

EVALUATION OF THE PSYCHOMETRIC QUALITY OF A  
MORE INCLUSIVE MENTAL HEALTH CONTINUUM SHORT  
FORM VERSION

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Master thesis

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### **Abstract**

This study focused on validating the revised version of the MHC-SF as well as comparing it to the original version, considering the psychometric performance of the two versions on both total and sub-scale level. The revised version included changes in the item formulation (items were simplified), as well as 4 new items were added to measure social well-being in terms of relational well-being. The assessed psychometric properties encompass the internal consistency, the factor structure, as well as the convergent validity. For assessing the convergent validity, self-esteem and life satisfaction were used as validating measures. The results showed that the revised MHC-SF performs equally well as the original MHC-SF in terms of internal consistency. The factor analysis disclosed an unambiguous 4 factor structure of the revised version, while the original MHC-SF version supported the 3-factor structure. However, zooming in on sub-scale level, it became apparent that the SWB scale of the revised MHC-SF performed noticeably better than the original SWB sub-scale. Furthermore, the convergent validity was found to be similarly strong in comparison to the original version. In conclusion, the revised MHC-SF showed comparable results as the original MHC-SF version in terms of internal consistency and convergent validity. Especially the SWB sub-scale showed some promising findings, as the new SWB items seemed to perform well. The reformulated SWB items however showed some ambiguous results in terms of factor loadings, as some of the reformulated items loaded on multiple factors. Nevertheless, as of now the revised MHC-SF showed a promising psychometric performance and thus further validation should be advised.

## **Introduction**

### **Mental Health**

The concept of mental health and its definition has been a controversial and disputed topic throughout the past and present. The most recent definition by the world health organization conceptualizes mental health as an individual's skill to recognize their strengths, being capable to handle the common challenges of life, as well as being able 'to make a contribution to his or her community' (WHO, 2005, p. 2). However, often mental health is considered equated with the absence of mental illness (Westerhof & Keyes, 2010). This negative framing of defining the concept of positive mental health might be due to the fact that clinical psychology has its origin within the medical model of health and illness (Greenspoon & Saklofske, 2001; Petrillo et al., 2015). Both the physical, and psychological health field focus on detecting abnormalities that need to be fixed or removed in order to return to a normal state or health (Greenspoon & Saklofske, 2001; Petrillo et al., 2015). This means that the medical model of health and illness assumes that mental health and mental illness are part of the same continuum with mental health being the positive extreme on the one end, and mental illness being the negative extreme on the other end.

### **Two Continua Model of Mental Health and Mental Illness**

A study by Keyes (2007), found that mental well-being and mental illness are related but in fact part of two separate continua. A confirmatory factor analysis showed that mental health composed of two related factors is superior to a factor analysis composing mental health of only a single factor (Westerhof & Keyes, 2010). As a result, this shows that mental health is best viewed as a whole state composed of the presence of positive mental health and the absence of mental illness, instead of conceptualizing mental health as solely the absence of mental illness (Westerhof & Keyes, 2010). Furthermore, Keyes (2007) conceptualizes mental health in three sub domains, namely emotional well-being (EWB), psychological well-being (PWB), and social well-being (SWB). Emotional well-being describes a person's satisfaction with life, and correspondingly the positive and negative affect that is experienced. Psychological well-being focuses rather on the internal functionality of an individual. Social

well-being refers to one's social functioning in one's social environment (Westerhof & Keyes, 2010; Greenspoon & Saklofske, 2001). These 3 dimensions of mental health are based on Ryan and Deci's (2001) two streams of well-being, namely hedonic well-being, and eudaimonic well-being. Hedonic well-being refers to higher life satisfaction, as well as experiencing more positive emotions and less negative emotions (Extremera et al., 2011). Hedonic well-being is traditionally linked to the idea of subjective well-being, as it encompasses subjective experiences of satisfaction and pleasure (Extremera et al., 2011). Eudaimonic well-being is described as experiencing fulfillment and being able to fully function as a human being. Hence, emotional well-being is linked to the hedonic perspective of well-being, while psychological and social well-being are linked to the concept of eudaimonic well-being (Ryan & Deci, 2001).

