



**POSITIVE MENTAL HEALTH:  
MEASUREMENT, RELEVANCE AND IMPLICATIONS**

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# **POSITIVE MENTAL HEALTH: MEASUREMENT, RELEVANCE AND IMPLICATIONS**

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# Chapter 1

General introduction

## General introduction

The title of this thesis contains a linguistic error. The term “Positive mental health” is a pleonasm. Why is the additive “positive” included? Is mental health not always positive? In fact, whenever we speak or read about mental health, we tend to think of psychopathology, such as symptoms of depression or anxiety. The term “mental health” is automatically associated with psychological problems and complaints. Apparently, the additive “positive” is necessary here to indicate that we are addressing positive aspects of mental health.

In this thesis, mental health is studied from a positive perspective. This chapter will introduce this positive approach to mental health. The chapter starts with a short introduction to the medical model, which results from the professionalization of the discipline of psychology. Although the medical model yielded many advantages, its focus on negative symptoms and mental illnesses has a downside as well. This chapter therefore describes a second approach to mental health, following the hedonic and eudaimonic tradition in well-being research. The chapter elaborates on questionnaires used to measure mental health from a positive perspective, the association of positive mental health to psychopathology, and on the implications of this association. It ends with an overview of the studies that were conducted. Besides the focus on positive aspects of mental health, these studies are pioneering in their investigation of both positive mental health and psychopathology longitudinally at four measurement occasions in nine months, as well as in using a large sample representative of the Dutch population. The studies will be described in subsequent chapters.

### **The professionalization of psychology**

Over the last decades, the field of psychology underwent a tremendous change. From a relatively new and inexperienced field, psychology has developed into a highly scientific and professional discipline (Lunt, 1999). It was mainly after the Second World War that an increasing number of psychologists started to work as scientist-practitioners, for example in mental health care (Lunt, 1998). Within mental health care, several trends demonstrate this increased professionalization of psychology, such as the increased length of education and training required to receive recognition as a qualified practitioner in psychology, the increased specialization and specialist training for subfields such as clinical psychology or health psychology, the development of ethical codes and disciplinary procedures, and the active role of professional associations (Lunt, 1999). There is a greater emphasis on evidence-based practice, as reflected by the use of protocols in psychological treatment, the application of treatments that are shown to be effective in randomized controlled

trials, and the monitoring of clients before, during, and after treatment using Routine Outcome Measures (Westerhof & Bohlmeijer, 2010).

### *Advantages of the medical model*

With this growing professionalization, clinical psychology's main focus shifted to assessing and curing psychopathology and mental illnesses (Seligman & Csikszentmihalyi, 2000). This medical model is most prominently present in the Diagnostic and Statistical Manual of mental disorders (DSM-IV; American Psychiatric Association, 2000), in which psychopathological complaints and maladaptive behaviors are categorized into diagnoses of mental disorders. The professionalization of psychology as well as the research and practice within the medical model have yielded many benefits. They have led to a usable taxonomy of mental disorders as well as reliable and valid instruments to measure them. Moreover, they have produced models for understanding the risk factors that may lead to these disorders. And more importantly, they have led to pharmacological and psychological interventions that have been shown to alleviate psychopathological symptoms and mental illnesses (Seligman & Csikszentmihalyi, 2000).

### *Disadvantages of the medical model*

The medical ideology and the focus on mental illnesses have a down side as well (Maddux, 2009), since this approach is accompanied by the risk that the person will be reduced to the sum of his or her problems. First, the categorical classification of mental disorders may lead to the incorrect assumption that we can distinguish normal from abnormal behavior and that mental disorders are qualitatively distinct from normal functioning and from one another (Widiger & Samuel, 2005). However, normal and abnormal behavior can also be interpreted as distinctions along dimensions of functioning (Maddux, 2009; Widiger & Samuel, 2005). Second, mental disorders are unjustifiably viewed as separate entities, a process that is known as reification. Clients and psychologists refer to a mental disorder as having or treating 'it', while a mental disorder is merely a label based on a combination of certain psychopathological symptoms (Maddux, 2009; Widiger & Samuel, 2005). Third, the classification of mental disorders leads to stigmatization, which is one of the main reasons why people decide not to seek, or fully participate in, mental health care (Corrigan, 2004). Since the number of mental disorders increased from 100 in 1953 to almost 300 in 1994, the risk of stigmatization has increased as well.

The current approach of clinical psychology has focused on mental illness and there is little attention for positive aspects of functioning, even while the DSM-IV underlines the importance of the individual behind the problems "*In DSM-IV, there is no*

*assumption that each category of mental disorder is a completely discrete entity with absolute boundaries dividing it from other mental disorders or from no mental disorder. There is also no assumption that all individuals described as having the same mental disorder are alike in all important ways”* (American Psychiatric Association, 2000, p.xxix). This broad view on the individual is shared with the World Health Organization (WHO). As the WHO (2005) argues, health is *“a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity”*. To fully understand mental health, we should not only treat illness, but also promote well-being. For this, a greater emphasis on individual goals and strengths is needed (Slade, 2010). What about valued subjective experiences, such as satisfaction and happiness? Positive individual traits such as forgiveness and wisdom? And civic virtues such as altruism and tolerance? (Seligman & Csikszentmihalyi, 2000).

### **Positive approaches to mental health**

Although during the past decennia mental health care mainly focused on psychopathology, there is nevertheless a long history of research into positive aspects in the field of psychology, including several models. In 1958, Marie Jahoda described a multidimensional model of positive mental health, based on several theories and research findings. She distinguished six criteria: 1) attitudes of an individual towards his own self; 2) the degree of growth, development, and self-actualization; 3) coherence and continuity of personality; 4) autonomy and self-determination; 5) an adequate perception of reality; and 6) environmental mastery. Half a century later, Vaillant (2003) contrasts six different empirical conceptualizations of positive mental health: 1) mental health as above normal, as an ideal state of complete functioning; 2) mental health as positive psychology and positive personal qualities such as love and wisdom; 3) mental health as healthy adult development; 4) mental health as social-emotional intelligence; 5) mental health as subjective well-being; and 6) mental health as resilience and coping. The models of Jahoda (1958) and Vaillant (2003) share the assumption that positive mental health is best conceived as a multidimensional phenomenon. This fits in with approaches to positive mental health from other disciplines.

Mainly within philosophy, there is a long history of theories about positive aspects in life (see for example, Deci & Ryan, 2008; Ryan & Deci, 2001; Ryff & Singer, 2008; Waterman, 1990, 1993). Two millennia ago, ancient Greek philosophers had already begun to theorize about what constitutes a good life. Although their theories did not directly aim at mental health, they correspond with two traditions on well-being that are currently used in the study of positive mental health. According to Aristippus of Cyrene

(435 to 356 BC), the main goal in life is *hedonism*; that is, to experience the maximum amount of pleasure. The hedonic tradition of well-being research encloses the hedonic view of Aristippus and defines well-being as the maximization of positive feelings and the minimization of negative feelings. In contrast, Aristotle (384 to 322 BC) stated that a good life is not found in pleasant moments, but in the expression of virtue: doing what is worth doing. *Eudaimonia* is the main goal in life, in which well-being is not a finite state, but rather a continuous process of fulfilling one's own potentials. The eudaimonic tradition of well-being research corresponds to the philosophical theory of eudaimonia, and defines well-being as optimal human functioning and self-realization. Within the hedonic and eudaimonic tradition of research on well-being, three components of well-being are distinguished: emotional well-being, psychological well-being, and social well-being. Instead of objective criteria, these three components comprise the subjective experience of well-being. Whereas Aristippus and Aristotle theorized about what is a good life, the hedonic and eudaimonic tradition in well-being research aim to empirically investigate subjective levels of emotional, psychological, and social well-being. To this end, mainly self-reports are used, reflecting one's own feelings and experiences of hedonia and eudaimonia.

### *The hedonic approach: Emotional well-being*

The first component, emotional well-being (also known as subjective well-being, e.g., Diener, 1984), belongs to the hedonic tradition. There is a consensus that emotional well-being involves the presence of a positive affect, the absence of negative affects, and an evaluation of life satisfaction (Diener, 1984; Diener, Suh, Lucas, & Smith, 1999). Although most people experience high levels of emotional well-being most of the time (Biswas-Diener, Vittersø, & Diener, 2005), there are large individual differences. In general, two models were developed to explain these individual differences (Diener, 1984; Diener, Suh, Lucas, & Smith, 1999). According to the top-down model, individual differences are the result of relatively stable traits. In this view, well-being is a disposition to experience positive feelings and satisfaction with life. In contrast, the bottom-up model states that individual differences in emotional well-being are the result of positive life experiences. Individuals who experience more positive life experiences, will experience more emotional well-being. There is evidence for both models, indicating that there is a mutual influence of top-down and bottom-up processes (Diener, Suh, Lucas, & Smith, 1999). Over time, emotional well-being is relatively stable and tends to revert to a fixed level (set point). However, long-term levels of emotional well-being can change, for example as a consequence of important life events (Diener, Lucas, & Scollon, 2006; Headey & Wearing, 1989).

### *The eudaimonic approach: Psychological and social well-being*

Whereas the hedonic tradition is centered on optimal experiences and the emotional components of positive mental health, the eudaimonic tradition focuses on optimal functioning and meaning in both individual life (psychological well-being) and social life (social well-being). According to the eudaimonic tradition, not all desirable outcomes such as positive feelings would yield enduring well-being when achieved (Deci & Ryan, 2008). Instead, well-being is achieved by self-realization through the fulfillment of one's own personal potential (Waterman, 1993). With this, the eudaimonic tradition adds an important perspective to the study of well-being (Deci & Ryan, 2008).

One of the most influential models within the eudaimonic tradition, is the model on psychological well-being developed by Carol Ryff (1989a, 1989b; Ryff & Singer, 2008). She emphasized the importance of theoretical grounding and based her model on preceding perspectives on optimal human growth and functioning. In this model on psychological well-being, she integrated and operationalized the points of convergence in the literature by developmental psychologists (e.g., Erikson, Jung, Neugarten, and Bühler), humanistic psychologists (e.g., Maslow and Rogers), personality psychologists (e.g.,

Allport), and mental health psychologists (e.g., Marie Jahoda, Birren, and Frankl) (Ryff, 1989b). This resulted in six dimensions of psychological well-being: 1) self-acceptance; 2) environmental mastery; 3) positive relations with others; 4) personal growth; 5) autonomy; and 6) purpose in life (see Table 1). These dimensions were not strongly related to dimensions of emotional well-being such as life satisfaction, indicating that psychological well-being reflects an additional component of well-being (Ryff, 1989b; Keyes, Shmotkin, & Ryff, 2002).

However, well-being is not merely a private phenomenon, since each individual is embedded in social structures and communities and faces multiple social tasks and challenges (Keyes, 1998). To fully understand optimal human functioning, social aspects of well-being should be taken into account. Using a similar method to Ryff (1989b), Corey Keyes (1998) based his multidimensional model of social well-being on classic sociological theories and social psychological perspectives (e.g., Durkheim, Marx, Merton, Seeman, Lefcourt, Srole, and Erikson). He identified five dimensions of social well-being: 1) social contribution; 2) social integration; 3) social actualization; 4) social acceptance; and 5) social coherence (see Table 1). In his opinion, social well-being encompasses the experience and judgment of one's own social functioning. Since these dimensions were correlated, but did not overlap, with measures of emotional and psychological well-being, social well-being reflects a distinct component of well-being (Keyes, 1998).

Table 1.

*The dimensions of emotional, psychological, and social well-being (based on: Keyes, 2005)*

<b>Dimension</b>	<b>Description</b>
<b>Emotional well-being</b>	
<i>Avowed happiness</i>	Feeling happy.
<i>Positive affect</i>	Feeling cheerful, in good spirits, happy, calm, and peaceful, satisfied, and full of life.
<i>Avowed life satisfaction</i>	Feeling satisfied with life in general or specific areas of one's life.
<b>Psychological well-being</b>	
<i>Self-acceptance</i>	Holding positive attitudes towards oneself and past life and conceding and accepting varied aspects of self.
<i>Environmental mastery</i>	Exhibiting the capability to manage a complex environment, and the ability to choose or manage and mould environments to one's needs.
<i>Positive relations with others</i>	Having warm, satisfying, trusting personal relationships and being capable of empathy and intimacy.
<i>Personal growth</i>	Showing insight into one's own potential, having a sense of development, and being open to new and challenging experiences.
<i>Autonomy</i>	Exhibiting a self-direction that is often guided by one's own socially accepted and conventional internal standards and resisting unsavory social pressures.
<i>Purpose in life</i>	Holding goals and beliefs that affirm one's sense of direction in life and feeling that life had a purpose and meaning.
<b>Social well-being</b>	
<i>Social contribution</i>	Feeling that one's own life is useful to society and that the output of one's activities is valued by or valuable to others.
<i>Social integration</i>	Having a sense of belonging to a community and deriving comfort and support from that community.
<i>Social actualization</i>	Believing that people, social groups, and society have potential and can evolve or grow positively.
<i>Social acceptance</i>	Having a positive attitude towards others while acknowledging and accepting people's differences and their complexity.
<i>Social coherence</i>	Being interested in society or social life, and feeling that society and culture are intelligible, somewhat logical, predictable, and meaningful.

### *A general perspective on positive mental health*

There is some debate about the distinctiveness of the hedonic and eudaimonic tradition. Kashdan, Biswas-Diener, and King (2008) recently argued that hedonic and eudaimonic well-being show conceptual as well as empirical overlap. They state that both reflect two traditions, but not two distinct types of well-being (Biswas-Diener, Kashdan, & King, 2009). Others have emphasized points of divergence and argued that both perspectives on well-being are distinct and complement each other (Deci & Ryan, 2008; Waterman, Schwartz, & Conti, 2008). Hedonic well-being is mainly focused on emotional functioning, whereas eudaimonic well-being focuses mainly on motivational and social aspects of functioning. Several studies show that both perspectives are indeed complementary (e.g., King, Hicks, Krull, & Del Gaiso, 2006; Peterson, Park, & Seligman, 2005). Confirmatory factor analyses have validated that hedonic indicators of well-being and eudaimonic indicators of well-being reflect two separate factors that are moderately correlated (Compton, Smith, Cornish, & Qualls, 1996; King & Napa, 1998; McGregor & Little, 1998). Moreover, emotional, psychological, and social well-being are empirically distinct (Gallagher, Lopez, & Preacher, 2009; Keyes, Wissing, Potgieter, Temane, Kruger, & van Rooy, 2008). Finally, studies revealed that hedonic and eudaimonic well-being show different relations to other psychological phenomena. For example, activities that focus on pleasure and happiness are more strongly related to hedonic well-being, whereas more complex activities aimed at achieving personally relevant long-term goals are associated with eudaimonic well-being (Delle Fave & Massimini, 2005; Huta, 2005; Vittersø, Oelmann, & Wang, 2009; Waterman, 1993; Waterman et al., 2008).

In our view, hedonic and eudaimonic components belong to the same overarching concept. Emotional, psychological, and social well-being together make up the definition of positive mental health. This is in line with the definition of the World Health Organization (WHO, 2005, p.2) which described mental health from a positive perspective as *“A state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”*. This definition includes aspects of both the hedonic and eudaimonic tradition in well-being research. A state of well-being reflects affective components (emotional well-being), the realization and ability to cope with the stresses of life reflect aspects of optimal individual functioning (psychological well-being), and the aspects in work and contribution to community reflect elements of optimal functioning in social life (social well-being). A person is considered to be mentally healthy when he or she experiences all three components: emotional, psychological, and social well-being. In line with these findings, emotional, psychological and social well-being together form an individual’s positive mental health (Keyes, 2005), hence

taking both traditions in well-being research into consideration. In other words, to fully understand an individual's positive mental health, their emotional, psychological, as well as social well-being should be measured.

### **Measuring positive mental health**

In addition to a clear definition of positive mental health, it is important to develop reliable and valid instruments to measure emotional, psychological, and social well-being. Most questionnaires include items on negative aspects and psychopathology such as the General Health Questionnaire (GHQ; Hu, Stewart-Brown, Twigg & Weich, 2007). For a long period of time, emotional well-being was the primary index of positive mental health and many instruments were developed to measure positive feelings and life satisfaction. The World Database of Happiness (Veenhoven, 2010) contains 1,164 different self-report measures of emotional well-being, often consisting of one item measuring a single aspect of well-being. The most frequently used questionnaires about emotional well-being consist of multiple item scales, such as the Satisfaction With Life Scale (SWLS; Pavot & Diener, 1993, 2008) and the Positive and Negative affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). In contrast, only a few questionnaires are available to measure an individual's psychological and social well-being. The Basic Need Satisfaction Scale (Gagné, 2003) investigates autonomy, competence, and relatedness: three aspects of psychological well-being. All six dimensions of psychological well-being are measured by the Psychological Well-Being Scales (Ryff, 1989b) that are available in different versions (varying from three to twenty items per dimension). Social well-being is mostly examined by single items, for example on social cohesion. To the best of our knowledge, the Social Well-being Scales (Keyes, 1998) is the only scale that systematically measures the five dimensions of social well-being, and is available in two versions (three or ten items per dimension).

Some questionnaires measure multiple dimensions of positive mental health. For example, the Control, Autonomy, Self-realization, and Pleasure Scale (CASP; Hyde, Wiggins, Higgs, & Blane, 2003) and the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant, Hiller, Fishwick, Platt, Joseph, et al., 2007) measure both emotional and psychological well-being. The Flourishing Scale (Diener et al., 2010) measures both psychological and social well-being. Although it is a great advantage that these questionnaires incorporate multiple dimensions of positive mental health, the items do not reflect all aspects of emotional, psychological, and social well-being. A questionnaire that completely covered all three dimensions of mental health did not exist.

### *Mental Health Continuum*

In order to cover emotional, psychological, as well as social well-being in a single questionnaire, the Mental Health Continuum (MHC) was developed, based on several instruments assessing emotional, psychological and social well-being (Keyes, 2002). The first version of the MHC consists of 40 items. The subscale emotional well-being is measured by one item of life satisfaction and by six items of positive affect, respectively based on Cantril's self-anchoring scale (1967) and the positive and negative affect scales of Mroczek and Kolarz (1998). The six dimensions of Ryff's model of psychological well-being (1989b) include three items for each dimension, resulting in a total of 18 items (Ryff & Keyes, 1995). The subscale social well-being is based on Keyes' model (1998) and is also measured by three items per dimension, resulting in 15 items total.

Although these lengthy forms of measures of psychological and social well-being have been validated in samples of adults (Ryff, 1989b; Keyes, 1998; Keyes, Shmotkin & Ryff, 2002; Gallagher et al., 2009), adolescents (Ryff, 1989b; Gallagher et al., 2009), and students (Robitschek & Keyes, 2009), there was need for a well-being questionnaire consisting of fewer items. A brief questionnaire that completely covers all three dimensions of mental health was missing, which led to the development of the Mental Health Continuum-Short Form (MHC-SF).

The Mental Health Continuum-Short Form (MHC-SF) consists of 14 self-report items, each one representing a single theoretical dimension of well-being (Table 1). With this, the questionnaire fits the positive definition of mental health as stated by the World Health Organization (WHO; 2005). For each dimension, the most prototypical item of the long form of the Mental Health Continuum was chosen. Some items were reformulated to adapt to a uniform question format and response scale. This format closely matches widespread instruments such as the WHO Composite International Diagnostic Interview Short-Form (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998) and the Patient Health Questionnaire (Kroenke & Spitzer, 2002), making the MHC-SF highly suitable for population studies. For the Dutch version of the MHC-SF, items were translated into Dutch and then backwards into English to ensure comparability. The MHC-SF has shown good psychometric properties in five Dutch pilot studies, comprising two samples of undergraduate students, two samples of middle-aged and older adults, and one sample of adults in the general population.

The first aim of this thesis is to evaluate the psychometric properties of the MHC-SF in a representative sample of Dutch adults. We investigate the structure, reliability, convergent validity, and discriminant validity of the MHC-SF (Chapter 2). Furthermore, we examine the longitudinal functioning and measurement invariance of the MHC-SF by applying Item Response Theory analyses (Chapter 3).

## **The two-continua model: Is positive mental health more than the absence of psychopathology?**

Within mental health care it is often assumed that psychopathology and positive mental health are two sides of the same coin, and that the treatment of psychopathology automatically results in a mentally healthy population. Mental illness and mental health are traditionally seen as opposites. Considering the positive approach to mental health, this assumption is questionable. Is a person without symptoms of psychopathology automatically mentally healthy? Does this person necessarily experience positive feelings and life satisfaction and positive functioning in their individual life as well as in society? Or can a person with a mental disorder experience low emotional, psychological, and social well-being, just as a person without a mental disorder can?

In the traditional view, the presence of psychopathology implies the absence of positive mental health. Psychopathology and positive mental health are two ends of one continuum. A high number of psychopathological symptoms does not go together with a good positive mental health. In contrast to this traditional view, psychopathology and positive mental health may be complementary and reflect two related continua. This alternative model is called the *two-continua model* (Keyes, 2005). One continuum reflects the presence or absence of psychopathology, that is moderately related to the other continuum, that reflects the presence or absence of positive mental health. In practice, this implies that an individual experiencing many symptoms of psychopathology has a higher chance on experiencing low well-being, such as few positive emotions or decreased functioning in their personal or social life. However, this relation is not perfect. An individual may be suffering from mental illness (e.g., a panic disorder) and have a relatively high positive mental health at the same time. Conversely, the absence of psychopathology is neither necessary nor sufficient to ensure that an individual lives a productive, fruitful, and actualized life.

### *Empirical findings on the two-continua model*

The first empirical findings are supportive of the two-continua model rather than the traditional model. Using data from the Midlife Development in the United States (MIDUS) on adults between 25 and 74 years old, Keyes (2005) showed that a model with two related factors matches the data well, and fits better than a one-factor model (i.e., the traditional model), or a two-factor model with unrelated factors. The first continuum reflecting positive mental health was distinct from the second continuum reflecting symptoms of depressive disorder, generalized anxiety disorder, panic disorder, and alcohol abuse. Both continua had a correlation of  $-.53$ .

Figure 1 graphically represents the two-continua model, using data from the study by Keyes (2005). In this Figure, positive mental health is divided into categories of ‘low’, ‘moderate’, and ‘high’ positive mental health, based on the categorical scoring by Keyes (2002). Mental illness was divided into ‘mental disorder’ or ‘no mental disorder’. Figure 1 shows that there is a correlation between positive mental health and mental illness. For example, persons with a mental disorder more often have a poor positive mental health than persons with no mental disorder. However, every combination of positive mental health (low, moderate and high) and mental illness (mental disorder or no mental disorder) is possible. The absence of a mental disorder does not necessarily imply the presence of good positive mental health. This would not have been possible in the traditional view of one continuum.

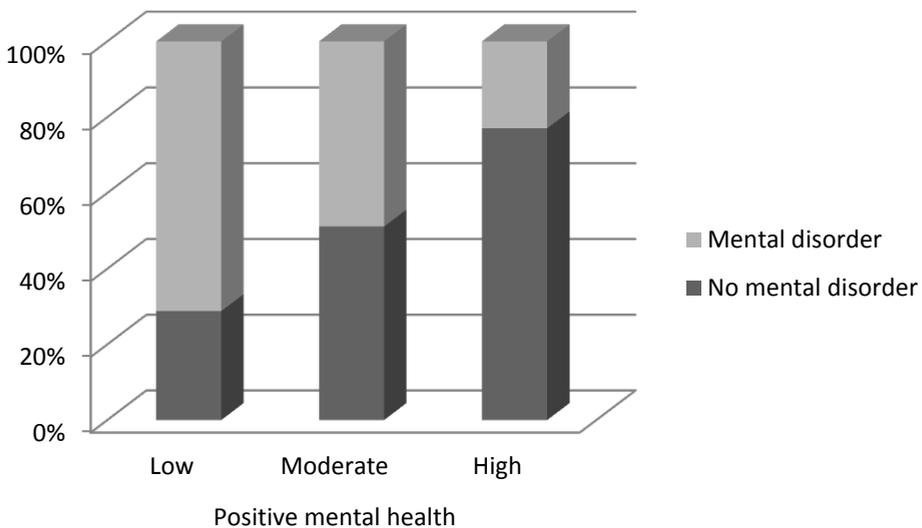


Figure 1. *The two-continua model reflected by low, moderate or high positive mental health in combination with the presence or absence of a mental disorder (based on: Keyes, 2005).*

Besides the study by Keyes (2005), the two-continua model of psychopathology and mental health was validated in different cultural populations (Keyes, 2006; Keyes, Eisenberg, Dhingra, Perry, & Dube, in press; Keyes et al., 2008) and using several measurements and conceptualizations of mental health and illness (Compton et al., 1996; Greenspoon & Saklofske, 2001; Headey, Kelley, & Wearing, 1993; Masse, Poulin, Dassa, Lambert, Belair, & Battaglini, 1998; Suldo & Shaffer, 2008; Westerhof & Keyes, 2010). The two-continua model is even found at the genetic level (Kendler, Myers, Maes, & Keyes,

2011). These findings indicate that positive mental health and psychopathology are two related dimensions. With this, positive mental health is more than the absence of undesirable states such as anxiety, and also includes the presence of well-being.

The second aim of this thesis is to validate the two-continua model of mental health in a representative sample of Dutch adults, by investigating differential associations of positive mental health and psychopathology with age (Chapter 4) and personality traits (Chapter 5). When positive mental health and psychopathology reflect two components of mental health in line with the two-continua model, associations with age and personality traits are expected to be different. In addition, we evaluate whether associations of positive mental health and psychopathology to age and personality traits remain when controlling for psychopathology or positive mental health, respectively. According to the two-continua model, positive mental health and psychopathology are more than merely opposites, and positive mental health and psychopathology should remain related to age and personality traits when controlled for psychopathology or positive mental health, respectively. When the findings show that positive mental health is related to age and personality independent from psychopathology, and psychopathology independent from positive mental health, this would further validate the two-continua model of mental health.

### **Implications of the two-continua model**

The most important implication of the two-continua model is that a person is only completely mentally healthy when he or she experiences both low levels of psychopathological symptoms and a good state of positive mental health. To investigate a person's mental health, psychopathology as well as positive mental health should be measured. Moreover, with psychopathology and positive mental health reflecting separate aspects of mental health, positive mental health may have effects on individual and social functioning that are independent from the effects of psychopathology. Several studies indicate that this may be the case. For example, positive feelings predict the onset of diseases such as influenza and stroke and even predict survival rates (Howell, Kern, & Lyubomirsky, 2007; Pressman & Cohen, 2005; Veenhoven, 2008). In addition, positive feelings contribute to better individual functioning in several life domains such as work and social relationships (Lyubomirsky, King, & Diener, 2005). An important limitation of these studies is that they did not validate the assumption that the contribution of positive mental health was separate from psychopathology.

However, several studies empirically evaluated the unique contribution of positive mental health on top of psychopathology. A meta-analysis (Chida & Steptoe, 2008) shows that the effects of emotional well-being on physical health were independent from the effects of negative feelings, providing further evidence for the two-continua model. Moreover, Keyes (2002, 2004, 2005, 2006, 2007; Keyes & Grzywacz, 2005) examined the effects of positive mental health, including emotional, psychological, as well as social well-being, while controlling for mental illness. His studies showed that a good state of positive mental health was related to better physical health, less health care consumption, and better work performance, also when controlling for levels of psychopathology. Persons with a good positive mental health in combination with the absence of a mental disorder functioned even better on these aspects than persons with a poor positive mental health and/or a mental disorder. A combined diagnosis of mental health and mental illness predicted psychosocial functioning better than a single diagnosis did, showing positive mental health and mental illness were complementary indicators of mental health (Keyes, 2002, 2005; Keyes & Grzywacz, 2005).

When positive mental health is separate from psychopathology in line with the two-continua model, positive mental health may not only predict physical health, but also psychopathology. To our knowledge only two studies (Keyes, Dhingra, & Simoes, 2010; Wood & Joseph, 2009) have examined the longitudinal association of positive mental health with psychopathology. Both studies indicate that positive mental health may predict future levels of psychopathology. The absence of psychological well-being formed a substantial risk factor for depression (Wood & Joseph, 2009), and change in positive mental health predicted the prevalence and incidence of major depressive disorders, panic disorders, and generalized anxiety disorders ten years later (Keyes et al., 2010). Although these studies are the first to prospectively examine the association of positive mental health with psychopathology by using a ten-year follow-up, both studies had limitations as well. The study of Wood and Joseph (2009) used a selective sample of older adults, merely focused on psychological well-being, and on depressive symptomatology. Moreover, both studies only measured outcomes on two occasions and merely investigated the predictive association of positive mental health with psychopathology, and not the predictive association of psychopathology with positive mental health.

Although most studies are cross-sectional and no conclusions on causality can be made, these findings underline the importance of assessing positive mental health in addition to psychopathology. Therefore, the third aim of the present thesis is to investigate the predictive effects of positive mental health to physical health and psychopathology. First, we evaluate the longitudinal association of well-being with recovery and survival in physically ill patients (Chapter 6). Since this chapter is a meta-

analysis on studies that are currently available, we focused on emotional well-being. Second, we investigate the longitudinal impact of positive mental health on psychopathology in a representative sample of Dutch adults (Chapter 7). In this chapter, we broadly assess positive mental health by including emotional, psychological as well as social well-being, and broadly measure psychopathology through a large variety of symptoms. Moreover, we assess both positive mental health and psychopathology by taking measurements on four occasions during a nine-month period, using sophisticated statistical analyses. The study not only evaluates the predictive effects of positive mental health on psychopathology, but also of psychopathology on positive mental health, to investigate the reciprocity between the two continua of mental health.

### **Outline of the thesis**

In this thesis, we study mental health from a positive perspective, as the presence of emotional, psychological, and social well-being. Our aim is threefold. First, we evaluate the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF). Second, we investigate the two-continua model of psychopathology and positive mental health by examining the association with age and the Big Five personality traits. Third, we examine the predictive effects of positive mental health by studying the longitudinal association of emotional well-being with physical health and of positive mental health with psychopathology. Each of the three aims is addressed by two studies. Besides the focus on the positive aspects of mental health, the studies are pioneering in that they investigate both positive mental health and psychopathology longitudinally by taking measurements on four occasions during a nine-month period, as well as by using a large sample ( $N = 1,932$ ) of respondents that are representative of the Dutch population. All of the studies, except the study that will be described in Chapter 6, draw on data from the LISS panel of CentERdata, a representative panel for Longitudinal Internet Studies for the Social Sciences (Tilburg, the Netherlands). The study described in Chapter 6 is based on a systematic literature review and meta-analysis. The studies will be described in the subsequent chapters.

Chapter 2 addresses the evaluation of the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF) which measures positive mental health by incorporating self-report items on each of the dimensions of emotional, psychological, and social well-being (Table 1). We examine the structure, reliability, convergent validity, and discriminant validity of the MHC-SF. In addition, Chapter 3 examines the longitudinal functioning of the MHC-SF, using more advanced methods to evaluate the measurement invariance of the items across demographics, physical illness, and mental illness. In addition to a clear definition of positive mental health, it is important that the

measurement of positive mental health takes place with a proper and well-validated questionnaire.

Chapters 4 and 5 investigate the two-continua model of mental health by studying the associations of positive mental health and psychopathology with age (Chapter 4) and the Big Five personality traits: neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience (Chapter 5). When positive mental health and psychopathology reflect two components of mental health in line with the two-continua model, associations with age and personality traits are expected to be different. In addition, we evaluate whether associations of positive mental health and psychopathology to age and personality traits remain when controlling for psychopathology or positive mental health, respectively. According to the two-continua model, positive mental health and psychopathology are more than mere opposites, and positive mental health and psychopathology should remain related to age and personality traits when controlled for psychopathology or positive mental health, respectively. This would further validate the two-continua model of mental health.

