Likert scale (*never; once or twice a month; about once a week; two or three times a week; almost every day; every day*). The MHC-SF is multidimensional and contains three items of emotional well-being, six items of psychological well-being, and five items of social well-being. We computed a mean score, with higher scores indicating higher levels of emotional well-being, psychological well-being, social well-being, and overall positive mental health. The Dutch version of the MHC-SF has shown good psychometric properties (Lamers et al. 2011) and stability over time (Lamers et al. 2012b). Moreover, confirmatory factor analyses confirmed the three-factor structure in emotional, psychological, and social well-being (Lamers et al. 2011). In the present study, Cronbach's alpha was 0.83 for emotional and psychological well-being, 0.74 for social well-being, and 0.89 for overall positive mental health.

Analyses

After inspecting the bivariate relations between the variables of interest, we used five hierarchical regression analyses to assess our research hypotheses: one for psychopathology and four for mental health (i.e., one for overall positive mental health, and three for the subscales emotional, psychological, and social well-being). In the first model, we entered positive mental health in the regression analysis on psychopathology, and psychopathology in the analyses on mental health. Furthermore, we controlled for demographic variables in this first model. To answer our first research question, we included age and age-squared in the second model to detect both, linear and curvilinear relations. Age was centered on the mean to avoid collinearity between age and age-squared. To investigate the second research question on physical health as a potential confounder, we added measures of physical health in the third model. To answer the third research question on age as a moderator, we examined interaction effects of age and age-squared with physical health on psychopathology and on positive mental health, by applying computational procedures in regression analysis using the Johnson–Neyman technique, as described by Hayes and Matthes (2009). The Johnson–Neyman technique computes the regression weight and explained variance of the interaction effect by identifying regions in the range of age and age-squared where the relation of physical health to psychopathology or positive mental health is statistically significant and not significant. In all analyses, we applied a p -value of 0.01 instead of the common 0.05, because of the large sample size.

Table 2.1 Descriptives and correlations of age, age-squared, physical health, psychopathology, and positive mental health

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----------------------------|---------|---------|---------|---------|--------|--------|---------|-------|
| Range | 0–3 | 0–3 | 1–5 | 0–4 | 1–6 | 1–6 | 1–6 | 1–6 |
| M | 0.65 | 0.58 | 3.12 | 0.37 | 3.98 | 4.67 | 4.18 | 3.33 |
| SD | 0.89 | 0.98 | 0.76 | 0.33 | 0.84 | 0.94 | 0.99 | 1.01 |
| Age ^a | 0.36** | 0.28** | –0.17** | –0.14** | –0.06* | 0.05 | –0.15** | –0.01 |
| Age-squared ^a | 0.09** | 0.11** | 0.01 | 0.05 | 0.02 | 0.05 | 0.01 | 0.00 |
| 1. Physical diseases | – | | | | | | | |
| 2. Functional limitations | 0.43** | – | | | | | | |
| 3. Subjective health | –0.41** | –0.41** | – | | | | | |
| 4. Psy-chopathology | 0.18** | 0.25** | –0.29** | – | | | | |
| 5. Positive mental health | –0.06 | –0.10** | 0.21** | –0.33** | – | | | |
| 6. Emotional well-being | –0.09** | –0.13** | 0.24** | –0.47** | 0.74** | – | | |
| 7. Psychological well-being | –0.07* | –0.11** | 0.19** | –0.27** | 0.92** | 0.60** | – | |
| 8. Social well-being | –0.01 | –0.03 | 0.13** | –0.18** | 0.86** | 0.47** | 0.64** | – |