### **Mental-Health-Continuum Long Form**

Although multiple measurement instruments exist that claim to measure mental health valid and reliable, not all of these instruments include all presently known domains of mental health, which is a huge limitation in regard to the validity of those measures (Rafiey et al., 2017). One valid and reliable way to measure mental health is through administering the Mental-Health-Continuum long form (MHC-LF) as it incorporates the three sub domains of mental health discovered by Keyes (2007). The MHC-LF is a measurement instrument measuring an individual's mental health state through a 40-item questionnaire (Guo et al., 2015). This measurement instrument has been shown to be quite a reliable and valid measure, assessing all three presently known dimensions of mental health, namely emotional, psychological and social well-being. However, the MHC-LF is also facing some limitations. One of these limitations is the length of the questionnaire. According to Rafiey et al. (2017), 40 items is too extensive for assessing mental health. As a result, respondents' motivation decreases due to the perceived item redundancy that comes along with lengthy measurement instruments (Gogol et al., 2014). Furthermore, according to Gogol et al. (2014), such lengthy measurement instruments often seem monotonous and time consuming, causing respondents to feel bored, fatigued, impatient, and frustrated. Correspondingly, this possibly affects the reliability and validity of the obtained data, as this will likely cause a decrease in respondents' cognitive participation and can even cause completely missing data due to drop-out (Gogol et al., 2014). This is especially a problem in the clinical field of psychology, as measurement instruments such as the MHCLF are often administered multiple times

throughout one's clinical stay (Kahneman, 1973). Thus, it is preferable that measurement instruments are held short to overcome the corresponding issues of reliability and validity.

### **Mental-Health-Continuum Short Form**

Considering the limitations of the length of the MHC-LF, Keyes (2002) took the most informative items from each domain measured by the MHC-LF and created the Mental-Health-Continuum Short Form (MHC-SF) out of them. Thus, the MHC-SF is a less extensive form of the MHC-LF and includes also the three domains of mental health discovered by Keyes (2007). The MHC-SF consists of 14 items, with three items measuring emotional well-being, six items measuring psychological well-being, and five items measuring social well-being. Hereby, each item refers to one dimension of their subscale. Thus, the three items of EWB refer to the 3 dimensions of emotional well-being, namely happiness, satisfaction with life, and interest in life. The six items measuring PWB refer to the six dimensions of PWB described by Ryff, which are self-acceptance, positive relations, autonomy, environmental mastery, purpose in life, and personal growth. The five SWB items measure social contribution, social coherence, social acceptance, social integration, and social actualization.

### **Psychometric Properties of the MHCSF**

The MHC-SF has been shown to be a reliable and valid measure of mental health within clinical practice (Lamers et al., 2011; Franken et al., 2018). Multiple studies confirmed the three factor structure of mental well-being discovered by Keyes (2007), emphasizing the importance of measuring mental well-being in terms of its three sub-domains, namely emotional, psychological, and social well-being (Lamers et al., 2011; Franken et al., 2018; Petrillo et al., 2015). Furthermore, validation studies of the instrument found acceptable to outstanding internal consistency measures (Petrillo et al., 2015). The test-retest reliability of the MHCSF has also been found to be acceptable (Lamers et al., 2011). Discriminant and convergent validity have also been assessed. The discriminant validity has been detected to be strong

with instruments measuring mental illness (Lamers et al., 2011; Petrillo et al., 2015). The convergent validity of the instrument has been found to be moderately acceptable among the subscales of the instrument, correlating the emotional well-being scale with life satisfaction, the psychological well-being scale with self-esteem, and the social well-being scale with self-administered items measuring social engagement, political efficacy, and political participation (Lamers et al., 2011).