Chapters 6 and 7 evaluate positive mental health as a predictor of physical health and psychopathology. We study the longitudinal association of emotional well-being with physical health (Chapter 6) and of positive mental health with psychopathology (Chapter 7). Since the two-continua model holds that positive mental health reflects a separate component of mental health, positive mental health may predict future physical health and psychopathology. In Chapter 6, we investigate emotional well-being as a predictor of long-term recovery and survival in patients with physical illness. We apply meta-analytic techniques to a collection of studies retrieved by a systematic literature search. In Chapter 7, we evaluate the reciprocal impact of positive mental health and psychopathology. Whereas earlier studies used a longitudinal design of two measurement occasions in approximately ten years (Keyes et al., 2010; Wood & Joseph, 2009), we examine both positive mental health and psychopathology four times in nine months, using sophisticated analyses.

Chapter 8 includes a general conclusion and discussion.

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# Chapter 2

## Evaluating the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF)

Lamers, S. M. A., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. M. (2011). Evaluating the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF). *Journal of Clinical Psychology, 67*(1), 99-110.

## Abstract

There is a growing consensus that mental health is not merely the absence of mental illness, but it also includes the presence of positive feelings (emotional well-being) and positive functioning in individual life (psychological well-being) and community life (social well-being). We examined the structure, reliability, convergent validity, and discriminant validity of the Mental Health Continuum- Short Form (MHC-SF), a new self-report questionnaire for positive mental health assessment. We expected that the MHC-SF is reliable and valid, and that mental health and mental illness are 2 related but distinct continua. This article draws on data of the LISS panel of CentERdata, a representative panel for Longitudinal Internet Studies for the Social Sciences ( $N = 1,662$ ). Results revealed high internal and moderate test-retest reliability. Confirmatory factor analysis (CFA) confirmed the 3-factor structure in emotional, psychological, and social well-being. These subscales correlated well with corresponding aspects of well-being and functioning, showing convergent validity. CFA supported the hypothesis of 2 separate yet related factors for mental health and mental illness, showing discriminant validity. Although related to mental illness, positive mental health is a distinct indicator of mental well-being that is reliably assessed with the MHC-SF.

## Introduction

Concepts of mental health have changed in recent years. Mental health has long been described as the absence of psychopathology. Today, the World Health Organization (WHO) focuses on mental health as a positive state that is defined as “*a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community*” (WHO, 2004, p 12). There are three core components in this definition: well-being, effective functioning in individual life, and effective functioning in community life, which together make up mental health. This definition builds on two longstanding traditions in studies on a life well lived (Deci & Ryan, 2008; Ryff, 1989): the *hedonic* tradition concerns feelings of happiness whereas the *eudaimonic* tradition focuses on optimal functioning in individual and social life (Keyes, 1998; Waterman, 1993).

According to the hedonic tradition, well-being comprises happiness and the experience of pleasant emotions. Mental health is increased by maximizing positive, pleasant feelings while minimizing negative, unpleasant feelings. Research on *emotional well-being* reflects this affective aspect of the hedonic tradition. In addition to a positive balance of pleasant to unpleasant affect, emotional well-being includes a cognitive appraisal of satisfaction with life in general (Diener, Suh, Lucas, & Smith, 1999; Keyes, 2009; Table 1).

The eudaimonic tradition considers optimal psychological functioning in life and has been measured using two multidimensional models—*psychological well-being* and *social-well-being*—that reflect the extent to which individuals view themselves as functioning well in life (Keyes, 2002). Ryff (1989) developed a model of psychological well-being that comprises six dimensions, based on work of humanistic and lifespan psychologists, such as Jung, Maslow, Allport, Rogers, and Erikson. These dimensions (self-acceptance, personal growth, purpose in life, positive relations with others, autonomy, and environmental mastery; Ryff; Table 1) reflect the challenges that individuals encounter as they strive to realize their potential. Besides this assessment of optimal functioning in private life, optimal functioning should be measured in community life (WHO, 2004). Therefore, Keyes (1998, 2002) proposed a model of *social well-being* based on the work of sociologists such as Durkheim and Marx. This model has five dimensions (social integration, social contribution, social coherence, social actualization, and social acceptance; Keyes, 1998; Table 1), and focuses on the individuals’ evaluations of their public and social lives. Taking both the hedonic and the eudaimonic approaches into account, positive mental health can be defined as the presence of *emotional, psychological, and social well-being* (Keyes, 2002), in accordance with the definition of the WHO (2004).

The two-continua model of mental health states that positive mental health is related to, but different from, mental illness (Keyes, 2005). An individual experiencing many symptoms of psychopathology has a higher chance on experiencing low well-being, such as few positive emotions, low life satisfaction, or decreased functioning in individual or social life. However, this relation is not perfect. An individual may be suffering from mental illness (e.g., a panic disorder) and have a relatively high positive mental health at the same time. Conversely, the absence of psychopathology is neither necessary nor sufficient to ensure an individual lives a productive, fruitful, and actualized life.

The two-continua model has been confirmed in adolescent and adult samples in the United States (Keyes, 2005, 2006, 2007). Confirmatory factor analyses showed the best fit for a model with two related axes, where different measures of emotional, psychological, and social well-being load on a distinct factor that relates to a second factor that accounts for measures of psychopathology. Moreover, a combined diagnosis of mental health and of mental illness predicted psychosocial functioning better than a single diagnosis does, showing mental health and mental illness are complementary (Keyes, 2002, 2005; Keyes & Grzywacz, 2005). Therefore, assessment of positive mental health is an important addition to the assessment of mental illness.

To date, there are several questionnaires measuring well-being. However, existing questionnaires are rather long (e.g., WHOQOL-100; WHOQOL Group, 1998) or measure only one or a few aspects of well-being (e.g., PANAS; Watson, Clark, & Tellegen, 1988; SWLS; Pavot & Diener, 1993; CASP-19; Hyde, Wiggins, Higgs, & Blane, 2003). Other questionnaires include not only well-being but also items on psychopathology (e.g., GHQ; Hu, Stewart-Brown, Twigg, & Weich, 2007).

Because a brief questionnaire that fully covers all three dimensions of mental health was lacking, the Mental Health Continuum-Short Form (MHC-SF) was developed. The MHC-SF measures emotional, psychological, and social well-being, includes only 14 items, and focuses only on aspects of well-being. It was derived from a number of instruments that assess emotional, psychological, and social well-being in the Survey on Midlife Development in the United States (MIDUS; Keyes, 2002). In the MHC-SF, just one item is used for each dimension of emotional, psychological, and social well-being. Each item, thus, represents one theory-guided dimension, such as “How often did you feel that you liked most parts of your personality?” measuring self-acceptance of psychological well-being (Ryff, 1989). A first evaluation of the MHC-SF was carried out in four communities in South Africa, showing that the instrument is reliable and valid, as well as confirming the two-continua model of mental health and illness (Keyes et al., 2008).

The present article expands on the South African study in a number of ways, besides being the first study in a European country. Rather than studying individuals between 30 and 80 years of age in four communities, it covers the total adult lifespan in a sample that is representative of the Dutch population. Furthermore, it includes longitudinal data, allowing for the assessment of test-retest reliability. Data were collected online through the Internet, whereas the South African study used personal interviews. Last, it uses different validation measures, also including a broader assessment of mental illness.

First, we expect to confirm the three-factor structure of emotional, psychological, and social well-being as found in studies with other instruments (Gallagher, Lopez, & Preacher, 2009; Robitschek & Keyes, 2009). Second, we hypothesize that the MHC-SF as well as the three subscales have a high internal reliability, similar to earlier findings in the South African sample and to findings in the United States that used other instruments to measure mental health. Reliability over time should be moderate, because the MHC-SF is intended, as any instrument assessing well-being, to demonstrate temporal stability, yet maintain sensitivity to reflect and detect changes in positive mental health, such as those because of major life events. Moreover, we expect larger test-retest reliability for the direct paths (e.g., emotional well-being at baseline predicting emotional well-being later in time) than for the cross-over paths (e.g., emotional well-being at baseline predicting social well-being later in time).

Third, we hypothesize that our study confirms the convergent validity of the MHC-SF, with the subscales emotional, psychological, and social well-being correlating positively with corresponding measures. That is, we expect emotional well-being to correlate with measures of positive affect and life satisfaction, psychological well-being with measurements of individual functioning (e.g., self-esteem), and social well-being to be correlated with measurements of involvement in society (e.g., social engagement). However, we predict the correlations to be low to moderate, because the MHC-SF subscales comprise several dimensions, of which the validity measures only represent a small part.

Fourth, we expect to confirm the two-continua model where mental health and mental illness are two related, but distinctive, latent factors. We hypothesize that positive mental health and mental illness belong to two separate latent factors, which have low to moderate negative correlations.

## Method

### Participants

A representative sample of 1,662 Dutch respondents between the ages of 18 and 87 years participated in the current study. The sample was stratified by age group, gender, and migratory status. Of the respondents, 49.8% ( $N = 828$ ) were male; 22.9% ( $N = 381$ ) were aged 18 to 29 years, 28.4% ( $N = 472$ ) were 30 to 49 years, 26.5% ( $N = 440$ ) were 50 to 64 years, and 22.2% ( $N = 369$ ) were aged 65 years and over. The mean age was 47.6 (standard deviation [ $SD$ ] = 17.7). Of the respondents, 83.1% ( $N = 1381$ ) were Dutch and 16.9% ( $N = 281$ ) were born abroad or had at least one parent born abroad. Of the respondents, 30.3% ( $N = 504$ ) had 6 or fewer years of education, 33.6% ( $N = 558$ ) had 12 or fewer years, 22.4% ( $N = 373$ ) had more than 12 years, and 12.0% ( $N = 199$ ) had more than 16 years of education. For 1.7% ( $N = 28$ ) of the respondents, data on educational level were missing. Of the respondents, 53.1% ( $N = 882$ ) were married.

### Procedure

This article 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 households are provided Internet access and a personal computer when necessary. Compared with national statistics, the LISS panel shows some underrepresentation of elderly, single, never married persons, widowers, and immigrants (Knoef & De Vos, in press). In one third of the households, one member was selected by CentERdata to fill out a module on mental health in December 2007, March 2008, June 2008, and in September 2008. For this study, we used the data from December 2007 ( $N = 1,662$ , response rate = 69%). Data from the other three measurement times were used to assess test-retest reliability. Of the 1,662 respondents that filled out the module on mental health in December 2007, 1,469 (88%) went on to complete the same module in March 2008, 1,099 (66%) completed the module in June 2008, and 1,279 (77%) completed the module in September 2008.

We also used core modules developed by the LISS panel, which comprises various well-validated questionnaires and several background questions. To validate the MHC-SF, we used data from the core modules concerning health ( $N = 1,506$ ), personality ( $N = 1,458$ ), social integration and leisure ( $N = 1,565$ ), and politics and values ( $N = 1,661$ ). Of the respondents, 1,350 (81%) filled out all the modules.

## Measures

The Mental Health Continuum-Short Form (MHC-SF) (Keyes et al., 2008) measures positive mental health and comprises 14 items, representing various feelings of well-being. Respondents rate the frequency of every 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*). Items were translated into Dutch and backwards into English to ensure comparability. The MHC-SF contains three items of emotional well-being, six items of psychological well-being, and five items of social well-being, with each psychological and social well-being item representing one dimension, as described earlier (see Table 1).

The MHC-SF has shown good psychometric properties in five Dutch pilot studies, comprising two samples of undergraduate students, two samples of middle-aged and older adults, and one sample of LISS panel members. Emotional, psychological, and social well-being were rated as important by almost all respondents in a pilot using the LISS panel. About 85% of the respondents found the questions clear, interesting, and not difficult to answer. The psychometric properties of the MHC-SF in the current study will be discussed in the Results section.

### *Emotional well-being validation measures*

The *Satisfaction With Life Scale* (SWLS; Pavot & Diener, 1993) was developed to assess satisfaction with life as a whole and comprises five items, using a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Internal reliability in the current study was 0.87. *Happiness* was measured with a single item, asking respondents to rate their overall happiness on a 10-point scale, ranging from 1 (*totally unhappy*) to 10 (*totally happy*). The *Positive and Negative Affect Schedule* (PANAS; Watson et al., 1988) included the measure of positive affect, which reflects the extent to which a person feels enthusiastic, active and alert. It comprises 10 descriptors of positive affect, rated for their momentary presence on a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*extremely*). Because studies on the PANAS consistently show that the Dutch translation of one item of positive affect (“excited,” of which the translation is comparable to “agitated”) loads on the negative factor (Westerhof, 2003), this item was excluded from the analyses. Cronbach’s alpha for the nine remaining items was 0.88.

### *Psychological well-being validation measures*

The *Rosenberg Self-Esteem Scale* (RSE; Rosenberg, 1979) measures overall self-esteem. It comprises 10 items with a 7-point rating scale, ranging from 1 (*totally disagree*) to 10 (*totally agree*). Cronbach’s alpha in this study was 0.88. The *Need to Evaluate Scale*

(NES; Jarvis & Petty, 1996) measures the chronic tendency to engage in evaluative responding, to have and express own opinions. The scale comprises 16 items with a 5-point rating scale, ranging from 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*) and the internal reliability in this study was 0.73. The *Need for Cognition Scale* (NCS; Cacioppo & Petty, 1982) measures the tendency to engage in and enjoy thinking and complex thought. Need to evaluate and need for cognition should be related to psychological well-being, since the measures reflect aspects of psychological well-being such as autonomy (NES) and engagement in thinking about goals and challenges (NCS). The scale comprises 18 items with a 7-point rating scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) and the internal reliability was 0.88 in this study.

#### *Social well-being validation measures*

*Social engagement* was measured by asking respondents whether they participated in any of 12 kinds of organizations (e.g., sporting club, political party) in four ways (money donation, participation in activities, membership, or voluntary work). *Political efficacy* is defined as “the feeling that individual political action does have, or can have, an impact upon the political process, i.e., that it is worthwhile to perform one’s civic duties” (Campbell et al., 1954, p 54) and was measured with six items, using a dichotomous rating scale of 0 (*not true*) to 1 (*true*). *Political participation* was measured by asking participants whether they had used any of eight ways to influence politicians or the government in the past five years (e.g. join an action group, join a political discussion). For each of these three scales, the number of affirmative answers was counted, a higher score reflecting greater social engagement, political efficacy, and political participation.

#### *Mental illness*

The *Brief Symptom Inventory* (BSI; Dutch version: Beurs & Zitman, 2006) is an instrument for screening and assessment of psychopathology, comprising 53 items. It is among the most commonly used assessment tools in mental health services in the United States. Respondents indicated the degree to which they had experienced various psychological symptoms in the past week using a 5-point Likert scale, ranging from 1 (*not at all*) to 5 (*a lot*). The BSI includes nine subscales: *Depression, Anxiety, Phobic Anxiety, Interpersonal Sensitivity, Obsessive-Compulsive Disorder, Hostility, Paranoid Ideation, Psychoticism, and Somatization*. Cronbach’s alpha for the subscales was high in the current study, ranging between 0.73 and 0.81, with the exception of 0.59 (Psychoticism) and 0.67 (Phobic anxiety).

## Statistical analyses

We used SPSS 16.0 for analyzing the reliability and convergent validity of the MHC-SF. Reliability values (Cronbach's alpha) of above 0.70 are referred to as acceptable and above 0.80 as high (Kline, 2000). Correlations around 0.20 are considered low and around 0.50 to be moderate. In all analyses, we applied a  $p$  value of .001 instead of the common .05, because of the large sample size.

Two sets of factor analyses were conducted, to test the structure of the MHC-SF and investigate the two-continua model of mental health and mental illness. For both sets, we used a split-sample approach to cross-validate our findings. The total sample was randomly split into three samples of 554 respondents. First, in one sample (i.e., the "exploration sample"), we conducted an exploratory factor analysis to get insight in potential loadings and cross-loadings of the items on each factor. We performed a principal axis factoring analysis with oblique rotation to allow for correlated factors, using SPSS 16.0. We examined the pattern matrix of item loadings, which takes correlations between the factors into account (Costello & Osborne, 2005). Second, we conducted two confirmatory factor analyses in LISREL 8.70. In the second sample (i.e., the "calibration sample") different models were tested; the third sample (i.e., the "validation sample") was used to examine the extent to which the best fitting model was replicated. A tight replication strategy was used, whereby the parameters in the validation sample were fixed at the values estimated from the calibration sample. We used robust maximum likelihood as estimation method, because the items of the MHC-SF are ordinal variables, and the subscales of the MHC-SF and the BSI were not normally distributed (normality tests in LISREL with  $p < .001$ ).

We used several fit indices to assess the fit of the models: Satorra-Bentler chi-square (Satorra & Bentler, 2001), noncentrality parameter, Akaike's information criterion, root mean square error of approximation, comparative fit index, goodness of fit index and adjusted goodness of fit index. Values of  $< .06$  for the root mean square error of approximation,  $> .90$  for the comparative fit index (Hu & Bentler, 1999),  $< .05$  for the standardized root mean square residual, and  $> .90$  for both the goodness of fit index and the adjusted goodness of fit index (Byrne, 1998) are considered good.

# Results

## Structure

To test our first hypothesis concerning the structure of the MHC-SF, we first conducted an exploratory factor analysis to explore the data on factor loadings and cross-loadings on three subscales. Three factors were retained with an eigenvalue greater than 1, together explaining 58.0% of the variance. The point of inflexion of the curve in the scree plot also revealed three factors. As Table 1 shows, all items had the highest loading on the intended factor of emotional, psychological, or social well-being. Two items of social well-being (items 4 and 5) had a rather low factor loading of .34. The factor loadings for the other 12 items were  $> .40$  on the intended factor. The three factors were interrelated. The correlation was highest between psychological and social well-being (0.60), followed by the correlation between psychological well-being and emotional well-being (0.52), and the correlation between social well-being and emotional wellbeing (0.30). Because the highest factor loading is on the intended subscale for each of the 14 items, the exploratory analysis suggests a three-factor model with related factors fits the data.

To test whether this model of emotional, psychological, and social well-being as three related factors represents the data best, we conducted confirmatory factor analyses. Therefore, we evaluated three different models: (a) a model with a single factor, which represents mental health; (b) a model with two related factors, one representing hedonic well-being (emotional well-being) and one representing eudaimonic well-being (both psychological and social wellbeing); and (c) our hypothesized model of three related factors.

Table 1.

*Exploratory Factor Analysis with Three-factor Oblimin Rotation on the MHC-SF Items*

Theoretical dimension	MHC-SF item (numbers show item order)		E	P	S
In the past month, how often did you feel ...					
<i>Emotional well-being (E)</i>					
Happiness	01.Happy		<b>-.78</b>	.07	.01
Interest	02.Interested in life		<b>-.60</b>	.19	.05
Life satisfaction	03.Satisfied		<b>-.80</b>	.08	.11
<i>Psychological well-being (P)</i>					
Self-acceptance	09.That you liked most parts of your personality		-.02	<b>.58</b>	.17
Environmental mastery	10.Good at managing the responsibilities of your daily life		-.22	<b>.43</b>	.03
Positive relations	11.That you had warm and trusting relationships with others		-.30	<b>.54</b>	-.10
Personal growth	12.That you have experiences that challenge you to grow and become a better person		.14	<b>.56</b>	.12
Autonomy	13.Confident to think or express your own ideas and opinions		.01	<b>.72</b>	.02
Purpose in life	14.That your life has a sense of direction or meaning to it		-.30	<b>.55</b>	-.00
<i>Social well-being (S)</i>					
Soc. Contribution	04.That you had something important to contribute to society		-.24	.21	<b>.34</b>
Soc. integration	05.That you belonged to a community (like a social group, your neighborhood, your city)		-.17	.16	<b>.34</b>
Soc. actualization	06.That our society is becoming a better place for people		-.04	-.11	<b>.73</b>
Soc. acceptance	07.That people are basically good		.05	-.06	<b>.60</b>
Soc. coherence	08.That the way our society works makes sense to you		.13	.21	<b>.52</b>

**Bold.** Highest factor loading for the item.

Table 2 shows the results in both the calibration and the validation sample. None of the models indicated a poor fit, but the fit indices clearly suggest that the three-factor model is the best fit to the calibration sample data. The root mean square error of approximation indicated a good fit for all three models. Furthermore, the root mean square error of approximation for the three-factor model indicated the best fit compared to the one-factor and two-factor model. The other indices also favored the three-factor model. For example, the noncentrality parameter, the akaike’s information criterion, and standardized root mean square residual were lowest in the three-factor model compared with both other models and indicated a good fit. Scaled chi-square difference tests (Satorra & Bentler, 2001) indicated a significantly better fit for the two-factor over the one-factor model, and for the three-factor over the two-factor model. The model with three related factors of emotional, psychological, and social well-being thus had a good fit to the data, as well as the best fit of the three tested models.

Table 2.

*Robust Maximum Likelihood Estimation of CFA Models of the Latent Structure of the MHC-SF Items*

Fit indices	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	
	Calibration Single factor	Calibration Two factors	Calibration Three factors	Validation Three factors
SB $\chi^2$	198.1	135.3	109.6	224.1
<i>df</i>	77	76	74	179
NCP	121.1	59.3	35.6	45.1
AIC	254.1	193.3	171.6	286.1
RMSEA	.053	.038	.030	.021
CFI	.984	.992	.995	.997
Standardized RMR	.087	.079	.073	.063
GFI/AGFI	.78/.70	.85/.79	.82/.61	.90/-
	Model 1 vs. 2		Model 2 vs. 3	
Scaled $\Delta \chi^2$	14.69*		32.62*	
Contribution to $\chi^2$				56.9%

*Note.* SB  $\chi^2$  = Satorra-Bentler scaled chi-square; *df* = degree of freedom; NCP = estimated non-centrality parameter; AIC = Akaike’s information criterion; RMSEA = root mean square error of approximation; CFI = comparative fit index; Standardized RMR = standardized root mean square residual; GFI = goodness of fit index; AGFI = adjusted goodness of fit index; CFA = confirmatory factor analysis; MHC-SF = Mental Health Continuum-Short Form; BSI = Brief Symptom Inventory.

\*  $p < .001$ . 2-tailed.

The confirmatory factor analysis in the validation sample replicated these findings in the calibration sample. Even with a tight replication strategy, the validation sample contributed 56.9% to the global chi-square. The standardized solution of the three-factor model showed that all MHC-SF items had a high loading on their intended factor of emotional, psychological, or social well-being. All factor loadings were above .56 in the calibration sample and above .53 in the validation sample.

### Reliability

The descriptive results for the total MHC-SF as well as the subscales are shown in the upper panel of Table 3. Respondents experienced feelings of well-being on average “two or three times a week” (score 4) with the highest frequency for feelings of emotional well-being and lowest frequency for feelings of social well-being. Moderate correlations between the three subscales existed.

Table 3.

*Descriptives of the MHC-SF and Bivariate Correlations with Validation Measures*

Measures	Total MHC-SF	Emotional well-being	Psychological well-being	Social well-being
M (SD)	3.98 (.85)	4.67 (.94)	4.18 (.99)	3.33 (1.01)
Emotional well-being	.74*	-		
Psychological well-being	.92*	.60*	-	
Social well-being	.86*	.47*	.64*	-
<i>Emotional well-being</i>				
Satisfaction With Life Scale	.36*	<b>.49*</b>	.29*	.22*
Happiness	.36*	<b>.49*</b>	.31*	.19*
Positive Affect	.29*	<b>.24*</b>	<b>.26*</b>	.24*
<i>Psychological well-being</i>				
Self-esteem	.34*	<b>.39*</b>	<b>.33*</b>	.19*
Need to Evaluate	.16*	.09*	<b>.16*</b>	.13*
Need for Cognition	.16*	.07	<b>.17*</b>	.14*
<i>Social well-being</i>				
Social engagement	.15*	.07	.08	<b>.21*</b>
Political efficacy	.17*	.08	.14*	<b>.20*</b>
Political participation	.12*	.02	.09*	<b>.17*</b>
<i>Mental illness</i>				
Mental illness	-.33*	<b>-.47*</b>	-.27*	-.18*

Note. MHC-SF = Mental Health Continuum-Short Form; SD = standard deviation.

**Bold.** Partial correlation is significant ( $p < .001$ ), controlling for the other MHC-SF subscales.

\*  $p < .001$

In line with the second hypothesis, internal reliability was high for the total MHC-SF ( $\alpha = 0.89$ ), as well as for the subscales of emotional well-being ( $\alpha = 0.83$ ) and psychological well-being ( $\alpha = 0.83$ ), and adequate for the subscale social well-being ( $\alpha = 0.74$ ). To examine stability of the three subscales, we performed crossover path analysis of the three subscales as predictors of emotional, psychological, and social well-being later in time. We correlated the time points December 2007 (t0) and March 2008 (t1), March 2008 (t1) and June 2008 (t2), June 2008 (t2) and September 2008 (t3), and December 2007 (t0) and September 2008 (t3). Table 4 shows that each subscale consistently predicted this subscale at follow-up with its largest magnitude, about .50. For instance, emotional well-being at follow-up was best predicted by emotional well-being at baseline. The other two subscales were frequently positively related, for example, psychological well-being predicted emotional and social well-being at follow-up, but with low correlations between .10 and .20. Moreover, correlations were consistent over time, confirming our expectation that the MHC-SF outcomes are sufficiently stable over time, but also sensitive to change, suggesting they are modifiable.

### **Convergent Validity**

The bivariate and partial correlations of the MHC-SF with corresponding validation measures of well-being and functioning are presented in Table 3 to test our third hypothesis. The low to moderate correlations generally corresponded with our expectations. Measures that focus on aspects of emotional well-being in general showed a significant partial correlation with only the subscale emotional well-being. There is one exception, namely, *positive affect*, which showed significant partial correlations with both emotional and psychological well-being. The *Need to Evaluate* and *Need for Cognition scales*, used for validation of the subscale psychological well-being, had only partial correlations with this subscale. Contrary to our expectations, *self-esteem* showed partial correlations with psychological and emotional well-being. All measures focusing on aspects of social well-being had significant partial correlations only with the subscale social well-being.

Table 4.

*Cross-over Path Analysis of the MHC-SF Subscales as Predictors of MHC-SF at Follow-up*

Dependent variable	Predictor	Time point comparison			
		t0 - t1	t1 - t2	t2 - t3	t0 - t3
Emotional well-being	Emotional well-being	.52*	.53*	.56*	.46*
	Psychological well-being	.13*	.17*	.08	.16*
	Social well-being	.00	.01	.03	.00
Psychological well-being	Emotional well-being	.12*	.04	.09	.04
	Psychological well-being	.45*	.54*	.53*	.53*
	Social well-being	.11*	.11	.11*	.10*
Social well-being	Emotional well-being	.07	-.03	.05	.04
	Psychological well-being	.11*	.18*	.13*	.16*
	Social well-being	.49*	.54*	.53*	.47*
Total MHC-SF	Total MHC-SF	.65*	.70*	.70*	.65*

\*  $p < .001$ **Discriminant Validity: Two-Continua Model**

To examine our hypothesis of mental health and mental illness as two related but distinctive latent factors, we first conducted exploratory analyses. Mental illness was negatively and moderately correlated to positive mental health with the highest correlation to emotional wellbeing, which remained significant after controlling for psychological and social well-being (Table 3). Exploratory factor analysis revealed two factors with an eigenvalue greater than 1, which was confirmed by the curve in the scree plot. Together these factors explained 60.5% of the variance. All subscales had the highest loading on the intended factor, with high factor loadings between .52 and .90 (Table 5). The two factors had a negative correlation of -0.34.

Table 5.

*Exploratory Factor Analysis with Two-factor Oblimin Rotation on the MHC-SF and BSI subscales*

Subscale	Mental health	Mental illness
<i>MHC-SF</i>		
Emotional well-being	<b>.58</b>	-.28
Psychological well-being	<b>.90</b>	.04
Social well-being	<b>.70</b>	.06
<i>BSI</i>		
Depression	-.14	<b>.81</b>
Anxiety	.05	<b>.85</b>
Phobic anxiety	.02	<b>.63</b>
Interpersonal sensitivity	-.06	<b>.75</b>
Obsessive-Compulsive disorder	.01	<b>.75</b>
Hostility	.01	<b>.56</b>
Paranoid ideation	-.01	<b>.71</b>
Psychoticism	-.09	<b>.75</b>
Somatization	.08	<b>.52</b>

*Note.* MHC-SF = Mental Health Continuum-Short Form; BSI = Brief Symptom Inventory. **Bold** = Highest factor loading for the item.

Three confirmatory factor analysis models were run to test our hypothesis of mental health and mental illness: (a) a model with one single factor, where the absence of mental illness is the presence of mental health; (b) a model with two orthogonal factors, which represents a model where mental health and mental illness are two unrelated factors; and (c) the hypothesized two-continua model with two correlated factors. We again used the split-sample approach to validate our findings.

As shown in Table 6, the descriptive indices of the model with one single factor revealed a poor fit to the data. All descriptive fit indices improved markedly for both two-factor models, which confirmed the hypothesis that mental health and mental illness are distinct dimensions instead of the ends of one bipolar dimension. Moreover, the model of two related axes showed improved fit indices compared to the model of two orthogonal axes, such as a lower noncentrality parameter, Akaike's information criterion, and standardized root mean square residual. Furthermore, the scaled chi-square test statistic improved significantly for the model with two correlated factors over the model with two unrelated factors. Confirmatory factor analysis of the two-factor oblique model on the validation sample replicated these findings. The validation sample contributed 48.2% to the global chi-square, even with a tight replication strategy.

Table 6.

*Robust Maximum Likelihood Estimation of CFA Models of the Latent Structure of Mental Health (MHC-SF subscales) and Mental Illness (BSI subscales)*

Fit indices	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	
	Calibration Single factor	Calibration Two unrelated factors	Calibration Two related factors	Validation Two related factors
SB $\chi^2$	475.7	242.0	226.5	434.9
<i>df</i>	54	54	53	131
NCP	421.7	188.0	173.5	303.9
AIC	523.7	290.0	276.5	484.9
RMSEA	.119	.079	.077	.065
CFI	.941	.974	.976	.979
Standardized RMR	.102	.153	.081	.082
GFI/AGFI	.81/.72	.88/.83	.89/.84	.89/-
Model 2 vs. 3				
Scaled $\Delta \chi^2$	9.72*			
Contribution to $\chi^2$	48.2%			

*Note.* CFA = confirmatory factor analysis; MHC-SF = Mental Health Continuum-Short Form; BSI = Brief Symptom Inventory; *df* = degree of freedom; SB  $\chi^2$  = Satorra-Bentler scaled chi-square; NCP = estimated non-centrality parameter; AIC = Akaike's information criterion; RMSEA = root mean square error of approximation; CFI = comparative fit index; Standardized RMR = standardized root mean square residual; GFI = goodness of fit index; AGFI = adjusted goodness of fit index;.

\*  $p < .001$ . 2-tailed.

## Discussion

We evaluated the psychometric properties of the MHC-SF, a self-report questionnaire for measuring positive mental health. The current findings confirm the theoretically based arrangement of the 14 items in the three subscales emotional, psychological, and social well-being. These subscales have a good internal reliability and each of the subscales is predictive of the corresponding subscale at follow-up of 3 and 9 months. Furthermore, the direct paths (e.g., emotional well-being predicting emotional well-being later in time) are of larger magnitudes than the indirect paths (e.g., emotional well-being predicting psychological or social well-being later in time), which further confirms the three subscales of positive mental health. In addition, the moderate test-retest reliability suggests that the MHC-SF is both sensitive to change and stable over time. This raises interesting future research questions about the factors that contribute to stability and change of the MHC-SF.