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

^aAge and age-squared are controlled for each other in partial correlations

Results

Table 2.1 shows the descriptive results and bivariate correlations between age, age-squared, psychopathology, positive mental health (i.e., overall positive mental health as well as the subscales emotional, psychological, and social well-being), and physical health (i.e., physical diseases, functional limitations, and subjective health). Older adults showed less psychopathological symptoms. They also had less positive mental health than younger adults and lower levels of psychological well-being, but not of emotional and social well-being. Moreover, older adults reported lower levels of self-evaluated health than younger adults. Physical diseases and functional limitations showed both linear and curvilinear relations to age. Older adults had more physical diseases and functional limitations than younger adults, and the curvilinear relations show that the amount of diseases and limitation is disproportionately higher among older adults. Subjective health was related to lower levels of psychopathology and physical diseases and functional limitations to higher levels. The correlations of physical health to overall positive mental health as well as to the three subscales were in the opposite direction. Psychopathology and positive mental health were negatively related, with the largest correlation to emotional well-being, followed by psychological, and social well-being

Table 2.2 Hierarchical regression analysis of age and age-squared in relation to psychopathology, controlling for positive mental health, demographics, and physical health

| Model | Psychopathology | | |
|-------------------------------------|-----------------|---------|---------|
| | β | β | β |
| <i>Mental health</i> | | | |
| Positive mental health | -0.32** | -0.33** | -0.28** |
| <i>Demographics</i> | | | |
| Gender (high = female) | 0.07* | 0.06 | 0.03 |
| Marital status (high = married) | -0.13** | -0.06 | -0.05 |
| Education | -0.09** | -0.12** | -0.07* |
| Income | -0.07* | -0.09** | -0.08** |
| Migration status (high = nonnative) | 0.11** | 0.10** | 0.09** |
| <i>Age</i> | | | |
| Age | | -0.17** | -0.27** |
| Age-squared | | 0.02 | 0.00 |
| <i>Physical health</i> | | | |
| Physical diseases | | | 0.11** |
| Functional limitations | | | 0.16** |
| Subjective health | | | -0.15** |
| Adjusted R ² | 0.15** | 0.17** | 0.26** |

* $p < 0.01$; ** $p < 0.001$ **Table 2.3** Hierarchical regression analysis of age and age-squared in relation to positive mental health, controlling for psychopathology, demographics, and physical health

| Model | Positive mental health | | |
|-------------------------------------|------------------------|---------|---------|
| | β | β | β |
| <i>Mental health</i> | | | |
| Psychopathology | -0.34** | -0.35* | -0.33** |
| <i>Demographics</i> | | | |
| Gender (high = female) | 0.05 | 0.04 | 0.04 |
| Marital status (high = married) | -0.06 | -0.02 | -0.02 |
| Education | 0.03 | 0.01 | -0.00 |
| Income | -0.01 | -0.02 | -0.01 |
| Migration status (high = nonnative) | 0.02 | 0.02 | 0.02 |
| <i>Age</i> | | | |
| Age | | -0.11** | -0.12** |
| Age-squared | | 0.03 | 0.02 |
| <i>Physical health</i> | | | |
| Physical diseases | | | 0.08* |
| Functional limitations | | | 0.03 |
| Subjective health | | | 0.14** |
| Adjusted R ² | 0.11** | 0.12** | 0.13** |

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

Table 2.2 presents the findings of the regression analysis on psychopathology and Table 2.3 on overall positive mental health. With regard to our first research question

Table 2.4 Hierarchical regression analysis (final model) of age and age-squared in relation to emotional, psychological, and social well-being, controlling for psychopathology, demographics, and physical health

| Model | Emotional well-being β | Psychological well-being β | Social well-being β |
|-------------------------------------|------------------------------|----------------------------------|---------------------------|
| <i>Mental health</i> | | | |
| Psychopathology | -0.46** | -0.29** | -0.18** |
| <i>Demographics</i> | | | |
| Gender (high = female) | 0.06 | 0.05 | 0.00 |
| Marital status (high = married) | 0.11** | -0.05 | -0.05 |
| Education | -0.06 | 0.01 | 0.02 |
| Income | -0.03 | -0.01 | -0.01 |
| Migration status (high = nonnative) | -0.03 | 0.02 | 0.03 |
| <i>Age</i> | | | |
| Age | -0.07 | -0.18** | -0.03 |
| Age-squared | 0.10** | -0.00 | -0.02 |
| <i>Physical health</i> | | | |
| Physical diseases | 0.03 | 0.09* | 0.06 |
| Functional limitations | 0.02 | 0.02 | 0.05 |
| Subjective health | 0.14** | 0.12** | 0.11** |
| Adjusted R ² | 0.26** | 0.12** | 0.04** |