### **Revised version of MHC-SF**

Nevertheless, the MHC-SF also comes with some limitations. One of these limitations that has been reported, is the fact that the formulations of the items have been found to cause uncertainties among respondents (eg. ‘... that you had experiences that challenged you to grow and become a better person’) (Köhle, 2010). Furthermore, these item formulations have been perceived as unclear, challenging respondents to answer truthfully and honestly (eg. ‘How often do you feel that society is becoming a better place for you?’) (Köhle, 2010). Another issue that has been prevalent with the MHC-SF is encompassing its social well-being scale. Respondents reported that more extensive items were missing regarding interpersonal well-being (Köhle, 2010). The MHC-SF measures social well-being rather in terms of societal contribution and one’s place in society, than in terms of closer social relationships. These issues have been addressed in the revised MHC-SF version (MHC-SF-R) which is evaluated in this study. To clarify, within the MHC-SF-R all 14 item formulations were simplified. Additionally, 4 new items were added to the social well-being scale, intended to measure social well-being in terms of interpersonal well-being. Thus, this study will focus on validating a more inclusive version of the MHC-SF. Furthermore, the original MHC-SF will be compared the MHC-SF-R regarding their psychometric performance on both total and sub-scale level.

### **Convergent validity constructs**

To assess the convergent validity, this study will use measures of self-esteem and life satisfaction.

The most commonly used and known definition of self-esteem is from Rosenberg. He defined self-esteem as one’s attitude towards the self (Arsandaux et al., 2020). To specify, one’s self-esteem is determined by one’s attitude towards the self whether it is positive or negative (Arsandaux et al., 2020). However, according to Schmidt and Padilla (2003), self-esteem encompasses more than that. Schmidt and Padilla (2003) defined self-esteem not only as one’s attitude towards the self, but also as the perception others have of oneself. Furthermore, self-esteem is an important factor when considering resilience, as well as optimism. Individuals who show larger levels of self-esteem have shown to have an increased level of resilience and optimism. Correspondingly, low self-esteem individuals have shown to be less resilient and less optimistic (Abdel-Khalek, 2016). Since previous studies have shown

that self-esteem is related to one's psychological well-being, it will be used as a measure to test the convergent validity of the original and the revised MHC-SF (Lamers et al., 2011).

Life satisfaction can be described as one's own evaluation of experiencing to live life well (Martyr et al., 2018). In other words, it is the extent to which oneself perceives their life as a pleasant experience. Higher life satisfaction in individuals has been found to be associated with better overall health, better social relationships, more positive affect, as well as better emotional well-being (Proctor et al., 2010; Anataramian, 2017). Additionally, higher life satisfaction reduces the risk of the onset of a depression, and correspondingly decreases the perception of experiencing negative affect (Proctor et al., 2010). Due to the positive relationship of life satisfaction and emotional well-being, it will be used as a measure to assess the convergent validity. Furthermore, prior research has shown life satisfaction to be an acceptable validating variable to assess the convergent validity of the emotional well-being scale (Lamers et al., 2011).

Therefore, the following research questions will be examined:

RQ1: What is the internal consistency of the revised MHC-SF considering both total and sub-scale level and to what extent is it similar to the internal consistency of the original MHC-SF?

RQ2: What is the factor structure of the revised MHC-SF considering both the whole scale and the sub-scales and to what extent is it similar to the original MHC-SF version?

RQ3: What is the convergent validity of the revised MHC-SF using life satisfaction and self-esteem and to what extent is it similar to the original MHC-SF version?

## **Methods**

### **Design and Procedure**

This study is designed as an exploratory, non-experimental, cross-sectional survey study. The data that is used is provided by the Longitudinal Internet studies for Social Sciences (LISS) panel by Centerdata from the Tilburg University in the Netherlands. Further, the used data is taken from a larger cohort study consisting of multiple modules. These modules encompass health, religion and ethnicity, social integration and leisure, family and household, work and schooling, personality, politics and values and different economic situations (ie, assets, income, and housing). The different modules assessed overall 6969

randomly selected households (Scherpenzeel, 2011). For this paper, the data of the personality module was used. The provided data of the well-being study that is used within this paper has been collected in the scope of a study by Westerhof and ten Klooster (2020), with the aim to assess the psychometric properties of the Mental health continuum short form-revised in a large field test. The researchers collected data from 3572 randomly selected participants from the population register of Statistics Netherlands. Both, the data for the personality module, as well as the data for the well-being study were taken between May and June 2020.

