

Evaluating the Psychometric Properties of the Mental Health Continuum-Short Form (MHC-SF)

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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. © 2010 Wiley Periodicals, Inc. *J Clin Psychol* 67:99–110, 2011.

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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

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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

Table 1

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

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

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

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 well-being (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 well-being); and (c) our hypothesized model of three related factors.

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.

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

Table 2

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

Fit indices	Model 1	Model 2	Model 3	
	Calibration Single factor	Calibration Two factors	Calibration Three factors	Validation Three factors
SB χ^2	198.1	135.3	109.6	224.1
df	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	.03	.021
CFI	.984	.992	.995	.997
Standardized RMR	.087	.079	.073	.063
GFI/AGFI	.78/.70	.85/.79	.82/.61	.90/–
Scaled $\Delta\chi^2$		Model 2 vs. 1	Model 3 vs. 2	
Contribution to χ^2		14.69*	32.62*	56.90%

Note. SB χ^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.

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.

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 are 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

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
Mean (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*	.49*	.29*	.22*
Happiness	.36*	.49*	.31*	.19*
Positive affect	.29*	.24*	.26*	.24*
<i>Psychological well-being</i>				
Self-esteem	.34*	.39*	.33*	.19*
Need to evaluate	.16*	.09*	.16*	.13*
Need for cognition	.16*	.07	.17*	.14*
<i>Social well-being</i>				
Social engagement	.15*	.07	.08	.21*
Political efficacy	.17*	.08	.14*	.20*
Political participation	.12*	.02	.09*	.17*
<i>Mental illness</i>				
Mental illness	–.33*	–.47*	–.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.

* $p < .001$.

Table 4
 Crossover 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*

* $p < .001$.

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

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

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 well-being, 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 .

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.

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

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	Model 1	Model 2	Model 3	
	Calibration Single factor	Calibration Two unrelated factors	Calibration Two related factors	Validation Two related factors
SB χ^2	475.7	242	226.5	434.9
df	54	54	53	131
NCP	421.7	188	173.5	303.9
AIC	523.7	290	276.5	484.9
RMSEA	0.119	0.079	0.077	0.065
CFI	0.941	0.974	0.976	0.979
Standardized RMR	0.102	0.153	0.081	0.082
GFI/AGFI	.81/.72	.88/.83	.89/.84	.89/–
			Model 3 vs. 2	
Scaled $\Delta\chi^2$			9.72*	
Contribution to χ^2			48.2%	

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

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

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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