The convergent validity of the MHC-SF is good in the current study, suggesting that the MHC-SF is a valid instrument. Because we could use only measures included by CentERdata for validation, some measures were not fully representative for the aspects of the subscale, in particular, those used for psychological well-being. This might explain why self-esteem correlates with not only psychological well-being but also emotional well-being. *Self-acceptance*, one of the six characteristics of psychological well-being, encloses acceptance of both strengths and weaknesses (Ryff, 1989), whereas the measure for self-esteem focuses on a positive self-judgement (Rosenberg, 1979). This feeling about oneself therefore matches emotional well-being as well, which is about feelings in general. Moreover, the validation measures of *Need to Evaluate* and *Need for Cognition* represent only small aspects of psychological well-being. Although our results confirm the expected small partial correlations of these measures to psychological well-being, we suggest further research on the convergent validity of the MHC-SF using validation measures that better fit the subscales emotional, psychological and social well-being.

Besides convergent validity, the present study also confirms discriminant validity of the MHC-SF. Of all models tested, the two-continua model with correlated factors showed the best fit. Thus, mental health and mental illness are distinct indicators of mental well-being, instead of two ends of a single continuum. Put simply, the absence of psychopathology does not necessarily imply the presence positive feelings and optimal functioning in both individual and social life. And, conversely, the presence of psychopathology is not sufficient to conclude that this individual experiences a low emotional, psychological, and social well-being.

There are a number of limitations to this study that need to be considered. Because of the large sample size, even weak correlations are statistically significant. To account for this, we applied an alpha of .001 instead of the common .05 as a margin of significance in the validation analyses. Furthermore, we examined partial correlations to evaluate whether each correlation remained significant when controlling for the other MHC-SF subscales. Although the pattern of partial correlations confirms our expectations, we recognize that the magnitude of most correlations is low. On the other hand, validation measures were only representative for aspects of the subscale, resulting in low correlations. For further validation of the MHC-SF, we suggest using long and broad questionnaires of well-being, such as the WHOQOL-100 (WHOQOL Group, 1998).

Although there are several limitations, the findings are comparable to earlier findings in South Africa (Keyes et al., 2008), even though different sampling and interviewing procedures as well as different validation instruments were used. Furthermore, the findings on the two-continua model mirror earlier research in the United States using different, and much longer, instruments to measure mental health and illness (Keyes, 2005). In conclusion, the MHC-SF is a useful, brief self-report questionnaire for assessment of positive mental health.

The findings have important implications for mental health policy and care. Currently, mental health care focuses mainly on psychopathology in diagnostics as well as in treatment. However, with mental health and mental illness being two distinct indicators of mental health, it may be beneficial to focus also on promotion of positive mental health. As Keyes (2007) stated, focusing public health efforts solely on mental illness will not necessarily result in a mentally healthier population. Examples of mental health promotion in health care are well-being therapy (Fava, Rafanelli, Cazzaro, Conti, & Grandi, 1998) and Acceptance and Commitment Therapy (Hayes, Luoma, Bond, Masuda & Lillis, 2006), both psychotherapeutic approaches for increasing well-being. To gain insight in the usefulness and additional value of the MHC-SF in mental health care, we suggest further research on its psychometric properties in patient populations and on the effects of treatment in mental health care on positive mental health.

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# Chapter 3

## Longitudinal evaluation of the Mental Health Continuum-Short Form (MHC-SF): Measurement invariance across demographics, physical illness, and mental illness

Lamers, S. M. A., Glas, C. A. W., Westerhof, G. J., & Bohlmeijer, E. T. (2012, online first). Longitudinal evaluation of the Mental Health Continuum-Short Form (MHC-SF): Measurement invariance across demographics, physical illness and mental illness. *European Journal of Psychological Assessment*, doi: 10.1027/1015-5759/a000109

## **Abstract**

This study evaluated the measurement invariance of the Mental Health Continuum-Short Form (MHC-SF), a 14-item self-report questionnaire for measuring emotional, social, and psychological well-being. The study draws on data of a representative panel (Longitudinal Internet Studies for the Social Sciences of CentERdata). 1,932 Dutch adults filled out the MHC-SF at four timepoints over 9 months. We used item response theory analyses with two-parameter models to examine differential item functioning across demographics, health indicators, and timepoints. The results indicated differences in the performance of one item (social well-being) for educational level, one item (social well-being) for sex, and two items (psychological well-being) for age. The MHC-SF is highly reliable over time, as there was no differential item functioning across the four timepoints. Furthermore, the means and reliabilities of the subscales were consistent over time. The MHC-SF is a reliable and valid instrument to measure positive aspects of mental health.

## Introduction

There is an increasing interest in the promotion of mental health in addition to the treatment of mental illness. Recent studies show that mental health is more than the absence of undesirable states such as anxiety, but also includes the presence of well-being (Keyes, 2002; Westerhof & Keyes, 2009). Hence, proper and well-validated questionnaires are important for assessing well-being in addition to psychopathology. In this paper, we evaluate the measurement invariance of a questionnaire for well-being assessment: the Mental Health Continuum-Short Form (MHC-SF).

Keyes (2002) argues that positive mental health includes emotional, psychological, and social well-being. These aspects fit the WHO definition of positive mental health, which distinguishes between feelings of well-being, effective private functioning, and effective social functioning (World Health Organization, 2005). The MHC-SF measures self-ratings of these three components as well as overall levels of positive mental health.

The roots of emotional, psychological, and social wellbeing lie in two long-standing traditions in well-being research: The hedonic tradition describes well-being as pleasure attainment, while the eudaimonic tradition considers well-being as functioning well and realizing one's potentials (Deci & Ryan, 2008); emotional well-being corresponds to the hedonic tradition and focuses on feelings of pleasure, happiness, and life satisfaction (Diener, Suh, Lucas, & Smith, 1999). The model of psychological well-being developed by Ryff (1989) reflects the individual aspects of the eudaimonic tradition, focusing on optimal functioning in private life (Table 1). Social well-being reflects the public aspects of the eudaimonic tradition, focusing on optimal functioning in a community in terms of social engagement (Keyes, 1998; Table 1).

Several instruments for assessing emotional, psychological, and social well-being were combined in a 40-item form of the Mental Health Continuum (Keyes, 2002). Although these instruments have been well-validated (Gallagher, Lopez, & Preacher, 2009; Keyes, 1998; Ryff, 1989), there is need for a well-being questionnaire with fewer items. Existing questionnaires are rather long (e.g., WHOQOL- 100; WHOQOL Group, 1998), do not measure social well-being (e.g., CASP-19; Hyde, Wiggins, Higgs, & Blane, 2003), or include items on psychopathology (e.g., GHQ; Hu, Stewart-Brown, Twigg, & Weich, 2007). A brief questionnaire fully covering all three dimensions of mental health was lacking, which led to the development of the MHC-SF.

The MHC-SF consists of 14 items, each representing one theory-based dimension of well-being (Table 1). For each dimension, the most prototypical item of the long form of the Mental Health Continuum was chosen. The MHC-SF is thus a short questionnaire with a wide research body. Some items were reformulated to adapt to a uniform response

format on the frequency of symptoms. This format closely matches widespread instruments such as the WHO Composite International Diagnostic Interview Short-Form (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998) and the Patient Health Questionnaire (Kroenke & Spitzer, 2002), and allows for a categorical as well as a continuous assessment of positive mental health. These advantages make the MHC-SF highly suitable for population studies. The MHC-SF has revealed a three-factor structure of emotional, psychological, and social well-being with high reliability and validity in South Africa (Keyes et al., 2008), the Netherlands (Lamers, Westerhof, Bohlmeijer, ten Klooster & Keyes, 2011), and the United States (Keyes, Eisenberg, Dhingra, Perry, & Dube, 2011).

Table 1.  
*Subscales, Dimensions, and Items of the MHC-SF*

Dimension	Item
During the past month, how often did you feel...	
<i>Emotional well-being</i>	
Positive affect	1. happy
Positive affect*	2. interested in life
Life satisfaction	3. satisfied
<i>Social well-being</i>	
Social contribution	4. that you had something important to contribute to society
Social integration	5. that you belonged to a community (like a social group, or your neighborhood)
Social actualization	6. that our society is becoming a better place for people like you
Social acceptance	7. that people are basically good
Social coherence	8. that the way our society works makes sense to you
<i>Psychological well-being</i>	
Self-acceptance	9. that you liked most parts of your personality
Environmental mastery	10. good at managing the responsibilities of your daily life
Positive relations with others	11. that you had warm and trusting relationships with others
Personal growth	12. that you had experiences that challenged you to grow and become a better person
Autonomy	13. confident to think or express your own ideas and opinions
Purpose in life	14. that your life has a sense of direction or meaning to it

*Note.* \*The dimension positive affect consists of two items to facilitate statistical analysis of the subscale emotional well-being

The present study expands the previous evaluations of the MHC-SF in several ways. It assesses measurement invariance by examining whether items are subject to differential item functioning (DIF), which is the dependence of item functioning on factors irrelevant to the construct such as demographics and time. All analyses are carried out using item response theory (IRT) analyses. First, we evaluated whether functioning of the MHC-SF items differs across the demographics age, sex, marital status, migratory status, and educational level as well as across health indicators (physical diseases and psychopathology). Second, the stability of the functioning of the items over time was evaluated, as were the stability of the means, standard deviations, and reliabilities of the subscales.

## Method

### Participants

A representative sample of 1,932 Dutch respondents between the ages of 18 and 88 participated by filling out questionnaires at one or more timepoints. The sample was stratified by sex, age group (18-29; 30-49; 50-64; 65+), and whether native Dutch or not. Of the respondents, 20.7% were 18-29 years old, 29.2% were 30-49 years old, 26.3% were 50-64 years old, and 23.8% were 65+. About half of the respondents were male (49.4%) and married (52.7%). The majority was native Dutch (81.7%). 36.5% of the respondents had a low, 33.7% a moderate, and 29.8% a high educational level. Physical diseases were present in 45.8%. Psychopathology was low in 38.7%, moderate in 20.7%, and high in 40.6% of the respondents.

### Procedures

This paper draws on data from the LISS panel of CentERdata, a representative internet panel for longitudinal internet studies in the social sciences. The panel consists of 5,000 households that were randomly selected from the municipal registers in the Netherlands. In one-third of the households, one member was selected to fill out a module on mental health in December 2007 (t0), and March (t1), June (t2) and September 2008 (t3). In total, 1,932 respondents filled out this module at one or more measurement occasions (1,662 at t0; 1,675 at t1; 1,243 at t2; 1,466 at t3). Half of the respondents (50.8%) filled out all four modules. Respondents who completed all measurements did not differ on sex, marital status, migratory status, educational level, physical diseases, and psychopathology ( $p > .05$ ), but they were older than respondents who did not complete four measurements ( $\chi^2(3) = 13.67; p < .05$ ). The module on mental health consisted of the MHC-SF, the Brief

Symptom Inventory, and questions on age, sex, marital status, and educational level ( $N = 1,932$ ). To gather additional information, we used modules developed by the LISS panel on religion and ethnicity ( $N = 1,837$ ; 95.1%) and on health ( $N = 1,660$ ; 85.9%).

## Measures

The MHC-SF (Keyes et al., 2008; Table 1) consists of 14 items covering the three subscales emotional well-being (3 items), social well-being (5 items), and psychological well-being (6 items) of positive mental health. Each item represents a feeling of well-being, of which the frequency in the last month is rated (0 = *never* to 5 = *every day*). The Dutch MHC-SF showed good reliability and validity (Lamers et al., 2011).

The Brief Symptom Inventory (BSI; de Beurs, 2009) was used to assess psychopathology with 53 items. Respondents rated the degree to which they experienced these symptoms in the past week (0 = *not at all* to 4 = *a lot*). We divided the sample into low, moderate, or high on psychopathology, based on standard data in the general Dutch population, using separate standards for males and females.

In the Module on Religion and Ethnicity, questions were asked on the migratory status of the respondents and their parents. Respondents were categorized as nonnative Dutch if they had been born abroad or if at least one parent had been born abroad. In the Module on Health, respondents filled out a checklist of 18 diseases (e.g., diabetes, asthma). The response was classified as *yes* when at least one of the diseases was applicable, and as *no* when none of them was applicable to the respondent.

## Statistical Analysis

We used the software MIRT (available from [www.utwente.nl/gw/omd/afdeling/Glas](http://www.utwente.nl/gw/omd/afdeling/Glas)). The IRT model used is the generalized partial credit model (Muraki, 1992). The model pertains to polytomously scored items, such as the items of the MHC-SF. It is a latent regression model for the probability of a respondent scoring in a response category of an item, modeled as a function of a latent variable. The latent variable is an underlying scale, which is inferred from the observed item responses. The model is closely related to factor analysis, but it is better suited for the DIF analyses reported here. Following the three-factor structure reported above, the subscales emotional, social, and psychological well-being were treated as separate latent variables. The scales consisted of 3, 5, and 6 items, respectively. The number of items may seem small, but each item had six distinct score points (and consequently five item parameters), so the observed subscale scores range

from 0 to 15 for emotional well-being, from 0 to 25 for social well-being, and from 0 to 30 for psychological well-being.

We evaluated the presence of DIF across demographics, health indicators, and measurement occasions in the 14 MHC-SF items. Items showed DIF if the probability of responding in a category of an item differs across groups with the same level of well-being. The presence of DIF was evaluated with a methodology based on the observed and expected response frequencies in different groups and at different timepoints (Glas, 1998, 1999; te Marvelde, Glas, van Landegem, & van Damme, 2006). In this approach, the expected response frequencies are estimated under the null hypothesis of no DIF. This expectation is compared to the actual item responses in the different groups and at different timepoints (using a so-called Lagrange multiplier statistic, Glas, 1999), and if these item response frequencies are far from the expected frequency, it is concluded that DIF is present. In this approach, the item parameters were estimated using a marginal maximum likelihood (MML) procedure. The expected scores were estimated using equal parameters across groups (e.g., males and females). The average difference of these expected scores and the observed score in each group indicated the effect size of DIF (ES), which ranged from 0 to 5. We evaluated whether the DIF effect size was significant ( $p < .05$ ) and considered significant effect sizes  $> 0.15$  indicative of DIF. This is analog to the effect size used by Weisscher, Glas, Vermeulen, and de Haan (2010). The dependency between the repeated measures was taken into account by assuming that the respondents' well-being parameters were samples from a multivariate normal distribution where every dimension is related to a measurement occasion. MML estimates and DIF statistics were computed per subscale. First, we evaluated the item functioning at baseline across demographics and health indicators for the subscales emotional, social, and psychological well-being. For items showing DIF at baseline, we also evaluated the functioning of these items at the other three measurement occasions. Second, we investigated stability of the MHC-SF over time by examining DIF across the four measurement occasions, and the means, standard deviations, reliabilities of the subscales over time.

## Results

### DIF over Demographics and Health Indicators

Results indicated the presence of DIF in only 4 of the 14 items. Of the seven demographics and health indicators, DIF was found across sex (item 8 of social well-being), age (items 10 and 12 of psychological well-being), and educational level (item 5 of social well-being). The seven demographic and health indicators were not related to differences in functioning in

the 3 items of emotional well-being (maximum ES = .06). Below, we discuss the DIF across sex, age, and educational level, respectively.

Only one item showed DIF across sex: On item 8 (social coherence) the observed average scores for males and females were 2.64 and 2.17, respectively. However, the two expected averages evaluated using the MML-estimated model parameters were 2.40 and 2.41, respectively. So, at baseline, males scored higher and females lower than expected (ES = .24; LM = 90.2;  $p < .01$ ). Females scored lower than males, conditioning on the level of social well-being, so the level of social coherence for females is underestimated. Furthermore, the sex-based DIF in item 8 was not only present at baseline, but remained stable over time (ES  $t_1$  = .27;  $t_2$  = .20;  $t_3$  = .17). At each measurement occasion, the observed scores were higher for males and lower for females than the estimated scores. The presence and direction of the DIF were remarkably constant over time.

Across the four age groups, we found DIF in 2 items of the subscale psychological well-being. The average observed scores on item 10 (environmental mastery) were lower than expected for the age group 18 to 29 (ES = -.27; LM = 58.4;  $p < .01$ ) and in the age group 30 to 49 (ES = -.10; LM = 14.2;  $p < .01$ ). The age group 50 to 64 (ES = .13; LM = 25.8;  $p < .01$ ) and the age group 65+ (ES = .24; LM = 52.2;  $p < .01$ ) showed DIF on item 10 in the opposite direction, with higher average observed scores than estimated. The age-based differential functioning of item 10 was consistent at the four timepoints with similar effect sizes and direction within each age group.

Age-based DIF was also present in item 12 (personal growth), but in the opposite direction than in item 10 (environmental mastery). The average observed scores were higher than estimated in the age group 18 to 29 (ES = .47; LM = 75.2;  $p < .01$ ) and in the age group 30 to 49 (ES = .24; LM = 40.1;  $p < .01$ ), but lower than estimated in both older age groups (50–64 years: ES = -.20; LM = 18.88;  $p < .01$ ; 65+ years: ES = -.52; LM = 83.1;  $p < .01$ ). These results were also remarkably consistent over time. The age-based DIF in item 12 was present at the four timepoints, with similar effect sizes and direction within each age group.

Using the same methodology, we found DIF (ES = .16; LM = 39.9;  $p < .01$ ) across educational levels in item 5 (social integration). The observed average score on this item was lower than estimated for lower educated individuals and higher than estimated for higher educated individuals. Moderately educated adults scored as expected. These results were replicated at each measurement occasion.

In addition, marital status (ES = .19), educational level (ES = .16), and psychopathology (ES = .16) showed DIF in item 12 (personal growth). As described above, item 12 also showed DIF across age. Since married adults, lower educated adults, and adults experiencing less psychopathology scored lower than estimated, and since older

adults were more often married ( $\chi^2(3) = 315.67; p < .01$ ), had lower educational levels ( $\chi^2(6) = 264.27; p < .01$ ), and less psychopathology ( $\chi^2(6) = 17.03; p < .01$ ), these DIF results were related to age differences. All MHC-SF items functioned similarly across migratory status and physical diseases.

### **Impact of DIF**

Table 2 shows the item parameters (category bounds estimates) with standard errors for the MHC-SF items. As discussed above, the presence of DIF showed that item parameters were different across males and females (item 8, social coherence), across age (item 10, environmental mastery; item 12, personal growth), and across low or high educational levels (item 5, social integration). Equal parameters across these groups led to large differences ( $> .15$ ) in the observed and expected scores. Therefore, these items were given group-specific parameters. For example, in item 8 the item parameters for the males and females were no longer constrained to be equal. After taking the DIF into account, the effect size of the other items of the subscale also decreased. This did not only hold for baseline, but also for the other three timepoints. This indicates that by adjusting the scales for DIF we can make comparisons such that observed scores do not reflect DIF. As a result, measures are now comparable across groups despite the presence of DIF.

In addition, we examined the impact of the DIF on the latent scale of social and psychological well-being by comparing the subscale means before and after applying group-specific item parameters on the items 5, 8, 10, and 12. For example, we compared the means and 95% confidence interval (CI) on the subscale social well-being before and after applying education-specific item parameters to item 5. For low-educated adults the mean was  $-.11$  (CI  $-.19$  to  $-.02$ ) before and  $-.03$  (CI  $-.11$  to  $.05$ ) after using separate item parameters in each educational level. Since the confidence intervals showed overlap, the impact of the DIF on the mean social well-being is minimal. Applying this methodology on item 8 (sex-specific item parameters on social well-being) and items 10 and 12 (age-specific item parameters on psychological well-being) revealed similar results. The confidence intervals overlapped, showing that conclusions from statistical tests would not change. This indicates that the DIF across education, sex, and age had no significant impact on the subscale means of social and psychological well-being.

Table 2.

*Item Parameters (Category Bounds Estimates) with Standard Errors, Including Education-specific (Item 5), Gender-specific (Item 8) and Age-specific (Item 10 and 12) Item Parameters*

Item	$\alpha$ (SE)	$\beta_1$ (SE)	$\beta_2$ (SE)	$\beta_3$ (SE)	$\beta_4$ (SE)	$\beta_5$ (SE)
<i>Emotional well-being</i>						
1	1.96 (.16)	-4.73 (.03)	-2.94 (.13)	-2.33 (.28)	-.54 (.43)	2.56 (.51)
2	1.87 (.13)	-4.79 (.46)	-3.46 (.02)	-2.77 (.12)	-1.57 (.21)	1.04 (.33)
3	1.96 (.14)	-5.25 (.43)	-4.11 (.47)	-2.92 (.02)	-1.28 (.20)	1.84 (.35)
<i>Social well-being</i>						
4	.71 (.06)	-1.12 (.00)	-.45 (.02)	-.52 (.03)	.48 (.03)	1.43 (.04)
5 Low edu <sup>1</sup>	.50 (.06)	.07 (.06)	-.04 (.00)	-.50 (.03)	.07 (.03)	.56 (.03)
5 Medium edu <sup>1</sup>	.50 (.07)	-.25 (.01)	-.55 (.02)	-.46 (.02)	-.02 (.03)	1.06 (.04)
5 High edu <sup>1</sup>	.52 (.07)	-.27 (.00)	-.08 (.04)	-.80 (.05)	-.35 (.05)	.97 (.06)
6	1.05 (.08)	-.09 (.04)	.28 (.05)	.74 (.01)	2.48 (.01)	3.10 (.02)
7	.84 (.07)	-1.54 (.04)	-.56 (.09)	-.43 (.23)	.54 (.00)	2.13 (.02)
8 Males	.58 (.06)	-.94 (.03)	-.48 (.04)	-.61 (.04)	.30 (.06)	1.49 (.00)
8 Females	.64 (.06)	-.66 (.03)	-.05 (.05)	-.14 (.05)	.59 (.06)	2.06 (.07)
<i>Psychological well-being</i>						
9	1.00 (.07)	-1.74 (.01)	-.75 (.03)	-.75 (.04)	.30 (.06)	2.43 (.08)
10 Age 18-29	.79 (.12)	-1.74 (.11)	-1.69 (.01)	-.89 (.38)	-.31 (.38)	1.57 (.41)
10 Age 30-49	.54 (.06)	-.64 (.01)	-.26 (.03)	-.34 (.06)	.63 (.09)	1.46 (.11)
10 Age 50-64	.48 (.05)	.22 (.14)	-.09 (.00)	.01 (.04)	.62 (.04)	1.31 (.05)
10 Age 65+	.37 (.06)	.47 (.07)	.17 (.12)	.05 (.00)	.51 (.03)	2.05 (.03)
11	.92 (.07)	-2.63 (.42)	-1.33 (.42)	-1.10 (.00)	-.39 (.06)	1.03 (.08)
12 Age 18-29	.66 (.09)	-.92 (.10)	-.28 (.12)	-.61 (.14)	.58 (.01)	1.55 (.07)
12 Age 30-49	.97 (.10)	-2.39 (.04)	-1.36 (.06)	-1.36 (.11)	-.55 (.00)	1.38 (.03)
12 Age 50-64	1.16 (.15)	-3.11 (.03)	-1.78 (.04)	-1.67 (.05)	-1.19 (.24)	1.20 (.01)
12 Age 65+	1.26 (.20)	-2.30 (.20)	-2.60 (.26)	-1.83 (.32)	-1.28 (.35)	.94 (.36)
13	1.06 (.08)	-1.97 (.08)	-.98 (.08)	-.80 (.10)	.36 (.16)	2.02 (.01)
14	1.09 (.08)	-1.76 (.04)	-.90 (.06)	-.98 (.08)	-.30 (.10)	1.34 (.13)

*Notes.*  $\alpha$ =discrimination parameter;  $\beta$ =difficulty parameter; SE=standard error; <sup>1</sup>edu=educational level.

## **DIF over Time**

In the next analyses we examined DIF across timepoints, to investigate the similarity of the item parameters over time. In order to take the DIF across demographics into account, we used education-specific parameters for item 5 (social integration), sex-specific item parameters for item 8 (social coherence) as well as age-specific item parameters for the items 10 (environmental mastery) and 12 (personal growth). Results revealed that all time-based effect sizes were low (maximum ES emotional well-being = .02; social well-being = .05; psychological well-being = .08), indicating that the items functioned similarly across the four timepoints. This absence of time-based DIF supports the stability of the MHC-SF over time.

In addition, we investigated the means, standard deviations, and reliability of the three subscales at the four timepoints, when applying group-specific item parameters for items 5, 8, 10, and 12. Within each subscale the means and standard deviations at timepoint 3 functioned as reference and were set to 0 and 1, respectively. The means and standard deviations remained stable over time. For example, the means for emotional well-being were .08 (t3-t0), .09 (t3-t1) and -.04 (t3-t2), with standard deviations of 1.00 (t3-t0), 1.08 (t3-t1), and 1.04 (t3-t2). The means and standard deviations of social and psychological well-being revealed similar results. Moreover, the reliabilities of the subscales were high for emotional and psychological wellbeing (> .80) and acceptable for social well-being (> .70). Once again, these results underline the stability of the MHC-SF items and subscales.

## **Discussion**

In this study, we evaluated the measurement invariance of the Mental Health Continuum-Short Form across the demographics age, sex, marital status, migratory status, and educational level, across the health indicators physical diseases and psychopathology, and across four timepoints in 9 months. Only four items of the MHC-SF show differential functioning, each across one of the seven demographics and health indicators. The presence of DIF indicates different probabilities of responding in a category of an item across groups with the same level of well-being. Therefore, DIF does not show differences in actual levels of well-being, but shows that items function differently across groups. Since the remaining 10 items functioned equally across all demographics and health indicators, these items have similar meanings for most individuals. Moreover, the four items with DIF across education, sex, and age have no significant impact on the subscale means of social and psychological well-being, as the means show no significant differences before and after adjusting for DIF.

The results showed that the MHC-SF is remarkably stable over time. The item parameters of the 14 items are equal across measurement occasions since time-based DIF was absent. Moreover, the means and standard deviations of the subscales emotional, social, and psychological well-being are consistent over time. Also the reliabilities, varying from moderate (social well-being) to high (emotional and psychological well-being), are stable over the four timepoints. Together, these findings provide strong support for the longitudinal stability of the MHC-SF. From the perspective of construct validity, it is impressive that even the results of DIF were stable over time.

Clearly, many forms of DIF can be distinguished. An important distinction is between uniform DIF, which results in uniformly augmented item scores across the latent continuum for one of the subgroups, and nonuniform DIF, which pertains to local differences in response probabilities (Mellenbergh, 1995). These concepts are closely related to global and net DIF (Penfield, 2010). The methods used here target uniform and global DIF, because these effects are the most serious threats to the validity of a test score. Nonuniform and net DIF pertain to interaction with the latent trait and response categories of polytomously scored items. They may be theoretically highly interesting, but lie beyond the scope of this article.

As mentioned, males scored higher and females lower than expected on social coherence. Lower educated adults scored lower and higher educated adults higher than expected on social integration. Older adults reported more environmental mastery and less personal growth than expected, compared to younger adults. Although our study shows that these differences in item functioning do not impact the subscale means, other studies found sex, educational, and age differences in the subscale means (Keyes, 1998; Ryff, 1989). None of these studies applied IRT to the longer scales on positive mental health. Our results indicate that the interpretation of some items differs across sex, educational level, and age. For example, when individuals of different ages have different life goals and competences in mind (Dittmann-Kohli & Westerhof, 2000), it is likely that the interpretation of such questions also differs across age groups. However, when group-specific item parameters are used, the DIF was modeled and scores became comparable. Moreover, the impact on subscale level was limited. Additional research is needed to investigate why the items function differently across sex, educational level, or age.

There are some limitations to this study. First, the age differences could be generational instead of developmental. Longitudinal research is necessary with follow-ups after several years, which would also create the opportunity to evaluate the stability of the MHC-SF over a long period of time. Second, our sample included adults of the general population. Since we found no differences in item functioning across migration status or across health indicators, we expect the MHC-SF items to function similarly in other

cultures or diseased populations. However, we recommend future research to validate these assumptions. Additionally, the respondents that completed all four measurements (50.8%) might be a selective sample of stable adults who differ from respondents who did not complete all four measurements. However, they were similar on the demographic and health variables measured in this study, except that they were somewhat older.

In conclusion, the findings of DIF for two social well-being items and two psychological well-being items indicate that the assessment of positive mental health is potentially biased across education, sex, and age. When investigating educational, sex, or age differences in positive mental health, differences in the functioning of these items could be taken into account by applying group-specific item parameters to these items. However, the effect sizes were relatively low, and the differences between the means of social and psychological well-being before and after applying group-specific parameters were insignificant. This indicates satisfactory construct validity for emotional, social, and psychological well-being. Moreover, 10 of the 14 MHC-SF items show no differences in functioning across all measured demographics and health indicators. Adding the remarkable stability of the items and subscales over time, the MHC-SF is a highly reliable questionnaire for positive mental health assessment.

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# Chapter 4

## Mental health and illness in relation to physical health across the lifespan

Lamers, S. M. A., Westerhof, G. J., Bohlmeijer, E. T., & Keyes, C. L. M. (in press). Mental health and illness in relation to physical health across the lifespan. In J. Sinnott (Ed.), *Positive Psychology: Optimizing Adulthood*. New York: Springer.

## **Abstract**

This study addresses mental health as more than the absence of disease, approaching it also from a positive perspective as the presence of well-being across the lifespan. We investigated the association of age with psychopathology and positive mental health (i.e., emotional, psychological, and social well-being), controlling for potential confounding effects of physical health. The study draws on data of the representative LISS panel ( $N=1,506$ ) covering the adult lifespan (ages 18-87). Positive mental health, psychopathology and physical health were measured. Older adults experienced both lower psychopathology and lower positive mental health, which remained after controlling for positive mental health or psychopathology respectively, demographics, and physical health. Demographics and physical health were more strongly associated with psychopathology than with positive mental health. Mental health and psychopathology were related, but showed distinct patterns across the lifespan. This emphasizes the importance of assessing both psychopathology and positive mental health when investigating age in relation to mental health.

## Introduction

The present study examines mental health differences across the adult lifespan from a positive perspective 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, 2005a). 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, Westerhof, Bohlmeijer, ten Klooster, & Keyes, 2011), which partly have independent genetic propensities (Kendler, Myers, Maes, & Keyes, 2011). Moreover, poor positive mental health as well as decreases in positive mental health are predictive of future mental disorders (Keyes, Dhingra, & Simoes, 2010; Wood & Joseph, 2009). To examine mental health across the lifespan, assessment should not only address age differences in psychopathology but also in positive mental health.