## **Participants**

The data used for this study encompasses 2719 participants that completed the survey. The selected participants were divided into four groups, with each group getting assigned to a different version of the revised Mental health continuum short form. This study will only focus on two of those four groups, namely group 2 and group 4. Group 2 was assigned to fill out the original version of the MHCSF. Here, 665 people completed to fill out the original version. Group 4 on the other hand was asked to fill out a revised version of the MHCSF. The revised version has a revised item formulation and four new added SWB items, but the original response format. In total, 682 participants completed this questionnaire.

## **Instruments**

### *Personal background variables*

The assessed demographic variables used in this study encompass the participants sex, age, marital status, highest completed education, and occupation. These variables were assessed through self-constructed items.

### *MHC-SF*

The original version of the MHCSF consists of three sub-scales and encompasses 14 items (Keyes, 2007). The sub-scale emotional well-being is assessed through three items (e.g. ‘During the past month, how often did you feel interested in life?’), psychological well-being is measured by six items (e.g. During the past month, how often did you feel good at managing the responsibilities of your daily life?’), and social well-being is composed of five items (e.g. ‘During the past month, how often did you feel that our society is becoming a better place for people?’). Each item of the questionnaire is answered on a 6-point Likert scale ranging from 0 (never) to 5 (every day) (See Appendix Table 5 and Table 6).



### *MHC-SF revised*

The revised version of the MHCSF consists also of 18 items, 14 reformulated items and the four newly added SWB items. Thus, the questionnaire still consists of the three sub-scales, with emotional well-being being assessed by three items, psychological well-being being measured through six items, and social well-being investigated through nine items. An example item for emotional well-being is ‘In the past month, how often did you experience the following feeling? I am interested in life.’. Psychological well-being consists of items such as ‘In the past month, how often did you experience the following feeling? I have control over my life.’. Social well-being is measured through items like ‘In the past month, how often did you experience the following feeling? I think our country is developing well.’. Each item of this revised version of the MHCSF is answered on a 6-point Likert scale ranging from 0 (never) to 5 (every day).

### *Self-esteem*

The participants level of self-esteem was assessed through the Rosenberg Self-esteem Scale (RSE). The RSE is the most validated measurement instrument assessing self-esteem and has been proven to be a reliable measure with good to outstanding internal consistency measures (Arsandaux et al., 2020). The measurement instrument encompasses 10 items, measuring self-esteem on a 7-point Likert scale ranging from 1 (strongly agree) to 7 (strongly disagree) (Sinclair et al., 2010). Regarding the scoring of the questionnaire, reversed items were first recoded. Then a sum score was calculated with higher scores meaning higher levels of reported self-esteem.

### *Life satisfaction*

Life satisfaction was assessed through the satisfaction with life scale. This measurement tool includes five items, measuring life satisfaction on a 7-point Likert scale (Diener et al., 1985). The answering options range from 1 (strongly agree) to 7 (strongly disagree). The scale was scored according to its scoring manual, thus a sum score was calculated. Previous studies have shown that the instrument is a reliable measure, with Cronbach’s alpha scores ranging between 0.82-0.87 (Diener et al., 1985).

### **Data Analysis**

Every analysis conducted within this study were done using the software SPSS IBM 25 (Wagner III, 2019). The data was screened for valid cases so that only those cases that

completed the questionnaire they were assigned to were included in the analyses. Hence, cases with missing responses were excluded. Finally, each questionnaire was scored in accordance with their specific scoring manual.

First the data was assessed for normality to check whether parametric or non-parametric tests should be performed. This was assessed through the psychometric properties Skewness and Kurtosis (See Appendix Table 1). Here, it was concluded that almost all variables fulfill the requirement of normality, ranging between -1 and 1 (Cain et al., 2017). The only non-normal distributed variable was the EWB sub-scale of the original MHC-SF version. Nevertheless, parametric tests were selected as the subscale is considered normally distributed due the sample size (N=681) (Chang et al., 2008).