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

on the relation of age to psychopathology and positive mental health, we hypothesized a linear as well as a curvilinear relation of age to psychopathology, but no relation of age to positive mental health. Results on psychopathology partly confirmed our hypothesis: after controlling for positive mental health and demographics, age had a linear negative relationship with psychopathology, but no curvilinear relationship. Results on overall positive mental health differed from our hypothesis: there was a negative linear relation between age and positive mental health after controlling for psychopathology and demographics.

The second aim was to assess the relations of psychopathology and positive mental health to age after controlling for physical health. In the last model of the regression analysis, the variables accounted for 26 % of the variance in psychopathology and for 13 % of the variance in positive mental health. All three indicators of physical health were related to psychopathology, but only physical diseases and subjective health were related to positive mental health. Age remained linearly and negatively related to psychopathology. In line with our hypothesis, this correlation was stronger after physical health was added to the analysis. Although we expected age to be positively related to positive mental health when controlling for physical health, the relation of age to positive mental health remained negative after including physical health in the analysis. Table 2.4 presents the findings on the final model of the regression analyses for the three subscales: emotional, psychological, and social well-being. The results indicate that the unique negative linear relation between age and overall positive mental health only holds for psychological well-being. Moreover, physical

health functioned as a confounder in the relation of age to emotional well-being. After controlling for physical health, the association of age with emotional well-being was curvilinear. Emotional well-being was higher only among older adults, after controlling for psychopathology, demographics, and physical health.

To answer the third research question on age as a moderator in the relation to psychopathology and on positive mental health, we included interactions of age and age-squared to physical diseases, functional limitations, and subjective health in the final model of the previous regression analyses. Results revealed only a linear moderating effect of age by physical diseases on psychopathology ($F(12, 1459) = 12.30$; $p < 0.01$). The relation between physical diseases and psychopathology thus varied between ages. The linear interaction effect shows that physical diseases were related to more psychopathological symptoms only in respondents between the ages of 18 and 65. In respondents aged 66 and over, the correlation between physical diseases and psychopathology was insignificant. There were no significant interaction effects for all other interactions of age and physical health on psychopathology or positive mental health. Although we expected that physical health would show weaker relations to psychopathology and positive mental health in older than in younger adults, only the age differences in the relation of physical diseases to psychopathology confirmed this hypothesis.

Discussion

The present study examined mental health differences across the lifespan from a positive as well as a traditional perspective as the absence of psychopathology, in line with the two continua model. Our hypothesis about age differences in levels of psychopathology and positive mental health is partly confirmed. In line with our expectations, older adults have fewer symptoms of psychopathology, but the findings do not confirm that levels of psychopathology are higher in the oldest old adults. Although we expected that the combination of gains and losses in aspects of well-being would result in similar levels of overall positive mental health across age groups, our findings show that older adults have a poorer psychological well-being and positive mental health than younger adults. Our hypothesis of physical health as a confounder in the relation of age to mental health is also partially confirmed. Age differences in psychopathology become stronger when taking physical health problems into account, but physical health does not confound the relation of age to overall positive mental health. However, physical health is a confounder in the relation of age to emotional well-being: emotional well-being is only higher among older adults, and only after controlling for physical health. Our last hypothesis that physical health shows weaker relations to psychopathology and positive mental health in older adults than in younger adults is not confirmed with the exception that the relation of physical diseases to psychopathology is less strong in adults over 65 years of age.