### **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, Ravelli & van Zessen, 1998; Kessler, Mickelson, Walters, Zhao, & Hamilton, 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, Copeland, & Prince, 1999) and more common among older than younger adults (Newman & 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 (Mirowski & Ross, 1999). Since psychopathology and positive mental health belong to two continua, the World Health Organisation (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 & Ryan, 2008; Waterman 1993). Emotional well-being, corresponding to the hedonic tradition, includes the presence of feelings of happiness and life satisfaction (Diener, Suh, Lucas, & Smith, 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 & 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, 2005a), 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 & Kolarz, 1998), found no relation of age to positive affect (e.g., Vaux & Meddin, 1987), or found no unique effects of age after controlling for demographics, personality, health, and cognitive functioning (e.g., Isaacowitz & 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 & Keyes, 1995). Studies on social well-being (Keyes, 1998; Keyes & 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 & 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 & Westerhof, 2011) and a previous study in the Dutch population (Westerhof & Keyes, 2009) 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, 1998). Older adults report more functional limitations (House, Kessler, & Herzog, 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 & Pakkala, 2001) and subjective health (Beekman, Penninx, Deeg, Ormel, Braam, & van Tilburg, 1997). Positive well-being is related to physical health (Lyubomirsky, King, & Diener, 2005), and has a salutary impact on physical health (Howell, Kern and Lyubomirsky, 2007; Lamers, Bolier, Westerhof, Smit, & Bohlmeijer, 2011, online first). 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 the aging paradox (Staudinger, Freund, Linden, & Maas, 1999; Westerhof, Dittmann-Kohli, & Bode, 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, Fung, & Charles, 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 (Steuerink, Westerhof, Bode & Dittmann-Kohli, 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 (Brandtstädter & 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, Little, & Smith, 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 among 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, Cavalli, & Girardin, 2008).

Our study aim 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 & Westerhof, 2011; Westerhof & Keyes, 2009). 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 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 non-western and first generation immigrants (Knoef & 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 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 three 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 & Zitman, 2006), which is among the most commonly used instruments for screening and assessing psychopathology in mental health services in the United States. 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 fourteen 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, Glas, Westerhof, & Bohlmeijer, in press). 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 .83 for emotional and psychological well-being, .74 for social well-being, and .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 .01 instead of the common .05, because of the large sample size.

## Results

Table 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 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 <sup>1</sup>	.36**	.28**	-.17**	-.14**	-.06*	.05	-.15**	-.01
Age-squared <sup>1</sup>	.09**	.11**	.01	.05	.02	.05	.01	.00
1. Physical diseases	-							
2. Functional limitations	.43**	-						
3. Subjective health	-.41**	-.41**	-					
4. Psychopathology	.18**	.25**	-.29**	-				
5. Positive mental health	-.06	-.10**	.21**	-.33**	-			
6. Emotional well-being	-.09**	-.13**	.24**	-.47**	.74**	-		
7. Psychological well-being	-.07*	-.11**	.19**	-.27**	.92**	.60**	-	
8. Social well-being	-.01	-.03	.13**	-.18**	.86**	.47**	.64**	-

<sup>1</sup> Age and age-squared are controlled for each other in partial correlations

\*  $p < .01$  \*\*  $p < .001$

Table 2 presents the findings of the regression analysis on psychopathology and Table 3 on overall positive mental health. With regard to our first research question 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.

Table 2.

*Hierarchical Regression Analysis of Age and Age-squared in Relation to Psychopathology, Controlling for Positive mental health, Demographics and Physical Health*

Model	Psychopathology					
	$\beta$		$\beta$		$\beta$	
<i>Mental health</i>						
Positive mental health	-.32	**	-.33	**	-.28	**
<i>Demographics</i>						
Gender (high = female)	.07	*	.06		.03	
Marital status (high = married)	-.13	**	-.06		-.05	
Education	-.09	**	-.12	**	-.07	*
Income	-.07	*	-.09	**	-.08	**
Migration status (high = non-native)	.11	**	.10	**	.09	**
<i>Age</i>						
Age			-.17	**	-.27	**
Age-squared			.02		.00	
<i>Physical health</i>						
Physical diseases					.11	**
Functional limitations					.16	**
Subjective health					-.15	**
Adjusted R <sup>2</sup>	.15	**	.17	**	.26	**

\*  $p < .01$ ; \*\*  $p < .001$

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 the 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 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					
	$\beta$		$\beta$		$\beta$	
<i>Mental health</i>						
Psychopathology	-0.34	**	-0.35	*	-0.33	**
<i>Demographics</i>						
Gender (high = female)	.05		.04		.04	
Marital status (high = married)	-.06		-.02		-.02	
Education	.03		.01		-.00	
Income	-.01		-.02		-.01	
Migration status (high = non-native)	.02		.02		.02	
<i>Age</i>						
Age			-.11	**	-.12	**
Age-squared			.03		.02	
<i>Physical health</i>						
Physical diseases					.08	*
Functional limitations					.03	
Subjective health					.14	**
Adjusted R <sup>2</sup>	.11	**	.12	**	.13	**

\*  $p < .01$ ; \*\*  $p < .001$

Table 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.

Table 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*

	Emotional well-being		Psychological well-being		Social well-being	
Model	β		β		β	
<i>Mental health</i>						
Psychopathology	-.46	**	-.29	**	-.18	**
<i>Demographics</i>						
Gender (high = female)	.06		.05		.00	
Marital status (high = married)	.11	**	-.05		-.05	
Education	-.06		.01		.02	
Income	-.03		-.01		-.01	
Migration status (high = non-native)	-.03		.02		.03	
<i>Age</i>						
Age	-.07		-.18	**	-.03	
Age-squared	.10	**	-.00		-.02	
<i>Physical health</i>						
Physical diseases	.03		.09	*	.06	
Functional limitations	.02		.02		.05	
Subjective health	.14	**	.12	**	.11	**
Adjusted R <sup>2</sup>	.26	**	.12	**	.04	**

\*  $p < .01$ ; \*\*  $p < .001$

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 ( $F(12, 1459) = 12.30$ ;  $p < .01$ ). 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 to 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 perspective as well as from 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.

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. Last, 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 strong 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 (Joshi & 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 socio-demographics 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 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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# Chapter 5

Differential relationships in the association  
of the Big Five personality traits with  
positive mental health and psychopathology

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## **Abstract**

According to the two continua model of mental health, psychopathology and positive mental health (emotional, psychological, and social well-being) are related but distinct continua. This study investigates the two continua model by examining whether psychopathology and positive mental health show differential associations with the Big Five personality traits. This paper draws on data of the representative LISS panel (CentERdata). Participants ( $N=1,161$ ; age 18 to 88) filled out questionnaires on personality, psychopathology, and positive mental health. Personality traits were differentially related to psychopathology and positive mental health, supporting the independence of both continua. The intrapersonal trait emotional stability (reversed neuroticism) is the main correlate of psychopathology, whereas the interpersonal personality traits extraversion and agreeableness are uniquely associated with positive mental health.

## Introduction

Mental health is not only defined as the absence of psychopathological symptoms, but also as the presence of feelings of well-being. Both perspectives were traditionally seen as opposites, with high levels of psychopathology automatically indicating a poor positive mental health, but recent views on mental health emphasize that the two perspectives are complementary (Keyes, 2002). According to the two continua model of mental health, psychopathology and positive mental health are related but distinct dimensions (Keyes, 2002, 2005; Westerhof & Keyes, 2010). Individuals experiencing psychopathological symptoms may experience a poor positive mental health, but may also experience high levels of well-being. The two continua of psychopathology and mental health are validated in several studies, including some with confirmatory factor analyses (Greenspoon & Saklofske, 2001; Keyes, Wissing, Potgieter, Temane, Kruger, & Van Rooy, 2008; Lamers, Westerhof, Bohlmeijer, Ten Klooster, & Keyes, 2011; Suldo & Shaffer, 2008), and are even found at the genetic level (Kendler, Myers, Maes, & Keyes, 2011). Furthermore, psychopathology and positive mental health show differential associations with, for example, health care consumption and work performance (Keyes & Grzywacs, 2005).

To date, several meta-analyses have emphasized the importance of personality traits in understanding individual differences in psychopathology (Kotov, Gamez, Schmidt, & Watson, 2010; Malouff, Thorsteinsson, & Schutte, 2005) and well-being (DeNeve & Cooper, 1998; Steel, Schmidt, & Schultz, 2008). However, with psychopathology and positive mental health reflecting two distinct dimensions of mental health, the question emerges whether the Big Five personality traits (Goldberg, 1990; McCrae & Costa, 1987) are differentially related to both mental health dimensions. Which personality traits are related to individual differences in psychopathology, and which traits to positive mental health? In this study, we investigated the two continua model by directly comparing the unique association of the Big Five personality traits with psychopathology, i.e., controlling for levels of positive mental health, to the unique association of the personality traits with positive mental health including multiple dimensions of well-being, controlling for levels of psychopathology. The study uses a large sample covering the adult lifespan.

### Positive mental health

Current research on positive mental health follows two traditions: the hedonic and the eudaimonic tradition. The hedonic tradition pertains to happiness and defines well-being in terms of pleasure attainment and pain avoidance, whereas the eudaimonic tradition focuses on meaning and self-realization and defines well-being in terms of the degree to which a person is optimally functioning (Ryan & Deci, 2001; Waterman, 1993). In line with

these traditions, three components of well-being can be distinguished. The first component, emotional well-being, includes a balance of positive over negative emotions and the presence of life satisfaction, in accordance with the hedonic tradition in well-being research (Diener, Suh, Lucas, & Smith, 1999). The second component, psychological well-being, follows the eudaimonic tradition in well-being. In this approach, individuals are mentally healthy when they are fully functioning in life, as reflected by their experiencing self-acceptance, personal growth, autonomy, purpose in life, a sense of mastery, and positive relations with important others (Ryff, 1989). The third component, social well-being, also follows the eudaimonic tradition. Since individuals are embedded in social structures and communities, effective functioning can only be fully understood when optimal functioning in community life is included (Keyes, 1998). Social well-being defines individuals as mentally healthy when they experience that they belong and contribute to society, that they understand how society functions, and believe that society evolves in a positive direction (Keyes, 1998).

There is some debate on the distinctiveness of both traditions. Kashdan, Biswas-Diener, and King (2008) recently argued that hedonic and eudaimonic well-being show conceptual as well as empirical overlap. Others have emphasized points of divergence and argued that both perspectives on well-being complement each other (Deci & Ryan, 2008; Waterman, Schwartz, & Conti, 2008). In our view, hedonic and eudaimonic components belong to the same overarching concept. Emotional, psychological, and social well-being together make up the definition of positive mental health. This is in line with the definition of the World Health Organization (2005) which considers an individual mentally healthy when experiencing feelings of well-being (emotional well-being), and when functioning effectively in both private (psychological well-being) and social life (social well-being). However, hedonic well-being is also distinguishable from eudaimonic well-being. Hedonic well-being is mainly focused on emotional functioning, whereas eudaimonic well-being focuses mainly on motivational and social aspects of functioning. Several studies show that both perspectives are indeed complementary (e.g., King, Hicks, Krull, & Del Gaiso, 2006; Peterson, Park, & Seligman, 2005). Confirmatory factor analyses have validated that emotional, psychological, and social well-being are empirically distinct (Gallagher, Lopez, & Preacher, 2009; Keyes et al., 2008; Lamers et al., 2011). Finally, studies revealed that hedonic and eudaimonic well-being show different relations to other psychological phenomena. For example, activities that focus on pleasure and happiness are stronger related to hedonic well-being, whereas more complex activities aimed at achieving personally relevant long-term goals are related to eudaimonic well-being (Delle Fave & Massimini, 2005; Huta, 2005; Vittersø, Oelmann, & Wang, 2009; Waterman, 1993; Waterman et al., 2008). In this study, we examined whether personality traits are

differentially related to emotional (i.e., hedonic well-being) and to psychological and social well-being (i.e., eudaimonic well-being).

### **Mechanisms relating personality traits to mental health**

There is no general model that describes how personality traits may influence levels of mental health. However, several mechanisms have been proposed to explain associations of personality traits with mental health, focusing mainly on neuroticism and extraversion in relation to hedonic components of mental health. The proposed mechanisms include both biological and behavioral pathways.

First, personality and mental health may involve common biological components. Gray's (1990) reinforcement sensitivity theory distinguishes the Behavioral Inhibition System (BIS) and the Behavioral Approach System (BAS), comprised of several brain areas and circuits that are connected to both personality and well-being (Elliot & Thrash, 2002). The BIS is associated with behavioral inhibition and avoidance in the face of danger and conflict, with a primary emotional linkage to anxiety. The BAS regulates positive approach behavior by motivating behavior aimed at achieving goals and obtaining positive emotional rewards. The personality traits neuroticism and extraversion reflect trait-like individual differences in the functioning of the BIS and BAS, whereas negative and positive emotions reflect state-like differences in the BIS and BAS. Although there is some debate on the BIS and BAS, several studies show that neuroticism and psychopathology on the one hand and extraversion and positive mental health on the other share common physiological bases (Smits & Boeck, 2006). For example, neurotransmitters related to the BIS and BAS exhibit important connections to both personality and mental health. Serotonin is associated with both neuroticism and psychopathology, whereas dopamine is related to extraversion and positive affect (e.g., Costa & McCrae, 1992; Depue & Collins, 1999; Lasky-Su, Faraone, Glatt, & Tsuang, 2005).

Besides these biological pathways, personality may facilitate life events and create conditions that promote mental health through behavioral pathways (Ozer & Benet-Martínez, 2006). Neurotic people are more sensitive to negative affect, generally experience more negative life events, which are interpreted in more negative terms, and their negative feelings tend to spill over from one life area to another. This is described as the neurotic cascade (Suls & Martin, 2005). Extraverted people generally experience more positive life events (Magnus, Diener, Fujita, & Pavot, 1993), experience higher levels of positive emotions in social situations (Pavot, Diener, & Fujita, 1990), and engage more in social situations which help to increase their level of positive emotions (Watson, Clark, McIntyre, & Hamaker, 1992).

In sum, neuroticism and extraversion seem to influence the affective components of mental illness and mental health through both biological and behavioral mechanisms. The mechanisms involved in psychopathology differ from those in positive mental health so that the association of personality traits with psychopathology will differ from the association with positive mental health. However, the described mechanisms have been studied mainly for neuroticism and extraversion in relation to psychopathology and hedonic aspects of positive mental health. For other traits (agreeableness, conscientiousness, and openness to experience) mechanisms are largely unknown. For the eudaimonic aspects of positive mental health (psychological and social well-being), Ozer and Benet-Martínez (2006) showed in their review that the five personality traits are related to behavioral functioning, such as personal virtues, positive relationships, and community involvement. These may function as unique behavioral mechanisms between personality traits and eudaimonic well-being. Although mechanisms are not always known, significant relations have been found between all five personality traits and all aspects of mental illness and mental health. We will discuss what is presently known on these relations in the following.

### **Personality traits in relation to mental health**

Earlier studies on the relation of personality traits to mental health mainly examined psychopathology, and in particular negative emotions. These studies showed that neuroticism is strongly associated with the experience of negative emotions (e.g., Costa & McCrae 1980; Emmons & Diener 1985; Pavot, Diener, & Fujita 1990; Steel et al., 2008, provide a meta-analysis). Malouff and colleagues (2005) showed in a meta-analysis that high neuroticism, low conscientiousness, low agreeableness and low extraversion is the typical pattern of personality traits associated with mental disorders. Of the five personality traits, neuroticism is the most consistent and strongest predictor of psychopathology (Kotov et al., 2010).

With respect to the relation of personality traits to mental health, studies have mainly assessed emotional (hedonic) well-being, like positive affect and life satisfaction. Personality traits are strong and consistent predictors of emotional well-being (Diener et al., 1999). In general, extraversion is related to higher levels of emotional well-being, and neuroticism to lower levels (e.g., Argyle & Lu, 1990; Costa & McCrae, 1980; Lu & Snih, 1997; Pavot et al., 1990; Steel et al., 2008). The Big Five personality traits agreeableness, conscientiousness and openness to experience show smaller but positive correlations to emotional well-being (DeNeve & Cooper, 1998; McCrae & Costa, 1991; Steel et al., 2008).

Steel and colleagues (2008) conclude in their meta-analysis that the five personality factors can even account for 39 to 63% of the variance in emotional well-being.

The relation of personality traits to eudaimonic (psychological and social) well-being is less clear. Schmutte and Ryff (1997) found that psychological well-being was negatively related to neuroticism, positively to extraversion, agreeableness and conscientiousness, and not related to openness to experience. Another study showed that personality traits differentiated individuals with various levels of emotional and psychological well-being (Keyes, Shmotkin, & Ryff, 2002). For example, individuals with high psychological and low emotional well-being were distinguished from individuals with low psychological and high emotional well-being by their high levels of openness to experience. Only one study measured overall levels of positive mental health, including emotional, psychological, and social well-being, and showed that neuroticism, extraversion, agreeableness and conscientiousness, but not openness to experience, discriminated among low, moderate and high levels of positive mental health (Joshanloo & Nosratabadi, 2009). Although these studies show several relations between the Big Five personality traits and positive mental health, studies directly investigating and comparing the unique relation of personality to the three separate components of positive mental health are currently lacking.

### **Present study**

This study directly compares the relationship of personality traits with psychopathology and positive mental health, while also investigating separate components of positive mental health. First, we examined the relation of the Big Five personality traits to psychopathology and overall levels of positive mental health. A major strength of the present study is that it examines the unique associations of personality traits with psychopathology and positive mental health, while controlling for the other mental health dimension. In line with earlier studies, we expected neuroticism to be more strongly related to psychopathology than to positive mental health, and extraversion, agreeableness, conscientiousness and openness to experience more strongly to positive mental health than to psychopathology. Second, we examined and compared the relation of the five personality traits to emotional, psychological, and social well-being. For neuroticism and extraversion, we expected a stronger relationship with emotional (hedonic) well-being, since this component includes affective aspects of well-being. For openness to experience, agreeableness, and conscientiousness we hypothesized stronger relationships to the eudaimonic components of well-being: psychological and social well-being.

# Method

## Participants

A sample of 1,161 Dutch participants between the ages of 18 and 88 participated in this study. The sample was stratified by gender, age group, and migratory status (native Dutch versus being born abroad or having at least one parent born abroad). Of the respondents, 50% ( $N = 575$ ) were male, 21% ( $N = 239$ ) were aged 18 to 29 years, 26% ( $N = 304$ ) 30 to 49 years, 27% ( $N = 317$ ) 50 to 64 years, and 26% ( $N = 301$ ) were aged 65 years and over. The mean age was 49.6 ( $SD = 18.0$ ). Of the respondents, 83% ( $N = 967$ ) were Dutch, and 17% ( $N = 194$ ) were born abroad or had a least one parent born abroad. Educational levels were low in 37.4% ( $N = 434$ ), moderate in 33.3% ( $N = 387$ ) and high in 29.3% ( $N = 340$ ) of the respondents. Half of the respondents (52%;  $N = 607$ ) were married.

## Procedure

This paper draws on data of the LISS panel of CentERdata, a representative internet panel for Longitudinal Internet Studies in the Social Sciences, managed by CentERdata in Tilburg, the Netherlands. The LISS panel consists 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 households are provided with Internet access or a Personal Computer when necessary. Compared to national statistics the LISS panel shows a small underrepresentation of elderly persons, single persons, widowers, and immigrants (Knoef & 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 June 2008. 1,243 respondents (64%) filled out this module that included measures of positive mental health and psychopathology. A month earlier, in May 2008, a core module on personality was administered by CentERdata. 1,161 respondents (60%) filled out both the mental health module and the core module on personality.

## Measurements

*Demographics.* Questions were asked about age, gender, marital status, educational level and migration status.

*Personality* was measured using the *International Personality Item Pool* (IPIP) (Goldberg, 1992, 1999; Goldberg et al., 2006). The Big Five personality traits extraversion, agreeableness, conscientiousness, emotional stability (reversed neuroticism), and openness to experience were measured by 10 items per subscale, rated on a 5-point scale

from *totally disagree* (1) to *totally agree* (5). For each personality trait a total score was computed (10 to 50), with higher scores indicating higher levels of the personality trait. Cronbach's alpha was .84 for extraversion, .78 for agreeableness, .77 for conscientiousness, .87 for emotional stability, and .76 for openness to experience.

*Psychopathology* was assessed by the *Brief Symptom Inventory* (BSI; Dutch version: De Beurs & Zitman, 2006). Respondents indicated the degree to which they had experienced 53 psychological symptoms in the past week from *not at all* (0) to *a lot* (4). Higher average scores indicated higher levels of psychopathology. Cronbach's alpha was .95 in the present study.

*Positive mental health* was measured using the *Mental Health Continuum-Short Form* (MHC-SF; Keyes et al., 2008; Lamers et al., 2011), consisting of 14 items which represent the theoretically derived feelings of well-being. Respondents rated the frequency of each feeling in the past month on a Likert scale from *never* (1) to *every day* (6). 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, Glas, Westerhof, & Bohlmeijer, in press). 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 .88 for emotional well-being, .78 for social well-being, .85 for psychological well-being, and .91 for overall positive mental health.

In line with the two-continua model, psychopathology and positive mental health were treated as two related but distinct indicators of mental health. This two-continua model was validated by confirmatory factor analyses (Lamers et al., 2011). In the present study, psychopathology showed low and negative correlations to overall positive mental health ( $r = -.29$ ;  $p < .001$ ), emotional well-being ( $r = -.42$ ;  $p < .001$ ), psychological well-being ( $r = -.19$ ;  $p < .001$ ), and social well-being ( $r = -.21$ ;  $p < .001$ ). The three subscales of positive mental health were interrelated, with correlations of .58 (emotional and psychological well-being;  $p < .001$ ), .50 (emotional and social well-being;  $p < .001$ ), and .70 (psychological and social well-being;  $p < .001$ ).

## Analyses

To examine the association of personality traits to psychopathology and positive mental health, we first computed Pearson correlation coefficients between personality traits and psychopathology, positive mental health, emotional, psychological and social well-being, and between demographics and mental health. Second, we conducted hierarchical regression analyses. Since this study aimed at investigating the unique relation of personality traits to psychopathology and positive mental health, we controlled for the other mental health dimension (i.e., positive mental health and psychopathology, respectively). Since age, gender, marital status, educational level and migratory status were significantly related to psychopathology or positive mental health ( $p < .001$ ), we controlled for these demographics. In addition, we controlled for the interrelations between personality traits.

To investigate whether the personality traits showed significant differential associations with psychopathology, overall positive mental health, emotional, psychological and social well-being, we conducted a repeated measures analysis with psychopathology (reversed, with higher scores indicating less psychopathology), emotional, psychological, and social well-being as levels of a within-subjects factor, to control for the interrelations between the mental health variables within an individual. We controlled for age, gender, marital status, educational level, and migratory status. By Helmert contrasts, we compared the relation of personality traits to (1) psychopathology versus overall positive mental health (i.e., emotional, psychological and social well-being together), (2) hedonic (emotional) well-being versus eudaimonic (psychological and social) well-being, and (3) psychological versus social well-being. In all analyses, we applied an alpha of .001 because of the large sample size. Standardized beta weights were reported for the hierarchical regression analyses (Table 2 and 3).

## Results

Table 1 shows the means, standard deviations, and correlations between personality traits, psychopathology, and positive mental health. The five personality traits were significantly interrelated with correlations varying from .09 to .33, with two exceptions: there was no significant relation between extraversion and conscientiousness, nor between agreeableness and emotional stability. In further analyses, we controlled for these interrelations. The five personality traits were related to psychopathology and positive mental health, as well as to the subscales emotional, psychological and social well-being, with one exception: agreeableness was unrelated to psychopathology.

To investigate our first research question, we first examined the relation of personality traits to psychopathology, controlling for positive mental health (model 1), demographics (model 2), and interrelations between personality traits (model 3). Table 2 shows the results of the hierarchical regression analysis. In agreement with our expectations, emotional stability was uniquely related to lower levels of psychopathology when controlling for positive mental health, demographic characteristics and the other four traits. Personality traits explained 19% of the variance in psychopathology on top of positive mental health and demographics. In total, positive mental health, demographics, and personality traits explained 33% of the variance.

Table 1.

*Means, Standard Deviations and Correlations between Psychopathology, Positive Mental Health, and Personality Traits*

	Mean (SD)	Personality trait				
		1.	2.	3.	4.	5.
<i>Psychopathology</i>						
Psychopathology	0.34 (0.35)	-.52*	-.17*	-.04	-.12*	-.06
<i>Positive mental health</i>						
Positive mental health	3.9 (0.9)	.24*	.27*	.23*	.15*	.23*
Emotional well-being	4.6 (1.0)	.32*	.17*	.20*	.16*	.09
Psychological well-being	4.1 (1.0)	.18*	.27*	.20*	.13*	.25*
Social well-being	3.3 (1.0)	.16*	.24*	.20*	.10*	.20*
<i>Personality traits</i>						
1. Emotional stability	34.2 (6.6)	-	.28*	.09	.24*	.19*
2. Extraversion	32.8 (6.0)		-	.30*	.09	.33*
3. Agreeableness	38.9 (4.8)			-	.31*	.28*
4. Conscientiousness	37.5 (5.2)				-	.23*
5. Openness to experience	35.1 (5.0)					-

\*  $p < .001$

Next we examined the association of personality traits with positive mental health (Table 2). When controlling for psychopathology (model 1), demographics (model 2), and other traits (model 3), we found that agreeableness and extraversion were uniquely related to positive mental health. The traits contributed 9% to the explained variance in positive mental health on top of psychopathology and demographics. In total, 20% of the variance was explained by psychopathology, demographics, and personality traits.

Table 2.

*Hierarchical Regression Analysis of Personality Traits in Relation to Psychopathology and Positive Mental Health, Controlled for Mental Health and Demographics*

	Psychopathology			Positive mental health		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
<i>Mental health</i>						
Positive mental health	-.29*	-.31*	-.22*			
Psychopathology				-.29*	-.32*	-.26*
<i>Demographics</i>						
Age		-.16*	-.12*		-.18*	-.18*
Gender		-.05	.02		-.05	.00
Marital status		-.07	-.06		.03	.03
Educational level		-.08	-.03		-.00	-.04
Migratory status		-.15*	-.11*		-.09	-.09*
<i>Personality</i>						
Emotional stability			-.46*			.04
Extraversion <sup>1</sup>			-.03			.12*
Agreeableness <sup>1</sup>			.05			.14*
Conscientiousness			.04			.06
Openness to experience			.04			.10

Note. Psychopathology:  $R^2 = .08$  for Model 1 ( $F(1,1159) = 103.08$ ;  $p < .001$ );  $\Delta R^2 = .07$  for Model 2 ( $Fchange(5,1154) = 19.03$ ;  $p < .001$ );  $\Delta R^2 = .19$  for Model 3 ( $Fchange(5,1149) = 64.12$ ;  $p < .001$ ). Positive mental health:  $R^2 = .08$  for Model 1 ( $F(1,1159) = 103.08$ ;  $p < .001$ );  $\Delta R^2 = .04$  for Model 2 ( $Fchange(5,1154) = 11.04$ ;  $p < .001$ );  $\Delta R^2 = .09$  for Model 3 ( $Fchange(5,1149) = 24.58$ ;  $p < .001$ ).

<sup>1</sup> The personality trait was differentially associated with psychopathology and positive mental health ( $p < .001$ ).

\* $p < .001$

To answer our second research question, we examined the relation of the Big Five personality traits to the three subscales emotional, psychological, and social well-being. The final model of the three hierarchical regression analyses is shown in Table 3. In agreement with our expectations, emotional stability was significantly and uniquely related to higher levels of emotional well-being, and not related to psychological and social well-being when controlling for psychopathology, demographics, and other traits. Unexpectedly, extraversion was unrelated to emotional well-being but showed significant and unique contributions to both psychological and social well-being. Moreover, openness to experience was uniquely related to psychological but not to emotional and social well-being. Although we hypothesized significant contributions of agreeableness to psychological and social well-being, agreeableness showed unique relations to emotional

and social well-being. Conscientiousness was unrelated to the three components of well-being when controlling for psychopathology, demographics and the other four traits. On top of psychopathology and demographics, the personality traits explained 5% (emotional well-being), 8% (psychological well-being), and 7% (social well-being) of the variance. These results showed that four of the five personality traits were related to at least one of the three subscales of positive mental health.

Table 3.

*Hierarchical Regression Analysis of Personality Traits in Relation to Emotional, Psychological and Social Well-being, Controlled for Psychopathology and Demographics*

	Emotional well-being	Psychological well-being	Social well-being
<i>Mental health</i>			
Psychopathology	-.37*	-.20*	-.17*
<i>Demographics</i>			
Age	-.10*	-.19*	-.14*
Gender	-.04	-.02	.06
Marital status	.09	.02	.00
Educational level	-.11*	-.02	-.00
Migratory status	-.04	-.08	-.09
<i>Personality</i>			
Emotional stability <sup>1</sup>	.12*	.02	.02
Extraversion <sup>1</sup>	.01	.14*	.12*
Agreeableness	.15*	.09	.15*
Conscientiousness	.04	.07	.04
Openness to experience	.02	.13*	.08

*Note.* Emotional well-being:  $R^2 = .18$  for Model 1 ( $F(1,1159) = 251.26; p < .001$ );  $\Delta R^2 = .02$  for Model 2 ( $Fchange(5,1154) = 6.83; p < .001$ );  $\Delta R^2 = .05$  for Model 3 ( $Fchange(5,1149) = 13.79; p < .001$ ). Psychological well-being:  $R^2 = .05$  for Model 1 ( $F(1,1159) = 55.70; p < .001$ );  $\Delta R^2 = .06$  for Model 2 ( $Fchange(5,1154) = 14.14; p < .001$ );  $\Delta R^2 = .08$  for Model 3 ( $Fchange(5,1149) = 22.54; p < .001$ ). Social well-being:  $R^2 = .03$  for Model 1 ( $F(1,1159) = 41.58; p < .001$ );  $\Delta R^2 = .04$  for Model 2 ( $Fchange(5,1154) = 8.01; p < .001$ );  $\Delta R^2 = .07$  for Model 3 ( $Fchange(5,1149) = 18.20; p < .001$ ).

<sup>1</sup> The personality trait was differentially associated with hedonic (emotional) well-being and eudaimonic (psychological and social) well-being ( $p < .001$ ).

\* $p < .001$

We expected personality traits to be differentially related to psychopathology, overall positive mental health, emotional, psychological, and social well-being. Having seen some differences in the relations of Big Five traits to psychopathology, positive

mental health, as well as to the three components of positive mental health, we subsequently conducted a repeated measures analysis to assess whether these relations were significantly different. Multivariate analyses showed that emotional stability ( $F(3,1153) = 16.91; p < .001$ ), extraversion ( $F(3,1153) = 9.34; p < .001$ ), agreeableness ( $F(3,1153) = 11.95; p < .001$ ), and openness to experience ( $F(3,1153) = 15.54; p < .001$ ) were differentially associated with psychopathology, emotional, psychological, and social well-being. There were no differences in conscientiousness ( $p > .001$ ). Helmert contrasts (see superscripts in Table 2) revealed that extraversion and agreeableness showed significantly stronger relations to positive mental health than to psychopathology. Whereas agreeableness and extraversion were important correlates of positive mental health, emotional stability was the only personality trait related to psychopathology. Helmert contrasts (see superscripts in Table 3) revealed that the association of the personality trait emotional stability was stronger with hedonic than with eudaimonic well-being, whereas extraversion was more strongly associated with eudaimonic well-being (i.e. psychological and social) than with hedonic (i.e. emotional) well-being. The differences in the relation of the personality traits with psychological versus social well-being were nonsignificant ( $p > .001$ ), indicating that emotional stability, extraversion, agreeableness, conscientiousness, and openness to experience were similarly associated with both components of eudaimonic well-being.

## Discussion

This study directly compared the unique association of the Big Five personality traits (neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience) with psychopathology to their unique association with positive mental health. In addition, it investigated the relations of these traits to three components of positive mental health: emotional, psychological, and social well-being. The main finding is that personality traits have a different association with psychopathology than with positive mental health. Although psychopathology and positive mental health are related to each other, they are differentially related to personality traits. This confirms the two continua model of mental health.

In agreement with our expectations, emotional stability (reversed neuroticism) is associated with psychopathology, whereas the personality traits extraversion and agreeableness are significant contributors to positive mental health. Personality traits account for a substantial part of the variance in psychopathology (19%) and positive mental health (9%), controlling for each other and for demographic characteristics. Although one personality trait plays a role in psychopathology and two personality traits in

positive mental health, our study shows that the explained variance by personality traits is higher in psychopathology than in positive mental health. The percentages of explained variance are somewhat lower than in DeNeve and Cooper (1998), who report that personality traits explained 20 to 33% of the variance in well-being. Steel and colleagues (2008) report an even higher explained variance for personality traits of 39 to 63% when controlling for measurement differences across studies in their meta-analysis. One reason for the differences in explained variance, is that the present study examined the unique association of personality traits with psychopathology or positive mental health while controlling for the other mental health construct. This leads to more balanced indicators of the explained variance in mental health. The differences in explained variance between our study and earlier studies (DeNeve & Cooper, 1998; Steel et al., 2008), suggest that further research should take the relation between psychopathology and positive mental health into account. A second reason for the differences may be the use of the IPIP questionnaire to measure personality traits. This measure was not included in either meta-analysis.

It is remarkable that both personality traits associated with positive mental health, extraversion and agreeableness, are interpersonal traits. The combination of high extraversion and high agreeableness has been reported as a dominant-friendly personality profile, characterized by sociable and enthusiastic behavior (De Raad & Kokkonen, 2000; Wiggins & Trobst, 1997). Our study indicates that persons with a dominant-friendly profile are higher in positive mental health than persons who are less extravert and agreeable, whereas only the intrapersonal trait of neuroticism is associated with symptoms of psychopathology.

With respect to the components of positive mental health, personality traits explain between 5% (emotional well-being) and 8% (psychological well-being) of the variance, on top of psychopathology and demographics. Different personality traits contribute more to emotional (hedonic) well-being than to psychological and social (eudaimonic) well-being. In agreement with our expectations, emotional stability (reversed neuroticism) is a more important contributor to emotional well-being, whereas agreeableness is more strongly related to psychological and social well-being. These findings underline the distinctness in the hedonic and eudaimonic tradition of well-being, since personality traits have a different relation with emotional than with psychological and social well-being.

Although earlier studies on openness to experience were mixed (Schmutte & Ryff, 1997; Joshanloo & Nosratabadi, 2009; Ozer & Benet-Martínez, 2006), we found a positive relation to psychological well-being. Individuals with high levels of openness to experience are more willing to accept new ideas, to perform new behaviors, or to change habits,

which may improve their functioning in individual life. Unexpectedly, the personality trait extraversion was not related to emotional well-being, but to psychological and social well-being. This might be the consequence of the IPIP personality questionnaire used in this study. The IPIP is mainly directed at assertiveness, whereas other personality questionnaires also include excitement-seeking, cheerfulness and friendliness (e.g., NEO-FFI; Costa & McCrae, 1992). Facets such as cheerfulness and friendliness might be more highly correlated to emotional well-being than the assertiveness facet. Assertiveness focuses more strongly on an aspect of behavioral functioning that is apparently more strongly related to eudaimonic well-being.

There are some limitations that need to be considered. First, we merely examined the relations between personality traits and mental health and cannot draw any causal inferences, although mental health was measured one month after personality traits. Second, the moderate response rate (64%) indicates that the study sample may be a selective sample of motivated respondents. Third, we have no information on the simultaneous presence of psychopathology and mental health since the measures are retrospective and investigate summary statements over the past week or month, respectively. Fourth, there is item overlap and an indistinct relation between personality and mental health. For example, some items measuring emotional stability (reversed neuroticism) resemble items of psychopathology. However, there is a substantial difference between questionnaires on personality and on psychopathology since personality items aim at the individual in general, whereas psychopathology items only focus on the state of the individual. Steel and colleagues (2008) show that criterion contamination is not a significant issue. For example, the strong relation between neuroticism and negative affect remains after dropping potentially overlapping facets on depression and anxiety. Moreover, in our study psychopathology was measured one month after personality traits. Finally, the IPIP personality questionnaire is rarely used as compared to other personality questionnaires, making comparisons with earlier studies somewhat difficult. The mean correlation of .73 between the 30 facet scales of the often used NEO-PI-R and the corresponding IPIP scales indicates a high agreement between both questionnaires (Goldberg et al., 2006). Nevertheless, our findings on extraversion indicate that it is worthwhile to study relations of personality traits with mental illness and health at the level of facets as well.

In conclusion, personality traits are important correlates of psychopathology and the components of positive mental health. Moreover, the Big Five personality traits are differentially associated with psychopathology and positive mental health, confirming that both are independent continua of mental health. This supports mental health care in its aim to promote individuals' mental health in addition to the treatment of

psychopathology. The findings have important implications. An intrapersonal trait (emotional stability) is more important for symptoms of psychopathology, whereas interpersonal traits (extraversion and agreeableness) are more important for positive mental health. This indicates that interventions developed to decrease psychopathology may be more effective when enhancing intrapersonal characteristics and interventions aimed at increasing positive mental health may be more effective when improving interpersonal skills. More research is needed to validate these assumptions.

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# Chapter 6

## The impact of emotional well-being on long-term recovery and survival in physical illness: A meta-analysis

Lamers, S. M. A., Bolier, L., Westerhof, G. J., Smit, F., & Bohlmeijer, E. T. (2011, online first). The impact of emotional well-being on long-term recovery and survival in physical illness: A meta-analysis. *Journal of Behavioral Medicine*, doi: 10.1007/s10865-011-9379-8

## **Abstract**

This meta-analysis synthesized studies on emotional well-being as predictor of the prognosis of physical illness, while in addition evaluating the impact of putative moderators, namely constructs of well-being, health-related outcome, year of publication, follow-up time and methodological quality of the included studies. The search in reference lists and electronic databases (Medline and PsycInfo) identified 17 eligible studies examining the impact of general well-being, positive affect and life satisfaction on recovery and survival in physically ill patients. Meta-analytically combining these studies revealed a Likelihood Ratio of 1.14, indicating a small but significant effect. Higher levels of emotional well-being are beneficial for recovery and survival in physically ill patients. The findings show that emotional well-being predicts long-term prognosis of physical illness. This suggests that enhancement of emotional well-being may improve the prognosis of physical illness, which should be investigated by future research.

## Introduction

This meta-analysis investigates emotional well-being as a predictor of the prognosis of physical illness. We define emotional well-being from a positive perspective, not as the mere absence of symptoms of psychopathology. Currently, most studies on the relation between mental and physical health investigated the presence or absence of psychopathology. These studies show that psychopathology is related to the course and severity of several physical diseases. For example, depression is associated with increased osteoporosis (Michelson et al., 1996), coronary heart disease (Glassman & Shapiro, 1998), diabetes complications (De Groot et al., 2001), cancer incidence, progression (Spiegel & Giese-Davis, 2003) and cancer mortality (Satin et al., 2009), and anxiety may influence the development of coronary heart disease (Kubzansky & Kawachi, 2000).

By contrast, well-being may play an additional protective role in the course of physical diseases. After all, there is accumulating evidence that psychopathology and wellbeing are more than merely opposite poles of the same dimension (Huppert & Whittington, 2003; Keyes, 2005, 2007; Lamers et al., 2011; Watson & Tellegen, 1985), and both well-being and mental disorders may have independent impacts on physical health. To date, six reviews of the literature synthesized effects of well-being on physical health (Chida & Steptoe, 2008; Diener & Chan, 2011; Howell et al., 2007; Lyubomirsky et al., 2005; Pressman & Cohen, 2005; Veenhoven, 2008). In general, the conclusions are favorable with well-being being positively associated to better health (Diener & Chan, 2011; Howell et al., 2007; Lyubomirsky et al., 2005), reduced risk of illness and injury (Pressman & Cohen, 2005), and lower mortality rates (Chida & Steptoe, 2008; Pressman & Cohen, 2005; Veenhoven, 2008). In samples of healthy people, the results of these studies clearly point towards the positive effects of well-being on physical health. However, results appear to be mixed in physically ill populations.

To illustrate, Howell et al. (2007) found positive effects of well-being on physical health for both healthy and diseased populations, although results differed across health outcomes. The findings suggest that well-being may enhance physical functioning in healthy adults and improve management of symptoms in diseased adults. For example, the likelihood of longevity increases for individuals with high well-being compared to those with low well-being, and this survival rate even increases 10% for individuals with chronic diseases who report high versus low well-being. The meta-analysis of Chida and Steptoe (2008) also shows protective effects of well-being on survival in diseased populations with renal failure and HIV. Even though Howell et al. (2007) and Chida and Steptoe (2008) show that well-being generally is related to better physical health in diseased adults, Diener and Chan (2011), Pressman and Cohen (2005), and Veenhoven (2008) report otherwise. Diener and Chan (2011) conclude that findings with respect to

diseased populations are mixed. Although Pressman and Cohen (2005) and Veenhoven (2008) state that there is too little consistency in the data to draw robust conclusions, both reviews suggest that there may be no effects or even adverse effects of well-being on physical health. In general, the pattern of research findings seems to point towards positive effects or no effects in relatively mildly diseased adults, where adherence to medication and behavioral factors such as physical exercise could play a role, and negative effects in severely diseased adults with high short-term mortality rates (Pressman & Cohen, 2005; Veenhoven, 2008).

In sum, the existing reviews produce inconsistent evidence with respect to well-being as a predictor of physical health in diseased populations. Conclusions across healthy and diseased populations differ, because the outcomes differ as well. In healthy individuals, the desirable health outcome is to stay healthy and to reduce mortality and the development of physical illness. Individuals with physical diseases already experience a diminished physical health, resulting in a different set of aims, such as decreasing symptom severity, preventing worsening of disease, and increasing survival rates.

### **Present study**

This meta-analysis will focus on physically diseased patients, aiming to prospectively study the effects of emotional well-being on the prognosis of physical disease. The objective is to broadly investigate the prognosis, including survival, disease progress, recovery, and functional status. In addition, this systematic review will investigate emotional well-being, defined in the hedonic tradition of well-being research (Diener et al., 1999). In this research tradition, emotional well-being consists of an affective component, concentrating on positive emotions such as feelings of happiness, and a cognitive component, concentrating on evaluations of life such as life satisfaction. The previous literature reviews applied diverse definitions and terminology of well-being, investigating positive emotions (Pressman & Cohen, 2005; Veenhoven, 2008), positive emotions and positive dispositions such as optimism and sense of humor (Chida & Steptoe, 2008; Diener & Chan, 2011), or all positive psychological constructs (Howell et al., 2007). Moreover, several of these reviews included studies which measured quality of life by items on physical health and functioning (Howell et al., 2007). Other studies used positive affect adjectives such as active and energetic (Pressman & Cohen, 2005). These items might measure physical health instead of well-being. Thus to avoid confounding, this meta-analysis will employ a strict and narrow focus on emotional well-being, and in doing so will try to avoid contamination.

To further unravel the inconsistencies observed in reviewed studies, this systematic review will apply meta-analytic moderator analyses to evaluate how different constructs of well-being, health-related outcome, year of publication, follow-up time and sample size introduce their own impact on outcome. Moreover, the methodological quality of the included studies will be assessed and added as a potential moderator, since effect sizes might be smaller in high-quality studies than in other studies (Cuijpers et al., 2010).

In sum, this meta-analysis will synthesize evidence that is drawn from prospective studies on the relationship between emotional well-being and the prognosis of physical illness, in physically diseased samples across a range of health outcomes. In addition, our study will encompass quality assessment of the primary studies and we will employ meta-analytical techniques such as meta-regression and meta-analytic moderator analyses. The previous reviews of the literature (Chida & Steptoe, 2008; Diener & Chan, 2011; Howell et al., 2007; Lyubomirsky et al., 2005; Pressman & Cohen, 2005; Veenhoven, 2008) included several of these aims, but none of them combined all aspects into a single systematic literature review. Since the research field of positive psychology is growing rapidly, this review will also include several new studies on the relation between emotional well-being and the prognosis of physical illnesses.

## **Method**

### **Selection of studies**

Studies were included if they reported on emotional wellbeing or aspects of emotional well-being and on the prognosis of physical illness, aiming to evaluate the prospective effects of well-being on the prognosis. Studies were excluded when (1) the study design was not prospective; (2) emotional well-being was not measured (e.g., emotional well-being was measured otherwise than the presence of general well-being, positive affect and/or life satisfaction, emotional well-being was part of a composite index, or psychopathology was examined as indicator of well-being); (3) the study population was physically healthy, mentally disordered, or consisted of institutionalized elderly; (4) the paper included insufficient information for data extraction required for meta-analysis.

### **Search strategy**

First, we searched the reference lists of the literature reviews of Chida and Steptoe (2008), Diener and Chan (2011), Howell et al. (2007), Lyubomirsky et al. (2005), Pressman and Cohen (2005), and Veenhoven (2008) for studies fitting the inclusion criteria. Second, a

systematic search was performed in two electronic databases, Medline and PsycInfo, up to March 2011. The main search strategy was based on two key components: emotional well-being and prognosis of physical illness. Terms on both components were searched in title, abstract and keywords. Emotional well-being included the following terms of which at least one had to be present: (well-being) or (wellbeing) or (happiness) or (happy) or (life satisfaction) or (positive affect) or (positive mood) or (positive emotion\*). In addition, at least one term on prognosis of physical illness had to be present. With respect to prognosis, we were mainly interested in recovery outcomes, using terms as functional status, health, and survival. However, since recovery outcomes were not always explicitly mentioned, we also included search terms on recovery processes (recovery, rehabilitation, surgery, surgical, post-operative, postsurgical, morbidity, remission, convalescence), general terms of physical diseases (patient, disease, illness, pain, surviv\*, mortality, injury, fracture, infarction) and terms on specific diseases (cancer, tumor, diabetes, arthritis, osteoarthritis, fibromyalgia, arthrosis, heart failure, angina, cardiac, cardiovascular, myocardial, coronary, thrombosis, stroke, cardiovascular accident, COPD, lung disease, bronchitis, aids, HIV). Only one of the search terms of prognosis of physical illness had to be present.

We searched for peer-reviewed studies in the English language with no limitations on the year in which the study was published. To minimize the presence of publication bias we also searched for dissertations. Furthermore, we cross-checked the reference lists of included studies for additional eligible studies. Potentially eligible studies were independently selected by two reviewers (SL and LB) in two phases. In the first phase, selection was based on title and abstract, and in the second phase on the full-text paper. All studies evaluated as potentially eligible by at least one of the reviewers in the first selection phase, were evaluated in the second selection phase. In the second phase, disagreements between both independent reviewers were resolved by consensus.

### **Information extraction**

Our search revealed 17 eligible studies. The flow diagram of the study selection is shown in Fig. 1. Searching the reference lists of the literature reviews (Chida & Steptoe, 2008; Diener & Chan, 2011; Howell et al., 2007; Lyubomirsky et al., 2005; Pressman & Cohen, 2005; Veenhoven, 2008) and searching databases revealed in total 2,901 records. After exclusion (see Fig. 1), 17 studies were included in the meta-analysis. Of these studies, 6 studies were identified by searching the reference lists and 11 by the electronic search, thus adding new studies to the previous reviews.

Table 1 shows an overview of the included studies. All eligible studies were peer-reviewed articles. The study populations were diverse, including heart and vascular diseases ( $n = 6$ ), cancer ( $n = 1$ ), renal disease ( $n = 1$ ), spinal cord injury ( $n = 1$ ), HIV ( $n = 1$ ), diabetes ( $n = 1$ ), arthritis ( $n = 1$ ), stroke ( $n = 1$ ), hip fracture ( $n = 1$ ), respiratory disorder ( $n = 1$ ), general acute events, including stroke, hip fracture and heart attack ( $n = 1$ ), and general medical patients ( $n = 1$ ). The sample sizes ranged from 44 to 5,025 ( $M = 749.7$ ;  $SD = 1139.5$ ). Three types of well-being constructs were extracted: general well-being ( $n = 1$ ), positive affect ( $n = 13$ ), and life satisfaction ( $n = 3$ ). The studies measured general well-being using the WHO-5 well-being index ( $n = 1$ ; Heun et al., 1999), positive affect using the subscale Positive affect of the Center for Epidemiological Studies Depression Scale ( $n = 7$ ; Radloff, 1977), the subscale Positive affect of the Hospital Anxiety and Depression Scale ( $n = 2$ ; Herrmann, 1997), the Mood Adjective Check List ( $n = 2$ ; Nowlis, 1965), and the Global Mood Scale ( $n = 2$ ; Denollet, 1993). Life satisfaction was measured by the Satisfaction With Life Scale ( $n = 1$ ; Diener et al., 1985), the MOS short form general health survey ( $n = 1$ ; Stewart et al., 1988), and the Life Situation Questionnaire ( $n = 1$ ; Krause, 1992).

The type of outcome measures included functional status ( $n = 6$ ), health status ( $n = 1$ ), and survival ( $n = 10$ ). We combined functional status and health status as recovery outcomes. Functional status was measured by the Duke Activity Status Index ( $n = 1$ ; Hlatky et al., 1989), (modified version of the) Katz's Activities of Daily Living scale ( $n = 2$ ; Katz et al., 1963), the Inpatient Rehabilitation Facilities-Patient Assessment Instrument ( $n = 1$ ; Ottenbacher et al., 1996), the EuroQol (Euroqol group, 1990), and by measuring usual walking speed, rapid walking speed and chair stands ( $n = 1$ ). Of the 10 studies measuring survival as outcome, 9 studies measured survival status (alive or deceased at follow-up) and 1 study measured survival time. The studies reported hazard ratios ( $n = 6$ ), risk ratios ( $n = 3$ ), odds ratios ( $n = 4$ ), regression coefficients ( $n = 3$ ) or means ( $n = 1$ ). The follow-up time ranged from 3 months to 11 years with a mean of 4.47 years ( $SD = 3.93$ ), and the papers were published between 1996 and 2009.

Information was extracted on study design, type of study population (e.g., cancer patients), sample size, type of wellbeing construct, type of outcome measures, and the study's outcome measure. For each paper, we extracted the relevant and most reliable outcome which was most completely adjusted for potential confounders, such that we obtained a single outcome per paper. For one study (Versteeg et al., 2009) we performed a meta-analysis to synthesize three odds ratios on mobility, self-care, and activities, into a single odds ratio. Moreover, we extracted the results based on baseline emotional well-being instead of change in emotional well-being over time. For one study (Moskowitz, 2003), the result based on multiple measurements of well-being was extracted, since the study did not report results based on baseline emotional well-being. When a paper

included insufficient information for data extraction required for meta-analysis, we contacted the authors for additional information.

### **Quality assessment**

Two reviewers (SL and LB) independently assessed methodological quality of the included studies, using a protocol based on the quality checklist for observational studies of Wong et al. (2008). We adapted the checklist to our study aims into a checklist consisting of five quality criteria on external validity, response rate, reliability, control for confounding demographic variables, and control for confounding health variables. For the studies on recovery we included an additional item on the objectiveness of the recovery measurements (i.e., self-report versus laboratory test). Each criterion was rated as 0 (study does not meet criterion) or 1 (study meets criterion). The interrater reliability was 89.1%. The overall quality of the study was assessed by dividing the total score by the total number of applicable items, resulting in a quality score between 0 and 1.00.

The quality of the studies ranged from 0.50 to 1.00 ( $M = 0.74$ ;  $SD = 0.17$ ). Three of the studies met all quality criteria. In ten studies the reliability of the scale measuring emotional well-being was not reported ( $n = 1$ ) or Cronbach's alpha was lower than .60 ( $n = 9$ ), mainly because well-being was measured by positive affect subscales from depression and anxiety questionnaires. The criterion assessing whether course of disease was measured objectively (i.e., no self-report), was only applicable for the studies measuring functional status or health status. Of these studies ( $n = 7$ ), only one met this quality criterion.

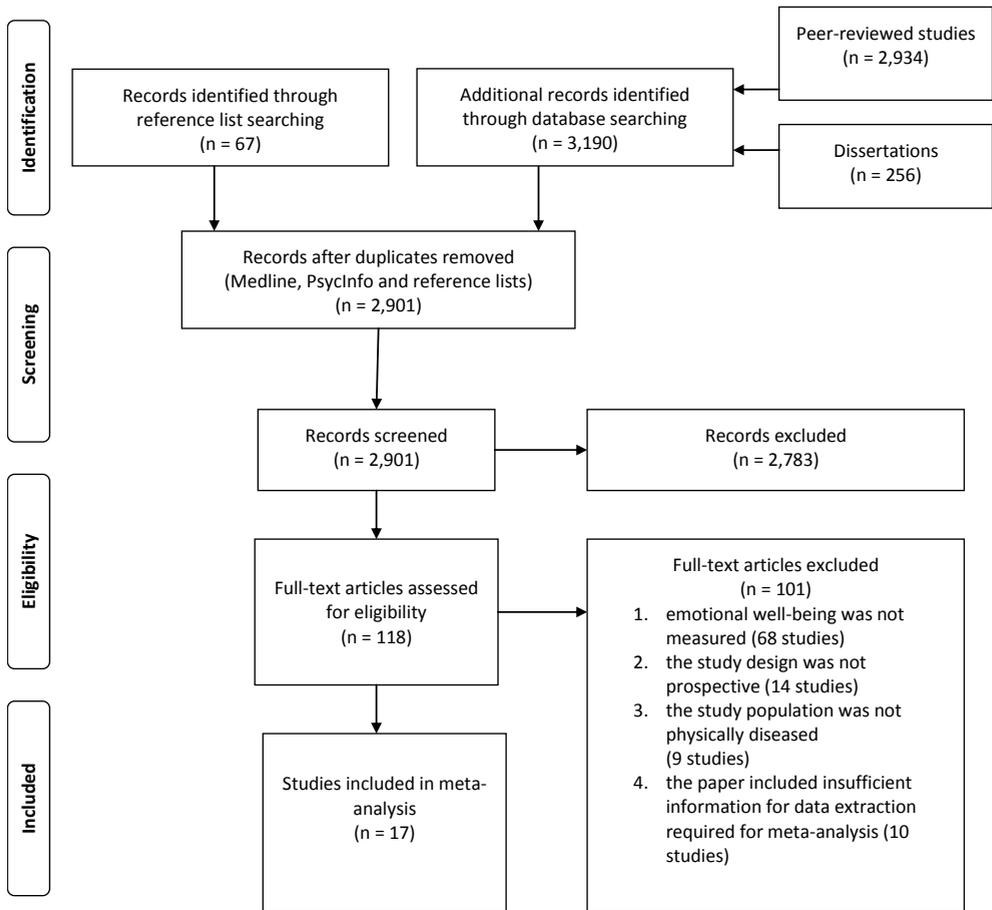


Figure 1. Flow chart.

## Meta-analysis

We used the software Comprehensive Meta Analysis (CMA) to meta-analytically combine study outcomes. For each study, we extracted the hazard ratio, risk ratio or odds ratio and its confidence intervals. Regression coefficients and means were converted to odds ratios using CMA. We combined the ratios, referring to the hazard ratios, risk ratios and odds ratios as likelihood ratios (LR). When necessary the ratio was inverted such that all LRs above 1 indicate a positive relationship of emotional well-being to the prognosis of physical illness. The meta-analysis included weighting of the study LRs by the inverse of the standard errors, based on the confidence intervals. With small studies tending to have wider confidence intervals and large studies to have narrow confidence intervals, the confidence interval reflects the precision of the LR. The LR is considered statistically significant if the confidence interval (95%) excludes the null value of 1.

A random-effects meta-analysis was performed, because of the heterogeneity across the studies. The random-effects method allows to assume that the studies are estimating different but related effects, thus relaxing the assumption that all studies are replicas. In addition, the random-effects model makes an adjustment to the study weights according to the extent of heterogeneity (Deeks et al., 2008), which translates into a broad 95% confidence interval around the pooled effect estimate.

We performed an overall analysis, as well as subgroup analyses and meta-regression analyses to identify potential moderators. In the subgroup analyses, we examined the effects of emotional well-being on the prognosis of physical illness separately for positive affect and for each measure of prognosis (survival; recovery). No subgroup analyses were performed on overall well-being and life satisfaction, since few studies measured these aspects of emotional well-being ( $n = 1$  and  $3$ , respectively). The study population could not be split into more homogeneous subgroups because of its (too large) diversity. In the metaregression analyses, we evaluated the potentially confounding relationship of sample size, the quality of the studies, the follow-up length, and the publication year on the relationship of interest: the impact of emotional wellbeing on the prognosis of physical illness. To this end, we used an unrestricted maximum likelihood mixed effects regression. Moreover, we examined heterogeneity between the studies by using the Q-test, indicating the probability of heterogeneity, and the I<sup>2</sup> index, indicating the magnitude of the heterogeneity. An I<sup>2</sup> between 0 and 30% was considered as low, between 30 and 75% as moderate, and between 75 and 100% as high heterogeneity (Deeks et al., 2008).

Publication bias in the studies was evaluated using three indices: the funnel plot, the Egger's test of intercept and the Rosenberg fail-safe number. The funnel plot is a graph of effect size (LR) against sample size (N). When publication bias is absent, the observed studies are expected to be distributed symmetrically around the pooled effect size. The Egger's test of intercept is a correlation between study precision (the inverse of the standard error) and the standardized effect (the effect size divided by its standard error). The fail-safe number indicates the number of nonsignificant unpublished studies needed to reduce the overall significant effect to non-significance (Sterne et al., 2008). We used Rosenberg's (2005) weighted method for calculating fail-safe numbers, where studies with small variance are given higher weight than those with large variance. For the reporting of this meta-analysis, we applied PRISMA guidelines (Moher et al., 2009).

Table 1.

*Descriptives of the Studies on Emotional Well-being as Predictor of the Course of Physical Disease*

Study	Quality <sup>1</sup>	Follow-up (years)	Participants	Predictive measure <sup>2</sup>	Outcome measure <sup>3</sup>	Results Likelihood ratio (95% confidence interval)	Conclusion <sup>4</sup>
Birket-Smith et al. (2009)	1.00	6	Chronic heart disease (N = 85)	Well-being (WHO-5)	Survival	1.024 (1.005 - 1.042)	+
Brown et al. (2003)	0.80	10	Cancer (N = 205)	Positive affect (MACL)	Survival	0.990 (0.938 - 1.045)	0
Brummett et al. (2009)	0.67	3	Coronary artery disease, age 60+ (N = 948)	Positive affect (CES-D)	Functional status (DASI)	1.609 (1.039 - 2.492)	+
Denollet et al. (2008)	0.80	2	Coronary artery disease (N = 874)	Positive affect (HADS)	Survival	2.550 (1.479 - 4.397)	+
Fisher et al. (2004)	0.67	2	Arthritis, age 65+ (N = 937)	Positive affect (CES-D)	Functional status (ADL)	1.099 (1.024 - 1.181)	+
Fredman et al. (2006)	0.50	2	Hip fracture, age 65+ (N = 432)	Positive affect (CES-D)	Functional status: Usual and rapid walking speed, chair stands	2.700 (1.096 - 6.654)	0
Kimmel et al. (1998)	1.00	4	Hemodialysis patients (N = 295)	Life satisfaction (SWLS)	Survival	1.205 (0.960 - 1.513)	0
Konstam et al. (1996)	0.80	3	Congestive heart failure (N = 5025)	Life satisfaction (MOS)	Survival	0.949 (0.899 - 1.001)	0
Krause et al. (1997)	1.00	11	Spinal cord injury (N = 330)	Life satisfaction (LSQ)	Survival	1.990 (1.373 - 2.885)	+
Moskowitz (2003)	0.60	10.8	HIV+ patients (N = 407)	Positive affect (CES-D)	Survival	1.163 (1.042 - 1.299)	+

Moskowitz et al. (2008)	0.80	10	Diabetic patients (N = 715)	Positive affect (CES-D)	Survival	1.111 (0.962 - 1.284)	0
Olofson et al. (2009)	0.60	8	Chronic alveolar hypoventilation (N = 44)	Positive affect (MACL)	Survival	1.961 (0.901 - 4.167)	0
Ostir et al. (2002)	0.50	1	Acute events (stroke, heart attack or hip fracture), age 65+ (N= 240)	Positive affect (CES-D)	Functional status (ADL)	2.700 (1.096 - 6.653)	+
Ostir et al. (2008)	0.50	0.25	Stroke, age 55+ (N = 823)	Positive affect (CES-D)	Functional status (IRF-PAI)	4.241 (0.939 - 19.151)	0
Pelle et al. (2009)	0.83	1	Chronic heart failure (N = 276)	Positive affect (GMS)	Health status (HCS)	0.865 (0.603 - 1.241)	0
Scherer and Hermann-Lingen (2009)	0.80	1	Patients of the general medical ward (N = 575)	Positive affect (HADS; 1 item on enjoyment)	Survival	1.400 (1.016 - 1.930)	+
Versteeg et al. (2009)	0.83	1	Coronary artery disease (N = 533)	Positive affect (GMS)	Functional status (EQ5D mobility)	1.031 (0.649 - 1.667)	0

<sup>1</sup> Range from 0.00 (low quality) to 1.00 (high quality), based on external validity, response rate, reliability, control for confounding demographic variables, control for confounding health variables, and objectiveness of the recovery outcomes (not applicable for studies on survival).

<sup>2</sup> Zung = Zung self-rating depression scale (SDS subscale well-being); WHO = WHO-5 well-being index; MACL = Mood Adjective Check list; HADS = Hospital Anxiety and Depression Scale (subscale positive affect); SWLS = Satisfaction with Life Scale; MOS = MOS short form general health survey, LSQ = Life Situation Questionnaire (subscale); CES-D = Center for Epidemiologic Studies Depression Scale (subscale positive affect); GMS = Global Mood Scale.

<sup>3</sup> DASI = Duke Activity Status Inventory; ADL = Activities of Daily Living Scale; IRF-PAI = Inpatient Rehabilitation Facilities - Patient Assessment Instrument; HCS = Health Complaints Scale (subscale cardiac symptoms); EQ5D = EuroQoL-5D.

<sup>4</sup> + = positive effect ( $P \leq .05$ ); 0 = no effect ( $P > .05$ ); - = negative effect ( $P \leq .05$ ).

## Results

An overview of the 17 selected studies is presented in Table 1. The studies investigated the prospective relationship of general well-being, positive affect or life satisfaction to survival or recovery. None of the studies reported negative effects of emotional well-being on the prognosis of physical illness. The results of the 17 studies and the meta-analysis are presented in Fig. 2. Meta-analytically summarizing the effects across the studies revealed an overall likelihood ratio of 1.14 ( $p < 0.001$ ), indicating a small but significant effect of emotional well-being on the course of physical disease. Since the studies were weighted, we also conducted a meta-analysis without the study of Konstam et al. (1996), which is an outlier in sample size ( $n = 5,025$ ) as reflected by its narrow confidence interval. Meta-analytically combining the remaining 16 studies revealed a higher likelihood ratio of 1.18 ( $p < .001$ ), indicating the positive relation of emotional well-being to recovery and survival is even stronger when excluding the study with the highest weight. The 17 studies were heterogeneous as the variability of the effect sizes is larger than would be expected from sampling error alone. This high heterogeneity indicated that variability across the primary studies largely stems from systematic factors, such as the type of studied well-being, type of outcome or differences in methodological quality of the studies.