Although the relations were not always as expected, the findings provide strong support for the two continua model of mental illness and mental health. The negative

relation of age to both psychopathology and positive mental health, confirms that they are two continua. The absence of psychopathology in older age groups does not necessarily imply the presence of positive mental health as would be expected from a traditional view of mental health as merely the absence of psychopathology. Furthermore, the two continua model is supported by the findings on physical health. Physical health had stronger relations to psychopathology than to positive mental health and these age differences in psychopathology became even stronger when taking physical health problems into account. Lastly, we only found age differences in the relation of physical diseases to psychopathology, but not to mental health. We conclude that psychopathology and positive mental health are more than merely opposites on one dimension and that both should be taken into account to provide a full picture of mental health in the older population.

The findings are only partly in line with previous studies on the aging paradox. The aging paradox applies more to psychopathology than to positive mental health. Older adults are capable of maintaining a relatively low level of psychopathology despite their larger number of physical diseases, functional limitations, and worse subjective health. Furthermore, physical diseases have a less stronger relation to psychopathology in older than in younger adults. However, findings on the aging paradox for positive mental health are mixed. Physical health functions as a confounder in the relation of age to emotional well-being, revealing a disproportional better emotional well-being in older than in younger adults after controlling for physical diseases, functional limitations, and subjective health. There is no confounding of physical health nor a moderating effect of age on the relation between physical health and psychological and social well-being. This is in line with previous studies on the aging paradox that mainly included measures on positive and negative affect and life satisfaction (Staudinger et al. 1999; Westerhof et al. 2003). These belong to the domain of emotional well-being, whereas our study also focused on psychological and social well-being. These evaluations of individual and social functioning may be less amenable to adaptation than emotional well-being. Westerhof and Keyes (2010) found indeed that emotional well-being is somewhat higher in older than in younger adults, whereas psychological and social well-being were not. These findings support our broad approach to positive mental health.

This study has several limitations. First, in the present study, only 13 % of the variance in positive mental health was explained as opposed to 26 % of the variance in psychopathology. Factors other than sociodemographics and health might explain levels of positive mental health, such as personality traits. For example, neuroticism discriminates strongly between individuals high and low in positive mental health (Joshani and Nosratabadi 2009). Furthermore, instruments for developmental regulation should be included to provide further support for the differentiated findings with regard to the aging paradox.

Second, the data are cross-sectional, which means that the results could be cohort effects and might be caused by cultural historical differences between age groups. Older adults might have had lower levels of psychopathology and positive mental health already when they were young. Due to the cross-sectional nature of our study, we can draw no causal conclusions on the development of positive mental

health, psychopathology, and physical health over time. In view of the two continua model, longitudinal examination of the trajectories of positive mental health and psychopathology would be critical for future research.

A third limitation of our study is the underrepresentation of the most senior age group in the sample. With respect to psychopathology, Mirowsky and Ross (1999) showed a lower prevalence among older than younger adults, but an increasing prevalence among the oldest old. The underrepresentation of the oldest old (the oldest age group ranged from 65 to 87 with a mean age of 71.3) might be the reason that we did not find this curvilinear relationship in later life. Our results also raise questions about the prevalence of positive mental health among the oldest old. Furthermore, we measured positive mental health and psychopathology in a sample representative of the Dutch population. Hence important questions remain about positive mental health and psychopathology in clinical populations, such as physically or mentally ill patients.

Our study has important implications for both research and practice. First, future research should include psychological factors such as personality and adaptation strategies when investigating positive mental health, since our findings indicate that factors other than sociodemographics and health explain levels of positive mental health. Second, it is particularly important that physical health problems are included in the assessment of psychopathology and emotional well-being, since the presence of physical diseases might alter the relation between age with psychopathology and emotional well-being. Third, the findings confirm the two continua model and show that mental health is more than merely the absence of psychopathology. Positive mental health and psychopathology are complementary, indicating that an individual is only completely mentally healthy when the absence of psychopathology is accompanied by the presence of positive mental health. When investigating mental health across the lifespan, both psychopathology and positive mental health should be measured.

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