We performed two subgroup analyses to evaluate whether the effects differed for positive affect or course of disease outcomes. When examining the effects separately for positive affect, the 13 studies on positive affect revealed an LR of 1.22 ( $p < .001$ ). Positive affect was significantly related to more survival and recovery. The distribution of effect sizes within studies on positive affect remained heterogeneous. Second, we performed a subgroup analysis on type of outcome. We split the studies in two groups, measuring recovery ( $n = 7$ ) or survival ( $n = 10$ ). Meta-analytically combining the studies on recovery and survival resulted in LRs of 1.39 ( $p = .02$ ) and 1.11 ( $p = .01$ ), respectively. Emotional well-being significantly predicted both survival and recovery later in time, with the strongest relation to recovery. Although the LR is higher for recovery, the confidence intervals show that the ratio for recovery is estimated with less precision than the ratio for survival. When taking type of outcome into account as a moderator, the heterogeneity remained moderate to large within studies on recovery and survival.

Moreover, we evaluated quality of the studies, follow-up length, publication year, and sample size as moderators of the relation between emotional well-being and course of disease by performing three meta-regression analyses. Results of the meta-regression were insignificant for study quality ( $B = -.56$ ;  $p = .24$ ), follow-up length ( $B = -.01$ ;  $p = .53$ ), publication year ( $B = .01$ ;  $p = .59$ ), and for sample size ( $B = -.00$ ;  $p = .23$ ).

Finally, we evaluated publication bias. The funnel plot indicated asymmetry, since the studies are mainly concentrated on the right side of the plot. The Egger's test of intercept ( $t = 4.41$ ;  $df = 15$ ;  $p < .001$ ) also suggests that bias exists. There is a significant correlation between study precision (the inverse of the standard error) and the standardized effect (the effect size divided by the standard error). Moreover, the fail-safe number indicated that 2.4 non-significant unpublished studies must be included in our random-effects model to reduce the overall significant effect to non-significance. The funnel plot, Egger's test of intercept and fail-safe number indicated the presence of publication bias. To gain insight in the grey literature, we searched the electronic databases for eligible dissertations. Three dissertations were eligible (Caron, 1997; Hamilton, 1996; Ostir, 2001), but excluded because the studies were already included in the meta-analysis (Ostir, 2001) or data required for meta-analysis were unavailable despite contacting the authors for additional information (Caron, 1997; Hamilton, 1996). These three dissertations reported positive effects in the dissertation abstract, showing positive effects of well-being on course of disease in unpublished studies. Furthermore, given the novelty of the focus on positive well-being in relation to physical health, it is unlikely that many studies with negative findings are unreported (Diener & Chan, 2011). However, we have to interpret the results in our meta-analysis carefully, since effects of well-being on course of disease might be overestimated.

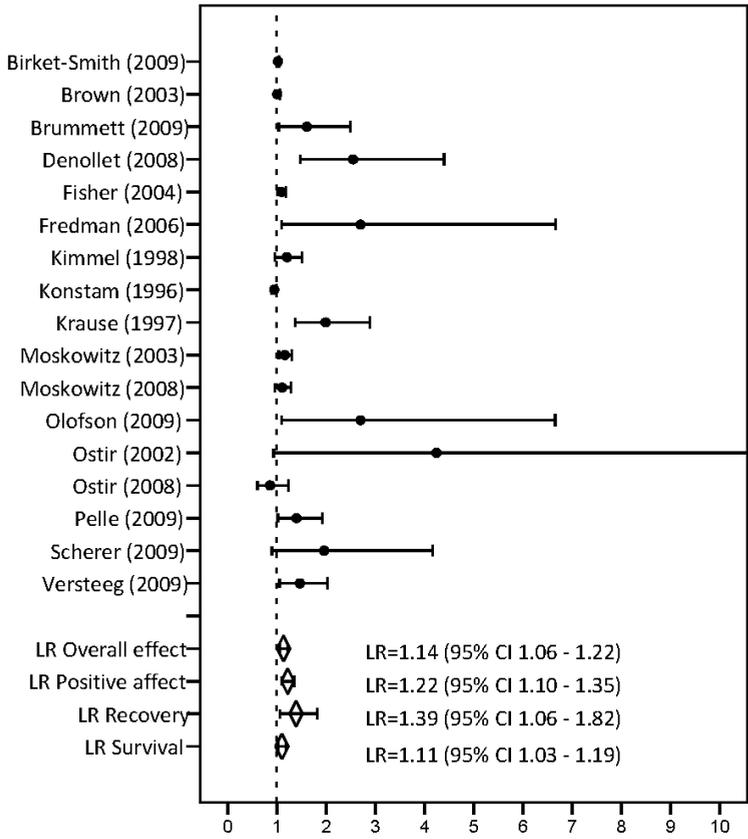


Figure 2. Forest plot.

## Discussion

### Main findings

This meta-analysis synthesized studies on emotional wellbeing as predictor of the prognosis of physical illness, while in addition evaluating the impact of putative moderators such as type of outcome. Although previous literature reviews included several of these study aims (Lyubomirsky et al., 2005; Pressman & Cohen, 2005; Howell et al., 2007; Chida & Steptoe, 2008; Veenhoven, 2008; Diener & Chan, 2011), this is the first study to our knowledge that combines all aspects into a single review. Our literature search identified 17 eligible papers, of which nine new studies in addition to the studies included in earlier reviews. This shows that the research field on the relation of positive well-being to physical health is growing rapidly.

Meta-analytically combining these studies showed that positive emotional well-being is favorably related to the prognosis of physical illness. Patients with higher baseline levels of emotional well-being have better recovery and survival rates than patients with low levels of emotional well-being. Although the effect is small, it is remarkable that emotional well-being at baseline has significant effects on physical health later in time, since the average follow-up is approximately after 4 years. The effect size of the relation between emotional well-being and course of disease is even similar for studies with short and long follow-ups.

Subgroup analyses indicated that emotional well-being is related to both survival and recovery. Moreover, positive affect is beneficial. Positive affect may influence immune and cardiovascular systems directly by activating the autonomic nervous system and the Hypothalamic-Pituitary-Adrenal axis (HPA) thus buffering the impact of stress. Positive affect has also an indirect favorable effect by increasing health behavior and engagement in social networks (Pressman & Cohen, 2005; Howell et al., 2007). There were not enough studies to conduct a subgroup analysis on life satisfaction (3 studies) and well-being (1 study).

### Recommendations for future research

It is important for future research to take into account that the impact of emotional well-being on course of disease might differ across health outcomes, well-being measures, and study populations. As suggested in previous literature reviews, effects might also differ across diseases (Chida and Steptoe, 2008). In addition, Pressman and Cohen (2005) and Veenhoven (2008) state that well-being has beneficial effects in relatively mildly diseased adults and negative effects in severely diseased adults. For our future understanding of

the role of well-being in disease progression, it is highly relevant whether well-being has similar effects in various disease populations. Unfortunately, the study populations in the current meta-analysis were too diverse to further investigate effects across diseases.

Moreover, other population characteristics could play a role in the relation between emotional well-being and course of disease. Pressman and Cohen (2005) found that positive affect was associated with lower mortality rates, mainly in older community-residing adults. They suggest that the association is possibly stronger in older participants. This meta-analysis could not unravel the effects of age and health outcome, since the studies on survival included patients of all ages, whereas studies on recovery more often included only older patients. Additionally, results could differ across gender. Brummett et al. (2009) and Fisher et al. (2004) found that effects of well-being on recovery were stronger for males than for females. In the current meta-analysis, the patient populations were too diverse to examine differential effects across well-being and outcome measures, diseases, age and gender, but we recommend investigating these aspects in future research.

### **Strengths and limitations**

One of the strengths of this systematic review is the focus on emotional well-being as the presence of well-being, positive affect, or life satisfaction. We investigated positive psychological aspects, whereas previous reviews also included studies on quality of life which use items on physical functioning and health. The focus on other aspects than emotional well-being was our main criterion for exclusion of studies. Aspects as vitality, energy, and optimism might indirectly measure health (Pressman & Cohen, 2005). In addition, we included control for baseline health status as a quality criterion, which was present in 14 of the 17 included studies.

Most studies used subscales from depression scales to measure positive affect. For example, both the Hospital Anxiety and Depression Scale (HADS) and the Center for Epidemiologic Studies Depression Scale (CES-D) include a subscale on positive affect. However, these questionnaires are designed to screen for depressive symptoms rather than to measure positive affect, resulting in low subscale reliability (Penninx, 2000). Additional studies need to be conducted, using reliable questionnaires which are designed to measure well-being, such as the Positive and Negative Affect Scales (PANAS; Watson et al., 1988) and Mental Health Continuum-Short Form (MHC-SF; Lamers et al., 2011).

Although most studies used depression scales to measure aspects of positive well-being, few studies included negative aspects of mental health such as psychopathology and negative affect as a confounding variable, to evaluate the unique

effects of emotional well-being. Studies that did evaluate the unique effects of positive emotional well-being report positive results, such as Brummett et al. (2009).

In addition, the results from our meta-analysis have to be interpreted carefully. First, the studies used different covariates varying from baseline health characteristics to demographic characteristics such as gender and age, making the studies diverse. The high heterogeneity confirmed that the variability across the studies was larger than would be expected from sampling error alone. Although study quality, in which control for baseline health status and for demographics were used as quality criteria, was not related to the effect size of the study, we have to take the high variability and diversity in covariates across studies into account. Moreover, the results have to be interpreted carefully because of potential publication bias. The effects of emotional well-being on recovery and survival might be overestimated.

### **Conclusion and implications**

Emotional well-being predicts long-term prognosis of physical illness. Higher levels of emotional well-being are beneficial for recovery and survival rates in physically diseased patients. Although the effects are small, the findings are important. Recovery and survival are highly relevant outcomes. Moreover, since physical diseases such as coronary heart disease and cancer are highly prevalent, small effects of emotional well-being on prognosis of physical illness have a large impact in the population. In addition, several psychological interventions are effective in enhancing well-being, such as Acceptance and Commitment Therapy (Fledderus et al., 2010) and well-being therapy (Fava et al., 1998). By the enhancement of wellbeing, these interventions might also improve recovery and survival in physical illness. Future research should investigate effects of psychological interventions on the prognosis of physical illness.

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# Chapter 7

## Reciprocal impact of positive mental health and psychopathology: Findings from a longitudinal representative panel study

Lamers, S. M. A., Westerhof, G. J., Glas, C. A. W., & Bohlmeijer, E. T. (submitted). Reciprocal impact of positive mental health and psychopathology: Findings from a longitudinal representative panel study

## Abstract

According to the two-continua model of mental health, positive mental health and psychopathological symptoms reflect two correlated dimensions. In this study, the reciprocal impact of positive mental health (i.e., the presence of emotional, psychological, and social well-being) and psychopathological symptoms was investigated at four measurement occasions in nine months. The study is new in several ways: by using a representative adult sample ( $N = 1,932$ ), broadly investigating both positive mental health (Mental Health Continuum-Short Form) and psychopathological symptoms (Brief Symptom Inventory), and by combining item response theory and latent growth modeling in the analyses. The nine-month courses of positive mental health and psychopathology were highly stable over time, although there was a significant variation across individuals. The most remarkable findings of our study were that changes in positive mental health predicted psychopathology later in time, as well as that changes in psychopathology predicted positive mental health later in time. The changes were even more important for psychopathology and positive mental health than the absolute levels of positive mental health and psychopathology, respectively. This underlines the relevance of enhancing positive mental health in addition to the alleviation of psychopathological symptoms and that mental health promotion should be an integral part of public health in addition to the alleviation of psychopathology.

## Introduction

In 2005, the World Health Organization (WHO) defined mental health as the presence of well-being and effective functioning in individual and community life. This positive approach of mental health corresponds to two traditions of studies in well-being, the hedonic and eudaimonic tradition, in which three types of well-being can be distinguished: emotional, psychological, and social well-being (Deci & Ryan, 2008; Waterman, 1993). Emotional well-being defines optimal well-being as the presence of life satisfaction and positive feelings, and the absence of negative feelings, following the hedonic tradition (Diener, Suh, Lucas, & Smith, 1999). Psychological and social well-being both encompass effective functioning in life and the optimal fulfillment of personal potentials, following the eudaimonic tradition. Psychological well-being addresses optimal functioning in individual life (Ryff & Keyes, 1995), whereas social well-being focuses on effective functioning in social and public life (Keyes, 1998). Together, emotional, psychological, and social well-being make up the definition of positive mental health, therefore taking both traditions in well-being research into account (Keyes, 2005).

There is accumulating evidence that positive mental health is indeed not merely the absence of psychopathology, but functions as an additional indicator of mental health. Positive mental health and psychopathology belong to two correlated factors, thus reflecting two dimensions of mental health. (Huppert & Whittington, 2003; Keyes, 2002; 2005; Lamers, Westerhof, Bohlmeijer, ten Klooster, & Keyes, 2011; Weich, et al., 2011; Westerhof & Keyes, 2010). This two-continua model is present at the genetic level as well. The genetic propensity for positive mental health is partly independent of the genetic propensity for mental illness (Kendler, Myers, Maes, & Keyes, 2011). The two-continua model of mental health implies that a person with high levels of psychopathology has a higher chance of experiencing low emotional, psychological, and social well-being, but may experience good positive mental health as well. Most studies confirmed the two-continua model of mental health based on a cross-sectional design by using a single measurement occasion (Compton, Smith, Cornish, & Qualls, 1996; Greenspoon & Saklofske, 2001; Headey, Kelley, & Wearing, 1993; Keyes, 2006; Keyes, Eisenberg, Dhingra, Perry, & Dube, in press; Keyes, Wissing, Potgieter, Temane, Kruger, & van Rooy, 2008; Masse, Poulin, Dassa, Lambert, Belair, & Battaglini, 1998; Suldo & Shaffer, 2008; Westerhof & Keyes, 2010). With positive mental health and psychopathology reflecting two dimensions of mental health, the courses over time may be different as well. Since good positive mental health is not automatically accompanied by few symptoms of psychopathology, an increase in positive mental health may not automatically be accompanied by a decrease in psychopathology over time. However, there is a lack of studies investigating the two-continua model by using a longitudinal design.

To date, studies that examined the longitudinal change in positive mental health, focused only on emotional well-being. Findings consistently indicate that individual levels of emotional well-being are reasonably stable over weeks (Eid & Diener, 2004) as well as over years (Fujita & Diener, 2005) and tend to revert to a fixed level (i.e., set point) (Diener, Lucas, & Scollon, 2006). However, levels of emotional well-being can change, for example as a consequence of important life events (Diener et al., 2006; Headey & Wearing, 1989). Studies on psychopathology show similar findings. Psychopathology such as depression and anxiety is relatively stable, mainly when comorbidity is present (e.g., Merikangas et al., 2003; Rhebergen et al., 2011). Although these findings indicate that emotional well-being and psychopathology are relatively stable, yet amenable for change, there are no studies that investigate the longitudinal course of positive mental health by including emotional, psychological, as well as social well-being, nor studies that directly compare the longitudinal courses of positive mental health and psychopathology. This study aims to gain insight into the stability or change in positive mental health and psychopathological symptoms in the general adult population, using four measurement occasions in nine months.

Positive mental health may not only be distinct from psychopathology, but may also function as a predictor of the course of psychopathology. In this study, we evaluate positive mental health and psychopathology in a longitudinal design, providing information on the prospective association between positive mental health and psychopathology. This is highly relevant for mental health care, where studies increasingly evaluate the impact of interventions aimed at enhancing positive mental health (for overviews and meta-analyses: Bolier, Haverman, Westerhof, Riper, Smit, & Bohlmeijer, under review; Duckworth et al., 2005; Sin & Lyubomirsky, 2009). However, the relevance of investing in positive mental health has hardly been corroborated at all by epidemiological, longitudinal studies. Do changes in positive mental health influence later levels of psychopathological symptoms? Moreover, the effects on positive mental health of interventions aimed at alleviating psychopathological symptoms are largely unknown. Do changes in psychopathology influence later levels of positive mental health? The present study aims to investigate this reciprocal impact of positive mental health and psychopathology in a longitudinal panel study.

To our knowledge only two studies (Keyes, Dhingra, & Simoes, 2010; Wood & Joseph, 2009) have examined the longitudinal association of positive mental health with psychopathology. Both studies showed interesting results. The absence of psychological well-being formed a substantial risk factor for depression (Wood & Joseph, 2009). Adults with low psychological well-being were over seven times more likely to be depressed ten years later, and twice as likely to be depressed after controlling for personality, negative

functioning, prior depression, demographic, economic and physical health status. Keyes and colleagues (2010) showed that change in positive mental health predicted the prevalence and incidence of major depressive disorders, panic disorders, and generalized anxiety disorders ten years later. These studies are the first to prospectively examine the association of positive mental health with psychopathology by using a ten-year follow-up, indicating that positive mental health functions as a predictor of the course of psychopathology. However, both studies had limitations as well. First, the study of Wood and Joseph (2009) used a selective sample of older adults and merely focused on psychological well-being and depressive symptomatology. Second, both studies (Keyes et al., 2010; Wood & Joseph, 2009) only used two measurement occasions. Third, the studies examined the predictive effects of positive mental health on psychopathology, but did not investigate the predictive effects of psychopathology on positive mental health.

The present study aims to examine the prospective relation between positive mental health and psychopathological symptoms using a more robust design and methods, and is new in several ways. We use a representative sample of adults that covers the complete adult life span. Furthermore, we broadly assess positive mental health by including emotional, psychological as well as social well-being, and measure psychopathology by a large variety of symptoms. Moreover, we investigate both positive mental health and psychopathology at four measurement occasions in nine months, to gain insight into the courses of positive mental health and psychopathology. Although Wood and Joseph (2009) and Keyes and colleagues (2010) showed that positive mental health predicted future psychopathology, the reciprocity between positive mental health and psychopathology remains unclear. The present study evaluates the predictive effects of positive mental health on psychopathology, as well as the predictive effects of psychopathology on positive mental health, to directly compare the strength of both predictive associations. Last, we applied sophisticated statistical analyses, using a combination of item response theory and latent growth modeling based on Bayesian methods. By estimating latent variables in the model, there is less confounding between the measurement error and true change in positive mental health and psychopathology over time, resulting in better estimations of the course in positive mental health and psychopathological symptoms.

The aim of our study is twofold. First, we investigate the average courses over time, to gain insight into the average change or stability in positive mental health and psychopathological symptoms during the course of nine months. We hypothesize that, on average, both positive mental health and psychopathology show stability over time, in line with studies on emotional well-being (Diener et al., 2006; Eid & Diener, 2004; Fujita & Diener, 2005) and psychopathology (e.g., Merikangas et al., 2003; Rhebergen et al., 2011),

and in accordance with the relatively short time-span and the general and representative sample of adults. We expect the levels and courses of positive mental health and psychopathology to be negatively correlated, in line with earlier studies (e.g., Lamers et al., 2011). Second, the study examines whether changes in positive mental health are predictive for levels of psychopathological symptoms later in time. To gain insight into the reciprocal impact of positive mental health and psychopathological symptoms, we also examine whether changes in psychopathological symptoms are associated with levels of positive mental health later in time. We hypothesize that changes in positive mental health are predictive for future psychopathological symptoms, as well as that changes in psychopathological symptoms are predictive for future positive mental health. Therefore, we not only investigate the longitudinal associations separately, but also simultaneously in a single model to directly compare the strength of the associations.

## Method

### Participants

A representative sample of 1,932 Dutch respondents between the ages of 18 and 88 participated by filling out questionnaires at one or more points in time. The sample was stratified by age group (18-29; 30-49; 50-64; 65+), gender, and whether the respondents were native Dutch or not. Of the respondents, 20.7% were between 18-29 years old, 29.2% were 30-49 years old, 26.3% were 50-64 years old, and 23.8% were 65+. Half of the respondents were male (49.4%) and married (52.7%). The majority was native Dutch (77.6%), and for 4.9% information on their origin was missing. Of the respondents, 10% had primary education (6 years), 26.5% lower vocational (10 years), 11.4% secondary (11-12 years), 22.3% middle vocational (13 years), 21.4% higher vocational (15 years), and 8.4% had university education (16 years).

### Procedures

This paper draws on data of the LISS panel of CentERdata, a representative internet panel for Longitudinal Internet Studies in the Social sciences. The panel consists 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 households are provided with internet access or a Personal Computer when necessary. In one-third of the households, one member was selected to fill out questionnaires on mental health in December 2007 ( $T_0$ ), and March ( $T_1$ ), June ( $T_2$ ) and September 2008 ( $T_3$ ). In total, 1,932 respondents filled out this module at one or more measurement occasions

(1,662 at  $T_0$ ; 1,675 at  $T_1$ ; 1,243 at  $T_2$ ; 1,466 at  $T_3$ ). Half of the respondents (50.8%) filled out all four modules. Respondents who completed all measurements did not differ in terms of gender, marital status, migratory status, educational level, psychopathological symptoms, or positive mental health ( $p > .05$ ), but they were older than the respondents who did not complete four measurements ( $F(1,1930) = 7,27; p < .05$ ).

## Measures

The *Mental Health Continuum-Short Form* (MHC-SF; Keyes et al., 2008; Lamers et al., 2011) was used to measure positive mental health. The MHC-SF consists of 14 items which represent theoretically derived feelings of well-being. Respondents rated the frequency of each feeling in the past month on a Likert scale from 0 (*never*) to 5 (*every day*). Higher scores indicate higher levels of positive mental health. The Dutch version of the MHC-SF has shown good psychometric properties (Lamers et al., 2011) and stability in the item parameters over time (Lamers, Glas, Westerhof, & Bohlmeijer, 2012). In the present study, Cronbach's alpha for positive mental health varied between 0.89 ( $T_0$ ) and .91 ( $T_2$ ).

The *Brief Symptom Inventory* (BSI; Dutch version: de Beurs & Zitman, 2006) was used to measure psychopathology. It is among the most commonly used instruments for screening and assessing psychopathology in mental health services in the United States. Respondents indicated the degree to which they had experienced 53 psychological symptoms in the past week using a 5-point Likert scale from 0 (*not at all*) to 4 (*a lot*). Higher scores indicate higher levels of psychopathology. The Cronbach's alpha's were 0.95 ( $T_0$ ,  $T_1$  and  $T_2$ ) and 0.96 ( $T_3$ ) in the present study.

## Statistical analyses

The statistical analyses were done using a combination of item response theory (IRT) modeling and latent growth modeling. The advantage of using an IRT model is that it accounts for measurement error in the analyses. Moreover, missing data are easily accommodated. The estimates were made using the observed response patterns only. That is, the method did not involve any imputation of missing data. Both the item responses to the MHC and BSI were modeled by an IRT model for polytomously scored items, the sequential model by Tutz (1992). The results obtained using this model are analogous to those obtained with other much used models, such as the graded response model and the partial credit model (Verhelst, Glas and de Vries, 1997). In the sequential model, every item response of a person labeled  $n$  to an item labeled  $i$  was modeled by an individual latent person parameter  $\theta_n$  and one or more item parameters.

In the present case, two measurement instruments at four measurement occasions were available.

The associated latent variables were denoted by  $\theta_{nt}^{(MHC)}$  and  $\theta_{nt}^{(BSI)}$ , for the measurement occasions  $t=0, \dots, 3$ , respectively. The latent variables were identified in such a way that high values correspond to high expected scores on the instruments.

Two analyses were carried out. The first analysis was done to investigate the average courses of positive mental health and psychopathology over time. The latent growth models used were

$$\theta_{nt}^{(MHC)} = \xi_{n0} + \xi_{n1}t + \varepsilon_{nt}^{(MHC)}$$

and

$$\theta_{nt}^{(BSI)} = \lambda_{n0} + \lambda_{n1}t + \varepsilon_{nt}^{(BSI)},$$

where  $\varepsilon_{nt}^{(MHC)}$  and  $\varepsilon_{nt}^{(BSI)}$  were normally distributed independent error terms. Note that these models imply that growth is a linear function of time, where every person  $n$  had two individual linear growth curves with intercepts  $\xi_{n0}$  and  $\lambda_{n0}$ , and slopes  $\xi_{n1}$  and  $\lambda_{n1}$ , respectively. The slope for the regression of the MHC on time,  $\xi_{n1}$ , was predicted from the initial level on the BSI,  $\lambda_{n0}$ , and the slope for the regression of BSI on time,  $\lambda_{n1}$ , was predicted from the initial level on the MHC,  $\xi_{n0}$ , that is

$$\xi_{n1} = \mu_1 + \delta_1 \lambda_{n0} + \varepsilon_{n1}$$

and

$$\lambda_{n1} = \mu_2 + \delta_2 \xi_{n0} + \varepsilon_{n2},$$

where, again,  $\varepsilon_{n1}$  and  $\varepsilon_{n2}$  were normally distributed independent error terms.

The model is depicted graphically in Figure 1. The squares are the observed scores on the two instruments, the circles are the intercepts and slopes of the two latent regression models. It can be seen that the intercepts and slopes have dependent normal distributions, and covariances between initial levels  $Cov(\xi_{n0}, \lambda_{n0})$ , slopes  $Cov(\xi_{n1}, \lambda_{n1})$ , and intercepts and slopes ( $Cov(\xi_{n0}, \lambda_{n1})$  and  $Cov(\xi_{n1}, \lambda_{n0})$ ) are also denoted in the figure.

In the second analysis, we predicted the levels of positive mental health and psychopathology from their previous levels and from the change in these levels using two sets of latent regression equations:

$$\theta_{nt}^{(MHC)} = \delta_1 \theta_{nt-1}^{(MHC)} + \delta_2 \theta_{nt-1}^{(BSI)} + \delta_3 (\theta_{nt}^{(BSI)} - \theta_{nt-1}^{(BSI)}) + \varepsilon_{nt}^{(MHC)}$$

and

$$\theta_{nt}^{(BSI)} = \delta_4 \theta_{nt-1}^{(BSI)} + \delta_5 \theta_{nt-1}^{(MHC)} + \delta_6 (\theta_{nt}^{(MHC)} - \theta_{nt-1}^{(MHC)}) + \varepsilon_{nt}^{(BSI)},$$

for  $t = 1, \dots, 3$ , where again  $\varepsilon_{nt}^{(MHC)}$  and  $\varepsilon_{nt}^{(BSI)}$  are normally distributed independent error terms. So the current level of positive mental health,  $\theta_{nt}^{(MHC)}$  was predicted from the previous level of positive mental health  $\theta_{nt-1}^{(MHC)}$ , the previous level of psychopathology  $\theta_{nt-1}^{(BSI)}$  and the change in psychopathology  $(\theta_{nt}^{(BSI)} - \theta_{nt-1}^{(BSI)})$ , where  $\delta_1$ ,  $\delta_2$  and  $\delta_3$  were the three regression coefficients. The model for the prediction of psychopathology was built up analogously. The models were first estimated separately for each instrument and each measurement occasion  $t = 1, \dots, 3$  separately, and then for both instruments and all measurement occasions simultaneously. The latter analysis provided insight into the question whether psychopathology was a stronger indicator for positive mental health than vice versa. The model is depicted graphically in Figure 2. All models were estimated in a Bayesian framework using the WinBugs software (Lunn, Spiegelhalter, Thomas, & Best, 2009). The parameters of the IRT models were estimated concurrently with the parameters of the latent growth models.

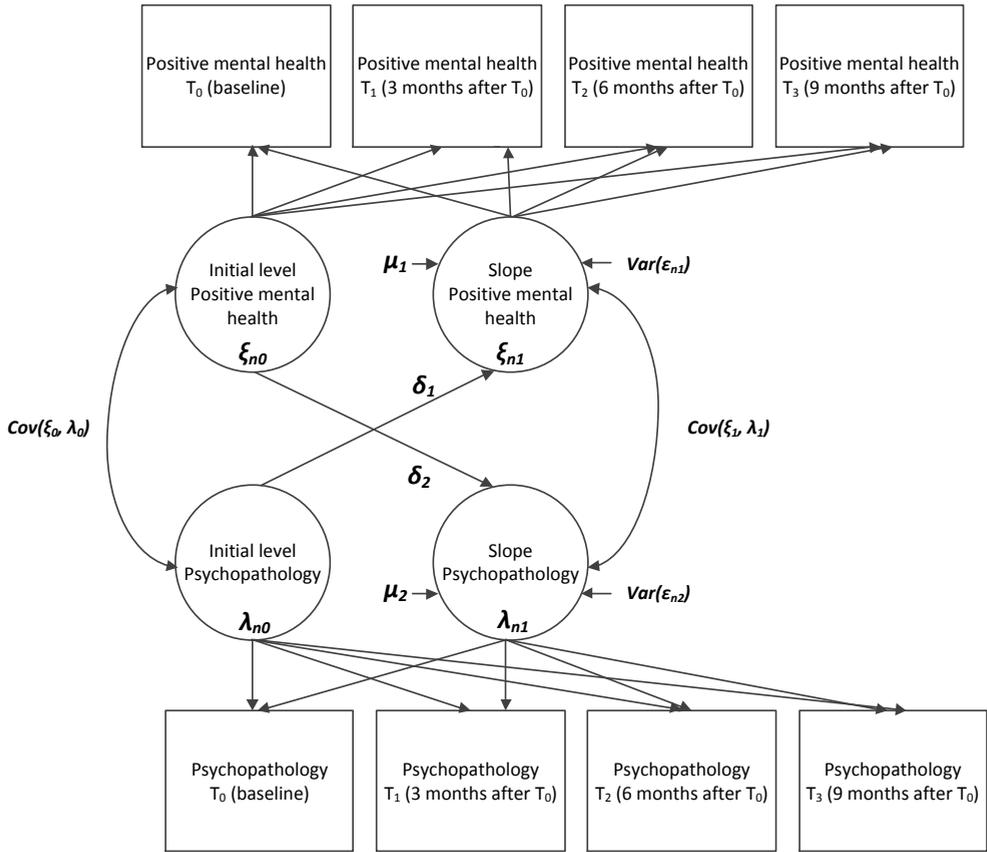


Figure 1. Linear model

## Results

The first aim of the study was to investigate the courses of positive mental health (MHC) and psychopathological symptoms (BSI) over time in order to gain insight into the average change or stability during the course of a nine-month period. Table 1 shows the findings of the analysis, based on the model as presented in Figure 1.

Table 1.

*Results of the linear model*

	Parameter	Estimate (Posterior SD)
<i>Average Slopes</i>		
MHC	$\mu_1$	-.06 (.01)*
BSI	$\mu_2$	.01 (.01)
<i>Dependence Slopes and Initial Level</i>		
Slope MHC and initial level BSI	$\delta_1$	-.00 (.01)
Slope BSI and initial level MHC	$\delta_2$	-.03 (.01)*
<i>Residual Variance Slopes</i>		
Residual variance slope MHC	$Var(\epsilon_{n1})$	.10 (.01)*
Residual variance slope BSI	$Var(\epsilon_{n2})$	.09 (.00)*
<i>Covariances</i>		
Initial levels MHC and BSI	$Cov(\xi_0, \lambda_0)$	-.32 (.01)*
Slopes MHC and BSI	$Cov(\xi_1, \lambda_1)$	-.02 (.01)*

*Note.* MHC = measure for positive mental health; BSI = measure for psychopathology.

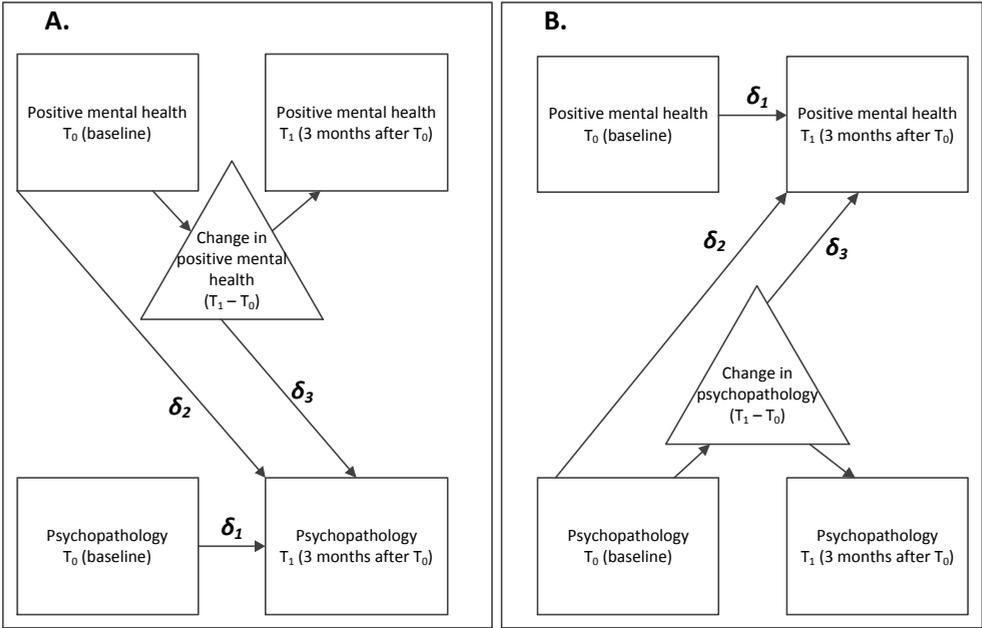
\*  $p < .05$ .

The model included the following key variables: the average of the slopes of the individual linear regression of the MHC on the BSI ( $\mu_1$ ), the dependence of these slopes on the initial value of the BSI ( $\delta_1$ ), the average of the slopes of the individual linear regression of the BSI on the MHC ( $\mu_2$ ) and the dependence of these slopes on the initial level of the MHC ( $\delta_2$ ). The model showed a good fit to the data ( $RMSA = .048$ ,  $p(RMSA < .05) = 0.604$ ). In line with our hypothesis, both positive mental health and psychopathological symptoms were highly stable over time, as indicated by the average slope estimates ( $\mu_1$  and  $\mu_2$ , respectively, where only  $\mu_1$  differed significantly from zero). As expected, the initial values of positive mental health and psychopathological symptoms were negatively correlated ( $Cov(\xi_0, \lambda_0) = -.32$ ). The slopes of positive mental health and psychopathology showed a low correlation ( $Cov(\xi_1, \lambda_1) = -.02$ ). The variance of the slopes of the personal regressions of MHC on time was significant, that is,  $Var(\epsilon_{n1}) = .10$  and, analogously, the variance of the slope of the regression of the BSI on time was  $Var(\epsilon_{n2}) = .09$ . The average slope of the

regression of the BSI on time depended negatively and significantly on the initial level of the MHC ( $\delta_2 = -.03$ ): respondents with higher initial levels of positive mental health increased in psychopathological symptoms over time. The average slope of the regression of the MHC over time was not significantly associated with the initial level of the BSI. In sum, on average respondents hardly changed at all in their levels of positive mental health and psychopathological symptoms during the nine-month period, although there was individual variation in the personal regressions.

The second aim of the study was to investigate whether changes in positive mental health were predictive for levels of psychopathological symptoms later in time. Moreover, we also examined whether changes in psychopathological symptoms were associated with levels of positive mental health later in time, to gain insight into the reciprocal impact of positive mental health and psychopathology. First, we estimated these associations separately for predicting positive mental health or psychopathology, and for the four measurement occasions. Figure 2 illustrates the model. Panel A (on the left) shows an example of change in positive mental health as a predictor of psychopathological symptoms later in time. Change in positive mental health between  $T_1$  and  $T_0$  ( $\delta_3$ ) was included in the model as a predictor of psychopathology at  $T_1$ , when controlling for psychopathology at  $T_0$  ( $\delta_1$ ) and positive mental health at  $T_0$  ( $\delta_2$ ).

The upper panel in Table 2 shows the results. The column labeled 'Estimates' gives the parameter estimates in terms of the IRT model, the column labeled 'Standardized Estimates' gives the standardized estimates to support the variance explained by the regression models. There was a high autocorrelation of psychopathology at  $T_0$  and  $T_1$  ( $\delta_1 = .86$ ), but positive mental health at  $T_0$  had an additional negative correlation to psychopathology at  $T_1$  ( $\delta_2 = -.13$ ). Most important, the change in positive mental health between  $T_1$  and  $T_0$  contributed significantly to the level of psychopathology at  $T_1$  ( $\delta_3 = -.21$ ). The change in positive mental health showed even stronger associations to the level of psychopathology at  $T_1$  than the absolute level of positive mental health earlier in time (at  $T_0$ ). Together, psychopathology and positive mental health at  $T_0$  and change in positive mental health between  $T_1$  and  $T_0$  explained 64% of the variance in psychopathology at  $T_1$ .



**Figure 2.** Panel A (on the left) shows an example of change in positive mental health as a predictor of psychopathology later in time. In this example, change in positive mental health between  $T_1$  and  $T_0$  ( $\delta_3$ ) is included in the model as a predictor of psychopathology at  $T_1$ , when controlling for psychopathology at  $T_0$  ( $\delta_1$ ) and positive mental health at  $T_0$  ( $\delta_2$ ). Panel B (on the right) shows an example of change in psychopathology as a predictor of positive mental health later in time. In this example, change in psychopathology between  $T_1$  and  $T_0$  ( $\delta_3$ ) is included in the model as a predictor of positive mental health at  $T_1$ , when controlling for positive mental health at  $T_0$  ( $\delta_1$ ) and psychopathology at  $T_0$  ( $\delta_2$ ).

In line with this model, we conducted similar analyses in predicting psychopathology at  $T_2$  from the change in positive mental health between  $T_2$  and  $T_1$ , while controlling for psychopathology and positive mental health at  $T_1$ , and in predicting psychopathology at  $T_3$  from the change in positive mental health between  $T_3$  and  $T_2$ , while controlling for psychopathology and positive mental health at  $T_2$ . These results were similar to those for psychopathology at  $T_1$  (see the middle and bottom panel of Table 2). In each of the three analyses, there was a high autocorrelation between levels of psychopathological symptoms, in line with the stability over time in response to our first study aim. Moreover, change in positive mental health was more important for future psychopathological symptoms than the absolute degree of positive mental health. The similarity of the results at each of the three measurement occasions ( $T_1$ ,  $T_2$ , and  $T_3$  as outcome) underlines the stability of the findings.

Table 2.

Change in positive mental health as a predictor of psychopathology at  $T_1$ ,  $T_2$ , and  $T_3$ , in line with the model in Figure 2 (A).

	Parameter	Estimate (SD)	Standardized Estimate (SD)
<i>Psychopathology <math>T_1</math></i>			
BSI $T_0$	$\delta_1$	.86 (.02)*	.77(.02)*
MHC $T_0$	$\delta_2$	-.13 (.02)*	-.12(.02)*
Change in MHC $T_1 - T_0$	$\delta_3$	-.21 (.02)*	-.19(.02)*
Unexplained variance	<i>Var</i>	.45 (.05)*	.36(.04)*
<i>Psychopathology <math>T_2</math></i>			
BSI $T_1$	$\delta_1$	.94 (.03)*	.77(.03)*
MHC $T_1$	$\delta_2$	-.12 (.03)*	-.09(.03)*
Change in MHC $T_2 - T_1$	$\delta_3$	-.19 (.03)*	-.15(.03)*
Unexplained variance	<i>Var</i>	.56 (.03)*	.38(.03)*
<i>Psychopathology <math>T_3</math></i>			
BSI $T_2$	$\delta_1$	.86 (.02)*	.73(.02)*
MHC $T_2$	$\delta_2$	-.13 (.03)*	-.11(.03)*
Change in MHC $T_3 - T_2$	$\delta_3$	-.30 (.03)*	-.26(.02)*
Unexplained variance	<i>Var</i>	.53 (.03)*	.39(.02)*

Note. MHC = measure for positive mental health; BSI = measure for psychopathology.

\*  $p < .05$ .

In addition, we investigated the predictive association of change in psychopathological symptoms with positive mental health later in time. Panel B (on the right) in Figure 2 shows an example where change in psychopathological symptoms between  $T_1$  and  $T_0$  ( $\delta_3$ ) is included in the model as predictor of positive mental health at  $T_1$ , when controlling for positive mental health at  $T_0$  ( $\delta_1$ ) and psychopathological symptoms at  $T_0$  ( $\delta_2$ ). Again, we conducted three analyses in predicting positive mental health at  $T_1$ ,  $T_2$ , and  $T_3$  from the change in psychopathology between  $T_1$  and  $T_0$ , between  $T_2$  and  $T_1$ , and between  $T_3$  and  $T_2$ , respectively, where we controlled for earlier levels of positive mental health and psychopathology. The results are shown in Table 3. For example, the upper panel of Table 3 shows the results of the model in Panel B (on the right) of Figure 2. There was a high correlation between positive mental health at  $T_0$  and  $T_1$  ( $\delta_1 = .81$ ), and an additional negative correlation of psychopathology at  $T_0$  to positive mental health at  $T_1$  ( $\delta_2 = -.20$ ). Change in psychopathology between  $T_1$  and  $T_0$  was moderately associated with positive mental health at  $T_1$  ( $\delta_3 = -.34$ ). The unexplained variance was 49%. The analyses on positive mental health at  $T_2$  and  $T_3$  showed similar results.

In general, the pattern is similar to the pattern for positive mental health in the prediction of psychopathology. There was a positive autocorrelation, and the change in psychopathology or positive mental health was a stronger predictor than the absolute level of psychopathology or positive mental health. In line with our hypothesis, changes in positive mental health were predictive for future psychopathological symptoms, while at the same time changes in psychopathological symptoms were predictive for future positive mental health. The unexplained variance was higher for positive mental health than for psychopathology, indicating that changes in psychopathology may be better predictors of future positive mental health than vice versa. However, the analyses were conducted separately and are therefore not directly comparable. In the next analysis, we simultaneously estimated the longitudinal reciprocal effects between positive mental health and psychopathological symptoms, using all four measurement occasions.

Table 3.

*Change in psychopathology as a predictor of positive mental health at  $T_1$ ,  $T_2$ , and  $T_3$ , in line with the model in Figure 2 (B).*

	Parameter	Estimate (SD)	Standardized Estimate (SD)
<i>Positive mental health <math>T_1</math></i>			
MHC $T_0$	$\delta_1$	.81 (.02)*	.64(.02)*
BSI $T_0$	$\delta_2$	-.20 (.03)*	-.16(.02)*
Change in BSI $T_1 - T_0$	$\delta_3$	-.34 (.04)*	-.27(.03)*
Unexplained variance	<i>Var</i>	.78 (.04)*	.49(.03)*
<i>Positive mental health <math>T_2</math></i>			
MHC $T_1$	$\delta_1$	.82 (.03)*	.68(.03)*
BSI $T_1$	$\delta_2$	-.06 (.03)*	-.05(.03)*
Change in BSI $T_2 - T_1$	$\delta_3$	-.23 (.04)*	-.19(.04)*
Unexplained variance	<i>Var</i>	.71 (.05)*	.50(.04)*
<i>Positive mental health <math>T_3</math></i>			
MHC $T_2$	$\delta_1$	.78 (.03)*	.63(.03)*
BSI $T_2$	$\delta_2$	-.16 (.03)*	-.13(.03)*
Change in BSI $T_3 - T_2$	$\delta_3$	-.34 (.03)*	-.27(.03)*
Unexplained variance	<i>Var</i>	.78 (.04)*	.51(.03)*

*Note.* MHC = measure for positive mental health; BSI = measure for psychopathology.

\*  $p < .05$ .

Table 4 shows the results of the simultaneous estimation of change in positive mental health as a predictor of psychopathological symptoms and change in psychopathological symptoms as a predictor of positive mental health, using the four measurement occasions. In line with the separate analyses, there was a high autocorrelation for both positive mental health ( $\delta_1 = .92$ ) and psychopathology ( $\delta_4 = 1.00$ ). Initial levels of psychopathology showed an association with positive mental health later in time ( $\delta_2 = .05$ ), whereas the association of initial levels of positive mental health to later psychopathological symptoms was not significant. Remarkably, change in psychopathological symptoms as well as change in positive mental health were much more important predictors of future positive mental health and psychopathological symptoms, respectively ( $\delta_3 = -.85$  and  $\delta_6 = -.58$ ). A decrease in psychopathology was associated with better positive mental health later in time, whereas a decrease in positive mental health was associated with a higher level of psychopathological symptoms later in time. Since the latent variables were estimated simultaneously, the estimates were directly comparable. The findings show that changes in psychopathology were better predictors of future positive mental health, than changes in positive mental health were of future psychopathology. This is additionally reflected by the higher unexplained variance for positive mental health as compared to psychopathology. By including initial levels of positive mental health and psychopathology at four measurement occasions, as well as changes in positive mental health and psychopathology in a single model, we were able to explain more than two-thirds of the variance in positive mental health and psychopathology. Finally, an analogous analysis was carried out without the change in the MHC and BSI as indicators. Comparing this analysis with the analysis of Table 4 showed that the change in the BSI accounted for 27% of the explained variance in the MHC, and that the change in the MHC accounted for 18% in the change in the BSI.

Table 4.

*Change in positive mental health as a predictor of psychopathology and change in psychopathology as a predictor of positive mental health in a simultaneous model using all four measurement occasions ( $T_0 - T_3$ )*

	Parameter	Estimate (SD)	Standardized Estimate (SD)
<i>Positive mental health</i>			
MHC	$\delta_1$	.92 (.01)*	.66(.01)*
BSI	$\delta_2$	.05 (.01)*	.03(.01)*
Change in BSI	$\delta_3$	-.85 (.03)*	-.61(.03)*
Unexplained variance	<i>Var</i>	.39 (.02)*	.20(.02)*
<i>Psychopathology</i>			
BSI	$\delta_4$	1.00 (.01)*	.79(.01)*
MHC	$\delta_5$	.01 (.01)	.01(.01)
Change in MHC	$\delta_6$	-.58 (.02)*	-.46(.02)*
Unexplained variance	<i>Var</i>	.26 (.02)*	.16(.02)*

*Note.* MHC = measure for positive mental health; BSI = measure for psychopathology.

\*  $p < .05$ .

## Discussion

In this study, we investigated positive mental health (i.e., the presence of emotional, psychological, and social well-being) and psychopathological symptoms at four measurement occasions with intervals of three months. The study is new in several ways. We used a representative sample of Dutch adults ( $N = 1,932$ ) between the ages of 18 and 88, broadly investigated positive mental health and psychopathological symptoms, not only examined the predictive effects of positive mental health on psychopathology, but also of psychopathology on positive mental health, and used highly sophisticated analyses. According to the two-continua model, positive mental health and psychopathology are two correlated dimensions of mental health. Our evaluation of positive mental health and psychopathology additionally confirms this two-continua model. The courses of positive mental health and psychopathology during the course of a nine-month period are only weakly correlated. Moreover, changes in positive mental health were predictive for levels of psychopathology later in time, and vice versa. This would not have been possible from the traditional view of positive mental health and psychopathology as mere opposites, since we controlled for initial levels of positive mental health and psychopathological symptoms. The predictive associations of changes in positive mental health and psychopathological symptoms, on top of initial levels of positive mental health and psychopathology, reveal that both dimensions of mental health are complementary.

On average, positive mental health and psychopathological symptoms were on average highly stable over time, which is in line with earlier findings. Although most studies used a longer time span of several years, levels of emotional well-being are found to be highly stable over time (Diener et al., 2006; Eid & Diener, 2004; Fujita & Diener, 2005) and psychopathology such as depression and anxiety is relatively stable as well, mainly when comorbidity is present (e.g., Merikangas et al., 2003; Røhde et al., 2011). Our finding of high average stability is also in line with the relatively short time span of nine months and the broad, representative sample of adults. The significant variances indicated that individuals differ in the courses of positive mental health and psychopathological symptoms, but because some individuals increase whereas others decrease, there is stability on average. Moreover, the stability is in line with earlier findings that the item parameters, reliabilities, means and standard deviations of the Mental Health Continuum-Short Form, used to measure positive mental health, are highly stable over time (Lamers et al., 2012).

Our findings indicate that both positive mental health and psychopathology are relatively stable over the course of a nine-month period. Additional research is necessary to investigate nonlinear changes in positive mental health, since we used linear growth models to estimate the courses of both mental health continua. Moreover future research needs to investigate stability or changes in positive mental health and psychopathology over a period of several years. Findings on emotional well-being indicate that levels tend to revert to a fixed level, but that levels of emotional well-being can change, for example after important life events (Diener et al., 2006; Headey & Wearing, 1989). Whether this holds for psychological and social well-being needs to be explored in future studies, since positive mental health consists of three factors (Lamers et al., 2011).

The most remarkable findings of our study are that changes in positive mental health predict psychopathology later in time and that changes in psychopathology predict positive mental health later in time. The changes are even more important for psychopathology and positive mental health than the absolute levels of positive mental health and psychopathology, respectively. Since levels of psychopathology and positive mental health tend to be highly stable, it is even more relevant when changes do occur. These findings have implications for mental health care. First, interventions that alleviate psychopathology, may also lead to better positive mental health. Although many studies already established the effects of psychopathology and mental illnesses on quality of life (e.g., Eack & Newhill, 2007; Hansson, 2006; Zatzick et al., 1997), our study shows that psychopathology not only influences aspects of emotional well-being that are often included in measures of quality of life, but also individual functioning in private (psychological well-being) as well as in social life (social well-being). Rather than the

amount of psychopathological symptoms, changes in the level of symptoms are relevant for positive mental health, which further underlines the importance of interventions that alleviate psychopathological symptoms. Second, our study emphasizes the relevance of recent developments, building on the movement of positive psychology (Seligman & Csikszentmihalyi, 2000), to enhance positive mental health in addition to the alleviation of psychopathological symptoms (Bolier et al., under review; Duckworth et al., 2005; Sin & Lyubomirsky, 2009; Slade, 2010). Since changes in positive mental health predict future levels of psychopathological symptoms, the enhancement of positive mental health may lead to less psychopathology. With this, interventions that promote positive mental health are complementary to interventions aimed at alleviating psychopathology. As Keyes et al. (2010) and Wood and Joseph (2009) already indicated, positive mental health may act as a buffer against psychopathology. Using more robust methods, our findings further support their findings of the predictive effects of positive mental health on psychopathology. Future research should investigate the practical consequences of these findings, for example whether enhancement of positive mental health is applicable for relapse prevention. Although more research is needed to validate the findings in clinical samples as well as by evaluating effects of interventions on both psychopathological symptoms and psychopathology, our study emphasizes that mental health promotion should be an integral part of public health in addition to the alleviation of psychopathology.

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# Chapter 8

General discussion

## General discussion

With the professionalization of the discipline of psychology, psychopathology gained more attention in mental health care in line with the medical model. This yielded many advantages, but had a downside as well. The current approach of clinical psychology focuses on mental illnesses, accompanied by the risk that the person will be reduced to the sum of his or her problems and that the individual behind the problems will be neglected. In this thesis, we therefore approached mental health from a positive perspective as the presence of emotional, psychological, and social well-being. In this chapter we will discuss the three main topics of the thesis. First, we will address the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF), a self-report questionnaire for the measurement of positive mental health. Second, we will discuss the relevance of positive mental health, based on our findings on the relation between positive mental health and psychopathology in view of the two-continua model as discussed in the General introduction (Chapter 1). Third, the chapter elaborates on the implications of positive mental health, discussing the predictive effects of positive mental health on physical health and psychopathology. The chapter will end with a discussion of the strengths and limitations of this thesis and recommendations for practice.

### Measurement of positive mental health

Mental Health Continuum-Short Form (MHC-SF), a self-report questionnaire for measuring positive mental health, was evaluated in the Chapters 2 and 3. For a long period of time, many instruments were developed to measure aspects of emotional well-being, such as positive feelings and life satisfaction. The World Database of Happiness (Veenhoven, 2010) contains 1,164 different self-report measures of emotional well-being, with 850 variations of single items measuring one aspect of well-being. Only a few questionnaires measure multiple dimensions of well-being, such as the Control, Autonomy, Self-realization, and Pleasure Scale (CASP; Hyde, Wiggins, Higgs, & Blane, 2003) and the Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant, Hiller, Fishwick, Platt, Joseph, et al., 2007). The MHC-SF has many advantages above these questionnaires on positive aspects of mental health. The MHC-SF fits in with the hedonic and eudaimonic tradition in well-being research, it covers emotional, psychological as well as social well-being, and each item represents one theory-based dimension of well-being. With this, the MHC-SF is theoretically well founded. Furthermore, the MHC-SF is brief which makes it highly suitable for population studies.

However, all such advantages are irrelevant when a questionnaire has poor psychometric properties. It is therefore important to demonstrate the psychometric qualities of the MHC-SF. This thesis confirmed the expected three-factor structure in emotional, psychological, and social well-being. Moreover, empirical findings underlined that the MHC-SF is a valid and reliable tool to assess positive mental health in the Dutch population. These findings confirm previous evaluations of the MHC-SF based on classical tests, using confirmatory factor analyses (Keyes, Eisenberg, Dhirra, Perry, & Dube, in press; Keyes et al., 2008). This thesis is new in expanding the previous evaluations of the MHC-SF by using advanced and robust methods based on Item Response Theory (IRT), demonstrating that the item parameters of the MHC-SF are remarkably stable over time. Although some items showed measurement variance across gender, age or educational level, the impact of this differential functioning of the items on the subscale scores was minimal.

Although the MHC-SF showed good psychometric properties, some remarks have to be made. Since the MHC-SF aims at a global assessment of positive mental health, it asks respondents to rate the frequency of their feelings of emotional, psychological, and social well-being in the past month, using a Likert scale (i.e., *never, once or twice a month, about once a week, two or three times a week, almost every day, and every day*). This frequency rating scale was deliberately chosen to measure relatively stable patterns of well-being instead of an intensity rating scale that measures intense, temporary feelings. The evaluation of the intensity of feelings depends more on individual standards than the frequency of feelings, so self-reports of intensity may be distorted (Diener, Sandvik, & Pavot, 1991). Although frequency ratings seem more suitable for self-report measures, interviews showed that some respondents find it hard to rank the presence of their feelings on a frequency scale (Köhle, 2010). However, this thesis shows that the psychometric properties of the MHC-SF are good, also at the item level using Item Response Theory analyses, even when some respondents find it hard to answer the questions of the MHC-SF on a frequency rating scale. Additionally, a pilot study showed that the distribution of answers in a frequency rating scale was similar to the distribution of answers in an intensity rating scale, with both formats being evaluated in an equally positive way by the respondents (Westerhof, 2007). For global assessments of positive mental health the frequency rating scale is suitable, whereas an intensity rating scale may be appropriate for other assessments, such as the degree of positive mental health during a day. Future research needs to examine in which situations frequency or intensity rating scales are most appropriate.

The strength of the global assessment is that the MHC-SF measures emotional, psychological, and social well-being by administering a relatively small and manageable

number of items: 14 items in total. As a consequence, the MHC-SF does not provide mean or total scores on the level of the dimensions, since each theory-based dimension of well-being is reflected by a single item.

For example, the MHC-SF assesses psychological well-being, but not the dimensions self-acceptance or environmental mastery of psychological well-being. Although there are methods available to assess single-item reliability (e.g., Wanous & Hudy, 2001), using a single item on self-acceptance as a scale may lead to large measurement errors. Whereas the MHC-SF is highly suitable to assess levels of emotional, psychological, and social well-being, extended versions of the MHC may be necessary to address the underlying dimensions separately. For example, well-being therapy (Fava, Rafanelli, Cazzaro, Conti & Grandi, 1998; Fava et al., 2005) is aimed at enhancing the six dimensions of psychological well-being. To properly evaluate the effects of this intervention, it may be necessary to use an extended version of the MHC or Ryff's Psychological Well-Being Scales (Ryff, 1989).

In sum, this thesis shows that the MHC-SF is a measure for global assessment of positive mental health that is theory-based and short, reliable and valid, and highly stable in its functioning over time. With this, the MHC-SF is one of the best evaluated questionnaires for positive mental health assessment that is currently available.

### **Relevance of positive mental health**

Nowadays, clinical psychology focuses mainly on mental illness. In the traditional model on mental health, positive mental health is seen as merely the opposite of psychopathology. In this thesis, we evaluated the relevance of positive mental health as an additional dimension of mental health. According to the two-continua model, positive mental health is not merely the absence of psychopathology, but positive mental health and psychopathology belong to two correlated factors, thus reflecting two dimensions of mental health (Keyes, 2002). Most studies investigated the two-continua model by confirmatory factor analyses (e.g., Keyes, 2005; Keyes et al., 2008). Our confirmatory factor analyses in Chapter 2 also revealed that positive mental health and psychopathology are two related dimensions of mental health. Positive mental health is only moderately correlated to symptoms of psychopathology, such as depression and anxiety. In this thesis, we found evidence for the two-continua model in three additional ways. First, both dimensions of mental health are differentially associated with age (Chapter 4) and the Big Five personality traits: neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience (Chapter 5). This underlines the relevance of positive mental health as a separate indicator of mental health: when positive mental health and psychopathology reflect two components of mental health in line with the two-

continua model, associations with age and personality traits are expected to be different. Older adults not only experience fewer symptoms of psychopathology, but also score lower in terms of positive mental health. Whereas the personality trait 'emotional stability' is associated with psychopathology, the traits of 'extraversion' and 'agreeableness' are related to positive mental health. Second, this thesis showed that associations of positive mental health and psychopathology to age and personality traits remain when controlling for psychopathology or positive mental health, respectively. Positive mental health remains associated with age and personality traits when controlling for psychopathological symptoms, in the same way that psychopathology remains related to age and personality traits when controlling for emotional, psychological, and social well-being. Although positive mental health and psychopathology are moderately correlated, both dimensions have independent relations to age and personality traits. Third, the nine-month courses of positive mental health and psychopathology showed a moderate correlation, which would not have been possible when positive mental health is merely the opposite of psychopathology.

This thesis did not only underline the relevance of positive mental health in general, but also the relevance of the three components emotional, psychological, and social well-being. There is some debate on the distinctiveness of hedonic and eudaimonic components of well-being (e.g., Kashdan, Biswas-Diener, & King, 2008), but this thesis shows that aspects of hedonic and eudaimonic can and need to be distinguished. Chapter 2 showed that emotional, psychological, and social well-being reflect three related components of positive mental health. Furthermore, associations of positive mental health with age (Chapter 4) and personality traits (Chapter 5) differ for each component. This is in line with recent findings that an intervention on Acceptance and Commitment Therapy enhances emotional and psychological well-being, but not social well-being (Fledderus, Bohlmeijer, Smit, & Westerhof, 2010). In our opinion, emotional, psychological and social well-being together make up the definition of positive mental health hence taking both the hedonic and eudaimonic tradition in well-being research into consideration (Keyes, 2005). In most studies of this thesis we included both the components and overall levels of positive mental health, to distinguish between levels of emotional, psychological and social well-being as well as to broadly investigate positive mental health. We suggest that the combination of both perspectives provides the best investigation of positive mental health, since this thesis shows that findings may differ across outcomes of positive mental health. In line with this suggestion, we recommend to examine the longitudinal course in emotional, psychological, and social well-being as well, in addition to the course in overall positive mental health as described in Chapter 7.

In sum, these findings fit in with the two-continua model, showing that positive mental health and psychopathology reflect two correlated dimensions. This emphasizes the relevance of positive mental health as an additional dimension of mental health.

### **Implications of positive mental health**

The two-continua model has important implications. In this thesis, we evaluated positive mental health as a predictor of future physical health and psychopathology. We conducted a meta-analysis, aiming to prospectively study the effects of emotional well-being on the prognosis of physical disease. This meta-analysis was pioneering by employing a strict and narrow focus on emotional well-being, by conducting meta-analytic moderator analyses to evaluate how different constructs of well-being, health-related outcome, year of publication, follow-up time and sample size are associated with the effect size of emotional well-being on long-term recovery and survival in physical illness, and by assessing the methodological quality of the included studies. The previous reviews of the literature (Chida & Steptoe, 2008; Diener & Chan, 2011; Howell, Kern, & Lyubomirsky, 2007; Lyubomirsky, King, & Diener, 2005; Pressman & Cohen, 2005; Veenhoven, 2008) included several of these aims, this is the first study to our knowledge that combines all aspects into a single review. Our meta-analysis revealed that emotional well-being predicts a long-term prognosis of physical illness. Higher levels of emotional well-being are beneficial for recovery and survival rates in physically diseased patients. Although the effects are small, the findings are important. Recovery and survival are highly relevant outcomes and since physical diseases such as coronary heart disease and cancer are highly prevalent, small effects of emotional well-being on the prognosis of physical illness may have a large impact in the population.

Furthermore, we investigated the reciprocal impact of positive mental health and psychopathological symptoms at four measurement occasions in a nine-month period. To our knowledge only two studies (Keyes, Dhingra, & Simoes, 2010; Wood & Joseph, 2009) have examined the longitudinal association of positive mental health with psychopathology. Our study was new in using four instead of two measurement occasions and in using a combination of item response theory and latent growth modelling. We found that changes in positive mental health predict psychopathology later in time, on top of initial levels of positive mental health and psychopathology. Changes in positive mental health are even more important predictors for future psychopathology than the absolute levels of positive mental health, and explain almost twenty percent in the variance of future psychopathology. This is line with findings by Keyes and colleagues (2010) and

Wood and Joseph (2009) and underlines the relevance of enhancing positive mental health in addition to the alleviation of psychopathological symptoms.

Our findings of positive mental health as an important predictor is in line with other studies. For example, Keyes and Grzywacs (2005) showed that a good state of positive mental health was related to better physical health, less health care consumption, and better work performance, also when controlling for levels of psychopathology. Therefore, we suggest future research to examine the predictive effects of positive mental health and changes in positive mental health on aspects that are relevant for social participation, such as work productivity. A next step may even be an economic evaluation of positive mental health, investigating the economic consequences of a good or poor mental health.

### **Strengths and limitations**

The present thesis has several strengths and limitations. The current approach of measuring positive mental health is a top-down approach, where individuals respond to items on aspects of emotional, psychological, and social well-being. This approach has some limitations. First, positive mental health may be better measured by dimensions that are considered important and relevant for the person himself, since positive mental health involves subjective experiences and one's own evaluation of well-being. Second, there may be a risk of normativity, in which positive feelings and good functioning in a client's individual and social life are considered the standard for every person. Norem and Chang (2002) describe that this "one-size-fits-all-approach" is not justified. They show, for example, that optimism can have negative consequences and that pessimism can lead to better performance and personal growth, indicating that qualities that are evaluated as positive may have negative consequences for some individuals. Third, there are no universal criteria for when a person is considered mentally healthy. Views on well-being differ across cultures and across persons. Even within the research field, there is a lack of clarity in the terms and definitions used. For example, the term 'subjective well-being' is frequently used for positive feelings and life satisfaction (Diener, Suh, Lucas, & Smith, 1999), whereas we prefer the term 'emotional well-being', since other components such as psychological and social well-being are subjective forms of well-being as well. Furthermore, while psychological well-being reflects optimal functioning in Ryff's model (e.g., Ryff, 1989), other studies use the term 'psychological well-being' for components of emotional well-being too (e.g., Chida & Steptoe, 2008), or 'well-being' for symptoms of psychopathology (e.g., Lamers, Bolier, Westerhof, Smit, & Bohlmeijer, 2011). Moreover, terms differ across disciplines. For example, in physical health care the term 'quality of

life' is frequently used, including aspects of emotional well-being such as life satisfaction (e.g., Testa & Simonson, 1996).

However, it is highly difficult - if not impossible - to overcome such problems. We may want to measure only the dimensions of well-being that are personally relevant for an individual, but such individualized measurements are difficult for psychometric evaluations, comparisons between studies, persons, or cultures, and correlations with other variables. Definitions of health also contain normative aspects and this even holds for physical health: *"Even our definition of physical disease is a normative or evaluative concept because to call a condition a disease is to judge that the person with that condition is less able to lead a good or worthwhile life"* (p.211, Resnek, 1987, in Maddux, 2009). While the definition of positive mental health is the result of sociocultural and philosophical assumptions, this also holds for psychopathology and the Diagnostic and Statistical Manual of mental disorders (DSM-IV; American Psychiatric Association, 2000). For example, homosexuality is currently socially accepted, but was considered a mental illness in the first version of the DSM (Maddux, 2009). Thus, the content of the definition of positive mental health may develop and change over time. Presently, emotional, psychological, and social well-being reflect the most prominent components of well-being, based on two longstanding traditions in well-being research, and in line with the internationally accepted definition of mental health by the World Health Organization (WHO, 2005). Since mental health is mainly associated with negative symptoms and problems, an additional focus on emotional, psychological, and social well-being provides a broad and more complete definition of mental health. Moreover, the diversity in terminology underlines the necessity to provide clear definitions of the concepts under study.

Besides the focus on positive aspects of mental health, the present thesis is pioneering in that it investigates both positive mental health and psychopathology longitudinally at four measurement occasions in nine months. The thesis uses a large sample representative of the Dutch adult population. Respondents were randomly selected from the municipal registers in the Netherlands, and were provided with internet access or a Personal Computer when necessary. Although we expect the two-continua model to be also applicable in samples of adults with severe mental and physical illness, future research is necessary to validate this assumption. To date, we have some indications that findings will be similar in adults with mental and physical illnesses. First, Chapter 3 reveals that the MHC-SF shows no differential item functioning across high or low levels of psychopathology and with or without physical illness in the general population. Furthermore, the MHC-SF is reliable and has a moderate correlation with psychopathological symptoms in adults with psychological distress (Fledderus, Bohlmeijer,

Pieterse, & Schreurs, 2012), older adults with mild to moderate depressive symptomatology (Korte, Bohlmeijer, Cappeliez, Smit, & Westerhof, 2011, online first), and in adults with fibromyalgia (Veehof, Westerhof, Bohlmeijer, ten Klooster, & Taal, 2010). Moreover, positive mental health and psychopathology seem to be two independent dimensions in populations with mental disorders as well, as evaluated in the Netherlands Mental Health Survey and Incidence Study (NEMESIS) by using a psychiatric diagnostic interview (Bergsma, ten Have, Veenhoven, & de Graaf, 2011). Since we broadly investigated symptoms of psychopathology, more research is needed to validate our findings in mentally ill populations, investigating various diagnoses of mental illness.

The longitudinal design in the present thesis is highly valuable. Because of this research design, we have longitudinally evaluated the MHC-SF as well as investigated the course of positive mental health and psychopathology over time. Although this thesis shows that positive mental health and psychopathology are two dimensions of mental health, further investigations are necessary to validate whether positive mental health and psychopathology can be present at the same moment. Both measures included a different time-span, with the MHC-SF assessing positive mental health over the past month, and the Brief symptom Inventory (BSI) assessing psychopathology over the past week. Therefore, a high score on both measures does not automatically mean that feelings of well-being and symptoms of psychopathology are present at the same time. A recent study by Steptoe, Leigh and Kumari (2011) indicated that positive and negative affects remain moderately correlated when investigated at several times during the day. Although this study merely included effects, it shows that the two-continua model may remain valid when positive mental health and psychopathology are examined at the same moment.

In this thesis, we conducted a meta-analysis on the longitudinal effects of emotional well-being on the course of disease in patients with physical illness. One of the most remarkable findings was the lack of studies using well-validated questionnaires to longitudinally examine well-being in physically diseased populations. Few studies included measures of psychopathology, which made it impossible to examine the unique effects of emotional well-being on top of psychopathology; the effects of emotional well-being may therefore overlap with the effects of psychopathology. Our meta-analysis underlined the importance of conducting new longitudinal studies using reliable and valid measures of both psychopathology and positive mental health. Moreover, there was a large diversity in the physically diseased population under study. Veenhoven (2008) and Chida and Steptoe (2008) indicated that well-being may also have negative effects for certain diseases, such as cardiovascular disease, which fits in with the findings by Norem and Chang (2002); namely, that positive aspects like optimism can have negative consequences. Future

studies need to unravel these findings. Furthermore, we focused on the predictive effects of emotional well-being on the course of disease, since psychological and social well-being are even less frequently examined within the context of physical disease. Since we found that emotional, psychological, and social well-being are three separate components of positive mental health, it is worthwhile investigating all three dimensions in relation to physical illness. We suggest to conduct a cohort study including diverse populations of physical illness, to assess both positive mental health and psychopathological symptoms and validate our findings in a sophisticated study.

### **Recommendations for mental health care**

The main implication of the findings in this thesis is that the promotion of positive mental health should be an additional goal, complementary to the assessment and treatment of psychopathology. In line with Slade (2010), we agree that more emphasis needs to be placed on the person's own goals and strengths. The present impact of mental health care on positive mental health is not clear. We suggest therefore that positive mental health needs to be incorporated in both diagnostics and in treatment (Bohlmeijer, 2012). Our recommendations are threefold.

First, this thesis shows that the Brief Symptom Inventory (de Beurs & Zitman, 2006), which is among the most commonly used instruments for screening and assessing psychopathology in mental health services in the United States, does not provide adequate insights into a person's emotional, psychological, and social well-being. Measuring psychopathology is not the same as measuring positive aspects of mental health. Therefore, we recommend including the MHC-SF in the Routine Outcome Monitoring (ROM). In the ROM, measures are included when fulfilling three criteria: validity, reliability, and sensitive to change (Slade, Thornicroft, & Glover, 1999). This thesis shows that the MHC-SF already fulfills two of these criteria: it measures the intended outcome (validity) and measurement at different times leads to similar results (reliability). In addition, we have several indications that the MHC-SF is able to detect change. This thesis shows a moderate test-retest reliability of the MHC-SF as well as individual variation in longitudinal courses of positive mental health over time. This suggests that positive mental health is relatively stable, in line with its aim to measure global emotional, psychological, and social well-being, but is able to change as well. Furthermore, interventions on acceptance and commitment therapy (Fledderus et al., 2010) as well as life-review therapy (Korte et al., 2011) were effective in improving positive mental health in persons with moderate depressive symptoms, as measured with the MHC-SF. Since these were preventive interventions where low effect sizes are expected, we assume that

positive mental health will increase even more in interventions for persons with severe psychopathology. Including the MHC-SF in the ROM will ensure that not only the negative symptoms of the client are measured, but also his or her positive mental health.

Second, the promotion of positive mental health should be an additional emphasis in interventions. This thesis implies that interventions that are effective in reducing psychopathology are not automatically effective in promoting emotional, psychological, and social well-being. A systematic evaluation of positive mental health before, during, and after psychological interventions would provide insights into the effects of those interventions on positive mental health, in addition to its effects on psychopathological symptoms. Although interventions as Cognitive Behavioral Therapy (CGT) are designed to reduce symptoms, they may promote positive mental health as well. Since Chapter 7 reveals that changes in psychopathology predict future levels of positive mental health, the alleviation of psychopathology may lead to a better mental health. However, this needs to be explicitly investigated, since the alleviation of symptoms is not automatically accompanied by increased well-being.

Third, in addition to the interventions designed to reduce psychopathology, many interventions have been developed in recent years to enhance positive mental health, mainly emotional and psychological well-being. Several have been tested and found to be effective (for overviews and meta-analyses: Bolier, Haverman, Westerhof, Riper, Smit, & Bohlmeijer, under review; Duckworth et al., 2005; Sin & Lyubomirsky, 2009). An example of an intervention aimed at enhancing positive mental health is well-being therapy (Fava et al., 1998; Fava et al., 2005). Well-being therapy is based on Ryff's model of psychological well-being (Ryff, 1989; see Chapter 1), and uses cognitive-behavioural techniques to enhance autonomy, personal growth, environmental mastery, purpose in life, positive relations, and self-acceptance, in line with this model (Fava & Ruini, 2003). First results indicate that the therapy is feasible for affective disorders (Fava et al., 1998; Fava et al., 2005), and may be highly valuable as relapse-preventive strategy in mood and anxiety disorders (Fava & Ruini, 2003). In line with the psychotherapeutic strategies of Fava and colleagues (1998, 2003, 2005), we are currently developing well-being therapy for Dutch adults. Besides the interventions that aim explicitly at alleviating psychopathological symptoms or at enhancing well-being, some interventions aim at both dimensions of mental health. For example, acceptance and commitment therapy improves positive mental health and reduces psychological distress by stimulating the skills of acceptance and value-based action (Fledderus, et al., 2012; Fledderus et al., 2010), and life-review therapy improves positive mental health and reduces symptoms of depression and anxiety by stimulating a structured evaluation of one's life to increase coping with negative experiences and a positive meaning in life (Korte et al., 2011). Other positive

interventions also increase positive mental health and show beneficial effects on relieving psychopathological symptoms as well (Bolier et al., under review; Duckworth et al., 2005; Sin & Lyubomirsky, 2009). However, future studies need to investigate whether these are unique effects on positive mental health and psychopathology that remain when controlling for psychopathological symptoms and positive mental health, respectively.

Within the positive psychology interventions that are found to be effective (Bolier et al., under review; Duckworth et al., 2005; Sin & Lyubomirsky, 2009), various strategies are used to promote positive mental health. For example, positive mental health may be promoted by enhancing psychological flexibility (Fledderus et al., 2010), ego-integrity (Lamers, Westerhof, Korte, & Bohlmeijer, 2011), and mindfulness (Brown & Ryan, 2003). These processes aim to promote positive mental health in general. In addition, some interventions focus on emotional, psychological or social well-being and prioritize these components differently based on their perceived importance. For example, in interventions based on the self-determination theory, the fulfillment of the needs of competence, autonomy, and relatedness, three aspects of psychological well-being, enhance emotional well-being (Ryan & Deci, 2000). Aspects of psychological well-being, such as individual potential, are seen as prerequisites for emotional well-being (Veenhoven, 2009). Other theories emphasize the effects of emotional well-being on aspects of psychological and social well-being. For example, in the broaden-and-build theory positive emotions help to build personal resources (Fredrickson, 2001). Since enhancing aspects of psychological well-being leads to better emotional well-being (Ryan & Deci, 2000) and enhancing aspects of emotional well-being leads to better psychological well-being (Fredrickson, 2001), both approaches seem appropriate to incorporate in interventions.

In sum, this thesis emphasizes the importance of combining positive mental health as well as psychopathology in mental health care. Neither the alleviation of psychopathological symptoms nor the promotion of emotional, psychological, and social well-being is sufficient for the achievement of good mental health. A combination is necessary for optimal mental health (Keyes, 2007). It is possible to experience well-being while being mentally ill, and not all psychopathological symptoms have to disappear to lead a meaningful and pleasant life (Davidson, Drake, Schmutte, Dinzeo, & Andres-Hyman, 2009). Therefore, it is important for mental health care to focus equally on the client's problems and psychopathological symptoms and on the strengths and skills (Gudmundsdóttir, 2010). This perspective is shared by patients. The majority of persons with a major depression judge both aspects of positive mental health and the absence of symptoms as very important for remission (Zimmerman et al., 2006). Furthermore, positive mental health is viewed as an important aspect of recovery by persons with

severe mental illness. People with psychiatric disabilities emphasized that striving for an overall sense of well-being was an important part of recovery (Young & Ensing, 1999). Ahmed and Boisvert (2006) found in their work with persons with schizophrenia that many clients responded positively to interventions aimed at enhancing their strengths, whereas clients seemed to respond less favourably to interventions on personal problems. The present medical model has resulted in a usable taxonomy of mental disorders, reliable and valid instruments to measure them, models for understanding risk factors that may lead to these disorders, and to pharmacological and psychological interventions that have been shown to alleviate psychopathological symptoms (Seligman & Csikszentmihalyi, 2000). These gains remain highly beneficial for mental health care. We should not make the mistake of shifting our attention completely and focussing it exclusively on positive mental health. Indeed, a broad approach in which positive mental health and psychopathology are combined is essential to fully promote mental health.

## **Conclusion**

This thesis showed that the MHC-SF is a reliable and valid measure for global assessment of positive mental health. Our confirmatory findings on positive mental health and psychopathology as two dimensions emphasize that the promotion of positive mental health should be an additional goal in mental health care, complementary to the treatment of psychopathology. Neither the alleviation of psychopathological symptoms nor the promotion of emotional, psychological, and social well-being is sufficient for good mental health. Therefore, a broad approach in which positive mental health and psychopathology are combined is essential to fully promote mental health. Hopefully, the term 'mental health' will soon be associated with both psychopathology and positive mental health, making the additive 'positive' in the title of this thesis redundant.

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# Samenvatting

(Summary in Dutch)

## Samenvatting

In **hoofdstuk 1** werd beschreven dat de psychologie zich de laatste decennia heeft ontwikkeld tot een wetenschappelijke en professionele discipline. Deze ontwikkeling heeft veel opgeleverd, maar heeft ook geleid tot een focus op psychopathologie binnen de geestelijke gezondheidszorg. Het risico is dat een persoon hierdoor wordt gereduceerd tot zijn of haar problemen. In hoofdstuk 1 werd een aanvullende positieve benadering van geestelijke gezondheid beschreven. Hier werden drie componenten van welbevinden belicht, die zijn gebaseerd op twee tradities in onderzoek naar welbevinden. Emotioneel welbevinden omvat de aanwezigheid van positieve gevoelens en levenstevredenheid en de afwezigheid van negatieve gevoelens, en past hiermee binnen de hedonistische traditie. Psychologisch en sociaal welbevinden richten zich daarentegen op positieve aspecten van functioneren en passen hiermee binnen de eudaimonische traditie van onderzoek naar welbevinden. Psychologisch welbevinden omvat het optimale functioneren in het individuele leven en sociaal welbevinden richt zich op goed functioneren in sociale groepen en de maatschappij. De drie componenten vormen gezamenlijk de mate van positieve geestelijke gezondheid, en sluiten hiermee ook aan bij de definitie van geestelijke gezondheid van de Wereldgezondheidsorganisatie (WHO). Hoewel er verschillende vragenlijsten bestaan om positieve geestelijke gezondheid te meten, zijn deze vaak gericht op één of enkele aspecten en bevatten zijn vaak items over psychopathologie. Hoofdstuk 1 beschrijft de Mental Health Continuum (MHC), een vragenlijst gericht op het meten van alle drie de componenten: emotioneel, psychologisch en sociaal welbevinden, waarvan een Nederlandstalige en verkorte versie van 14 items is ontwikkeld (MHC-SF). Daarnaast beschrijft hoofdstuk 1 het twee-continua model. Traditioneel werd de aanwezigheid van een goede geestelijke gezondheid gelijkgesteld aan de afwezigheid van psychopathologie, maar in recente onderzoeken is gebleken dat de aanwezigheid van positieve geestelijke gezondheid niet hetzelfde is als de afwezigheid van psychopathologie. Hoewel beide aan elkaar gerelateerd zijn, zijn het twee aanvullende continua van geestelijke gezondheid. Een persoon met weinig psychopathologische klachten heeft een grotere kans op een hoge positieve geestelijke gezondheid, maar dit is niet vanzelfsprekend. Weinig psychopathologie kan ook samengaan met een laag emotioneel, psychologisch en sociaal welbevinden. Dit betekent dat het belangrijk is om naast psychopathologie ook positieve geestelijke gezondheid te meten. Daarnaast betekent het twee-continua model dat positieve geestelijke gezondheid gevolgen kan hebben voor bijvoorbeeld lichamelijke gezondheid, bovenop de effecten van psychopathologie, en dat positieve geestelijke gezondheid voorspellend kan zijn voor de toekomstige mate van psychopathologie. Hoofdstuk 1 eindigde met een beschrijving van de doelen van dit proefschrift. Het eerste doel was het evalueren van de psychometrische

eigenschappen van de MHC-SF (Hoofdstuk 2 en 3). Het tweede doel was het onderzoeken van de relevantie van positieve geestelijke gezondheid, door na te gaan of positieve geestelijke gezondheid en psychopathologie verschillend samenhangen met leeftijd en persoonlijkheidskenmerken, zoals vanuit het twee-continua model werd verwacht (Hoofdstuk 4 en 5). Als positieve geestelijke gezondheid en psychopathologie twee gerelateerde dimensies zijn, is het niet voldoende om alleen aandacht te hebben voor symptomen van psychopathologie, maar moet er aanvullend aandacht worden besteed aan emotioneel, psychologisch en sociaal welbevinden. Het derde doel van het proefschrift was het onderzoeken van de implicaties van positieve geestelijke gezondheid als aparte dimensie, door te evalueren wat de voorspellende effecten van emotioneel welbevinden zijn op het herstel en overlevingskansen in lichamelijk zieke patiënten (Hoofdstuk 6) en van positieve geestelijke gezondheid op toekomstige psychopathologie, rekening houdend met de eerdere mate van psychopathologie (Hoofdstuk 7).

In **hoofdstuk 2** werden de psychometrische eigenschappen van de Mental Health Continuum-Short Form (MHC-SF) onderzocht in een representatieve steekproef van 1.662 Nederlandse volwassenen tussen de 18 en 87 jaar. De data waren afkomstig van het LISS-panel (Longitudinal Internet Studies in the Social sciences) van CentERdata (Tilburg). Confirmatieve factoranalyses bevestigden de drie-factor structuur in emotioneel, psychologisch en sociaal welbevinden. Daarnaast was de betrouwbaarheid van de subschalen voldoende (sociaal welbevinden) tot goed (emotioneel en psychologisch welbevinden). De subschalen waren voldoende stabiel, en vatbaar voor verandering over tijd (na 3, 6 en 9 maanden). Tevens correleerden de subschalen met overeenkomstige maten van welbevinden en functioneren, wat aangaf dat de MHC-SF een valide vragenlijst is om positieve geestelijke gezondheid te meten. Tot slot onderzocht hoofdstuk 2 of positieve geestelijke gezondheid en psychopathologie functioneren als één dimensie, zoals in het traditionele model waarin geestelijke gezondheid wordt gezien als de afwezigheid van psychische klachten, of als twee dimensies. Confirmatieve factoranalyses lieten zien dat een model met twee gerelateerde factoren het beste bij de data paste, zoals verondersteld in het twee-continua model. Hoewel het belangrijk is om de MHC-SF ook te valideren door de correlaties te onderzoeken met meetinstrumenten die beter aansluiten bij de drie subschalen van positieve geestelijke gezondheid, laat hoofdstuk 2 zien dat de MHC-SF een betrouwbaar en valide instrument is om positieve geestelijke gezondheid te meten.

In **hoofdstuk 3** werd de stabiliteit van de MHC-SF over tijd geëvalueerd, door met behulp van Item Response Theorie te onderzoeken of de item parameters hetzelfde functioneren op vier meetmomenten in negen maanden. Daarnaast werd gekeken of de item parameters hetzelfde functioneren over de demografische kenmerken leeftijd, geslacht, huwelijkse staat, afkomst (autochtoon of allochtoon) en opleidingsniveau, en over gezondheidsstatus (wel of geen lichamelijke ziekte en wel of geen psychopathologie). Hiervoor werd gebruikt gemaakt van data van het LISS-panel (CentERdata, Tilburg), bestaande uit een representatieve steekproef van Nederlandse volwassenen die op één of meerdere meetmomenten de MHC-SF hebben ingevuld ( $N = 1.932$ ). De resultaten lieten zien dat de vier items verschillend functioneerden voor ofwel opleidingsniveau (één item van sociaal welbevinden), geslacht (één item van sociaal welbevinden), of leeftijd (twee items van psychologisch welbevinden). Deze verschillen in functioneren van de item parameters hadden geen significant effect op de subschaalscores van sociaal en psychologisch welbevinden, wat liet zien dat de invloed minimaal is. Daarnaast bleken de item parameters, gemiddelden, standaard deviaties en betrouwbaarheid van de MHC-SF consistent over tijd. Hoofdstuk 3 liet hiermee zien dat de MHC-SF een betrouwbaar en valide vragenlijst is om emotioneel, psychologisch en sociaal welbevinden te meten.

In **hoofdstuk 4** werden de lineaire en curvilineaire relaties van positieve geestelijke gezondheid en psychopathologie met leeftijd onderzocht, rekening houdend met demografische kenmerken en de mate van lichamelijke ziekte (lichamelijke ziekte, functionele beperkingen en subjectieve gezondheid). De data waren afkomstig van het LISS-panel van CentERdata (Tilburg), bestaande uit 1.506 volwassenen tussen de 18 en 87 jaar. In overeenstemming met het twee-continua model werd verwacht dat positieve geestelijke gezondheid en psychopathologie verschillend samenhangen met leeftijd. Uit de resultaten bleek dat leeftijd negatief en lineair samenhang met zowel positieve geestelijke gezondheid als psychopathologie, passend bij het twee-continua model. De resultaten waren vergelijkbaar wanneer werd gecontroleerd voor respectievelijk de mate van psychopathologie en de mate van positieve geestelijke gezondheid. Wanneer de subschalen van positieve geestelijke gezondheid apart werden bekeken, bleek dat leeftijd alleen negatief lineair gecorreleerd is met psychologisch welbevinden. Daarnaast was er een curvilineair verband van leeftijd met emotioneel welbevinden, waarbij alleen de oudste groep respondenten meer emotioneel welbevinden ervoeren. Leeftijd was niet significant gerelateerd aan sociaal welbevinden. Lichamelijke ziekte bleek sterker gerelateerd aan symptomen van psychopathologie dan aan positieve geestelijke gezondheid. Daarnaast bleek er een interactie-effect van leeftijd en de aanwezigheid van lichamelijke ziekten op de mate van psychopathologie: de correlatie tussen lichamelijke

ziekten en psychopathologie was niet significant bij respondenten van 66 jaar en ouder, maar wel bij respondenten tussen de 18 en 65 jaar. Hoewel het belangrijk is om de verbanden verder te onderzoeken, onder andere in longitudinale studies en bij oudere ouderen, lieten de verschillende relaties van positieve geestelijke gezondheid en psychopathologie met leeftijd zien dat het belangrijk is om zowel positieve geestelijke gezondheid als psychopathologie mee te nemen wanneer geestelijke gezondheid wordt onderzocht.

In **hoofdstuk 5** werd het twee-continua model van positieve geestelijke gezondheid en psychopathologie als twee gerelateerde dimensies verder onderzocht aan de hand van de relaties met de Big Five persoonlijkheidseigenschappen emotionele stabiliteit (neuroticisme), extraversie, vriendelijkheid, consciëntieusheid en openheid voor ervaringen. Het hoofdstuk is gebaseerd op data van het representatieve LISS-panel (CentERdata, Tilburg), bestaande uit 1.161 volwassenen tussen de 18 en 88 jaar. In het hoofdstuk kwam naar voren dat de persoonlijkheidseigenschappen verschillend waren gerelateerd aan positieve geestelijke gezondheid en psychopathologie, wat het twee-continua model verder ondersteund. De persoonlijkheidseigenschap emotionele stabiliteit was gerelateerd aan psychopathologie, terwijl de eigenschappen extraversie en vriendelijkheid samenhangen met positieve geestelijke gezondheid. Wanneer gekeken werd naar de subschalen van positieve geestelijke gezondheid, bleken emotionele stabiliteit en vriendelijkheid gerelateerd aan emotioneel welbevinden, extraversie en openheid voor ervaringen aan psychologisch welbevinden, en extraversie en vriendelijkheid aan sociaal welbevinden. Persoonlijkheidseigenschappen verklaarden gezamenlijk meer variantie in psychopathologie dan in positieve geestelijke gezondheid. Het hoofdstuk ondersteunt het twee-continua model van geestelijke gezondheid en laat zien dat het belangrijk is om niet totale positieve geestelijke gezondheid te onderzoeken, maar ook de subschalen emotioneel, psychologisch en sociaal welbevinden te onderscheiden.

**Hoofdstuk 6** beschrijft een meta-analyse naar studies die de voorspellend effecten van emotioneel welbevinden op herstel en overlevingskansen onderzochten in lichamelijk zieke patiënten. In de meta-analyse werd niet alleen het gezamenlijke effect bekeken, maar tevens de impact van moderatoren onderzocht, namelijk het gebruikte construct van emotioneel welbevinden, de gebruikte gezondheidsuitkomst, het jaar van publicatie, de follow-up tijd, en methodologische kwaliteit van de geïncludeerde studies. Systematische zoeken in de databases Medline en PsycInfo leverde 17 relevante studies op, die de effecten onderzochten van algemeen welbevinden, positief affect en levenstevredenheid

op ziekteherstel en overlevingskansen. De meta-analyse resulteerde in een gezamenlijke Likelihood Ratio van 1.14, wat wees op een klein maar significant effect. Een hogere mate van emotioneel welbevinden is gunstig voor herstel en overlevingskansen in lichamelijk zieke patiënten. Het was opvallend dat weinig goed gevalideerde meetinstrumenten werden gebruikt voor het meten van welbevinden. De meeste vragenlijsten die in de studies werden gebruikt, waren oorspronkelijk vragenlijsten voor het meten van depressieve klachten. Daarnaast waren de steekproeven in de studies erg divers wat betreft de aard van de ziekte. Dit wijst erop dat meer onderzoek nodig is naar de prospectieve effecten van emotioneel welbevinden op ziektebeloop met goede instrumenten voor welbevinden en in verschillende populaties. Daarnaast moeten de resultaten voorzichtig worden geïnterpreteerd in verband met mogelijke publicatiebias. De bevindingen beschreven in hoofdstuk 6 laten zien dat het vergroten van emotioneel welbevinden mogelijk de prognose van lichamelijke ziekte zou kunnen verbeteren, maar meer onderzoek is nodig om deze assumptie verder te onderzoeken.

**In hoofdstuk 7** werd de wederkerige impact van positieve geestelijke gezondheid en psychopathologie onderzocht, gebaseerd op longitudinale data van het LISS-panel (CentERdata, Tilburg). Positieve geestelijke gezondheid en psychopathologie werden gemeten op vier meetmomenten in negen maanden en 1.932 respondenten namen deel aan het onderzoek op minimaal één van deze meetmomenten. De studie in hoofdstuk 7 was vernieuwend in de brede manier van onderzoeken van zowel positieve geestelijke gezondheid als psychopathologie en in de combinatie van Item Response Theorie met latente groeianalyses. In het hoofdstuk werd beschreven dat positieve geestelijke gezondheid en psychopathologie erg stabiel waren over tijd, hoewel er een significante variatie tussen individuen was. De belangrijkste bevinding was dat veranderingen in positieve geestelijke gezondheid over tijd voorspellend waren voor de mate van psychopathologie op een later moment, en dat veranderingen in psychopathologie voorspellend waren voor de mate van positieve geestelijke gezondheid op een later moment. Hierbij werd gecontroleerd voor de baseline waarden van psychopathologie en positieve geestelijke gezondheid. De veranderingen waren zelfs belangrijkere voorspellers dan de absolute niveaus van positieve geestelijke gezondheid en psychopathologie. De bevindingen bevestigden hiermee het twee-continua model, en lieten zien dat positieve geestelijke gezondheid en psychopathologie niet alleen twee gerelateerde dimensies waren, maar ook voorspellend waren voor elkaar, ook wanneer beide dimensies voor elkaar werden gecontroleerd. Dit wees op het belang van het verbeteren van positieve geestelijke gezondheid als aanvulling op het verminderen van psychopathologie in de geestelijke gezondheidszorg.

In **hoofdstuk 8** werden de bevindingen uit het proefschrift bediscussieerd, werden de sterke en zwakke kanten van het proefschrift belicht, en werden aanbevelingen gedaan voor de praktijk. Ten eerste liet dit proefschrift zien dat de Mental Health Continuum-Short Form (MHC-SF) een valide en betrouwbare vragenlijst is om positieve geestelijke gezondheid en emotioneel, psychologisch en sociaal welbevinden te meten. Bij gebruik van een vragenlijst naar welbevinden is het nodig om na te gaan wat het doel is van de vragenlijst. De MHC-SF is geschikt om globale niveaus van welbevinden te meten, maar uitgebreidere vragenlijsten zijn nodig wanneer het doel is om ook de dimensies (zoals zelfacceptatie als dimensie van psychologisch welbevinden) te onderzoeken. Ten tweede benadrukte het hoofdstuk 8 de relevantie van positieve geestelijke gezondheid, van zowel algehele positieve geestelijke gezondheid als ook het onderscheid in emotioneel, psychologisch en sociaal welbevinden. Positieve geestelijke gezondheid is niet enkel de afwezigheid van psychopathologie, maar is een aanvullende dimensie van geestelijke gezondheid. Daarnaast bleken leeftijd en persoonlijkheidstrekken verschillend samen te hangen met emotioneel, psychologisch en sociaal welbevinden, wat het belang aantoonde van het onderscheid in deze subschalen. Ten derde ging hoofdstuk 8 in op de implicaties van positieve geestelijke gezondheid. Zo bleek positieve geestelijke gezondheid een voorspeller van zowel lichamelijke ziekte als psychopathologie. Een volgende stap zou daarom kunnen zijn om de economische consequenties van een goede of slechte geestelijke gezondheid te evalueren. Het proefschrift had als beperking dat de benadering leidt tot het risico dat een goede geestelijke gezondheid gezien wordt als universele norm. Dit geldt echter ook voor benaderingen van lichamelijke gezondheid en psychopathologie. Daarnaast was gebleken dat de terminologie in onderzoek naar welbevinden erg verwarrend is. Termen worden door elkaar gebruikt en hebben in verschillende studies en disciplines een verschillende betekenis. Dit benadrukte het belang van goede definities van gebruikte concepten. Sterke punten van het proefschrift waren met name de vernieuwende brede focus op positieve geestelijke gezondheid en het gebruik van longitudinale data van het LISS-panel, representatief voor de Nederlandse bevolking. De resultaten van dit proefschrift zijn veelbelovend en laten zien dat het belangrijk is om positieve geestelijke gezondheid verder te onderzoeken, bijvoorbeeld in volwassenen met ernstige psychiatrie of lichamelijke ziekten. Tot slot werden in hoofdstuk 8 aanbevelingen gedaan voor de geestelijke gezondheidszorg. Er werd aanbevolen om positieve geestelijke gezondheid te meten in aanvulling op het meten van psychopathologie, om het bevorderen van positieve geestelijke gezondheid op te nemen als doel van psychologische interventies in aanvulling op het verminderen van psychopathologie, en om de effectiviteit van interventies niet alleen te bepalen aan de hand van klachtvermindering, maar ook aan de hand van verbetering van emotioneel, psychologisch en sociaal welbevinden. Een

combinatie van de afwezigheid psychopathologie en de aanwezigheid van positieve geestelijke gezondheid is nodig om te spreken van een goede geestelijke gezondheid. Daarom is een brede benadering van geestelijke gezondheid noodzakelijk, waarin er zowel aandacht is voor positieve geestelijke gezondheid als voor psychopathologie.

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