Furthermore, for the demographic variables a descriptive analysis was performed. Here, the demographic variables were checked for means (M), standard deviations (D), and frequencies to get an overview of the representativeness of the sample. Further, a t-test was performed including the demographic variables, to detect possible differences between the two samples. Additionally, the variables of interest, namely the revised and original version of the MHCSF (revised and original MHC-SF total, EWB, PWB, SWB), self-esteem and life satisfaction were analyzed through a descriptive analysis (means, standard deviations, and frequencies). Additionally, a t-test was performed as well including the total and all subscales of the revised and original version, to check for possible differences between the two versions.

For answering the first research question, Cronbach's alpha was analyzed for both, the original and the revised version of the MHC-SF. Next, a comparison between the two versions was drawn.

The second research question was answered through performing an exploratory factor analysis with a direct oblimin rotation to check both MHC-SF versions of their underlying factor structure. Here, no forced factors were applied, and all detected factors were extracted by SPSS. The results of both versions were then compared with each other.

To answer the third research question, a moderation analysis was conducted using the Preacher and Hayes process tool, to detect whether the relationship between participants mental health score and their life satisfaction/self-esteem score is moderated by the type of MHC-SF version (Hayes, 2017). Moreover, a correlation analysis using Pearson's r was performed for both versions of the MHCSF. To interpret the correlational analyses properly, the cut of scores of the correlation coefficients were set as follows: a correlation coefficient of 0.00 - 0.29 is considered weak, 0.30 - 0.59 is considered moderate, and 0.60 - 1.00 is

considered as strong (Schober et al., 2018). Then the results of the revised version and the original version were compared statistically.

## **Results**

### **Description of the study group**

The study group consisted of 1332 participants, of which 642 were males and 690 were females (Table 1). The age of the participants ranged from a minimum of 18 years to a maximum of 93 years, with the average age of the sample being 48.02 years and a standard deviation of 18.81. Furthermore, most participants reported to be either married (44.8%) or to never have been married (40.8%). Most of the participants finished their college education (25.9%). Furthermore, no significant differences were detected between the participants who filled out the original and those that filled out the revised MHC-SF version, considering the demographic variables.

**Table 1**  
*Demographics (N= 1312)*

Characteristic	Range	M (SD)	N	%	t(df)	p	$\chi^2$ (df)	p
1.Participants age in years	18-93	48.02(18.81)			0.02 (1330)	0.99		
2.Sex					0.14 (1330)	0.89	0.20 (1)	0.88
Male			642	48.2				
Female			690	51.8				
3.Marital status					-0.34 (1330)	0.73	3.03 (4)	0.55
Married			597	44.8				
Separated			131	9.8				
Divorced/ widower			60	4.5				
Never been married			544	40.8				
4.Education					1.36 (1324)	0.18	6.90 (5)	0.23
Primary school			76	5.7				
vmbo (intermediate secondary education, US: junior high school)			236	17.8				
havo/vwo (higher secondary education/ prepatory university education, US: senior high school)			163	12.3				
mbo (intermediate vocational education, US: junior college)			318	24.0				
Hbo (higher Vocational education US: collage)			341	25.9				
Wo(university)			190	14.3				

## Descriptive statistics of the variables of interest

### *Comparison of Sample 1 and 2*

To check whether the means of the two MHC-SF versions (total and subscale level) differ statistically significantly, a t-test was performed, comparing the MHC-SF original subscales and total scale with the subscales and total scale of the revised MHC-SF version (Table 2). The results of the t-test revealed significant differences on total scale level ( $t(1330)=-8.07$  ( $p<0.05$ )), as well as on the SWB subscale ( $t(1290.559)=-15.62$  ( $p<0.05$ )), and the PWB subscale ( $t(1330)=-5.20$  ( $p<0.05$ )). No significant differences of the subscale EWB were found between the two samples ( $t(1330)=-0.80$  ( $p>0.05$ )). Therefore, it is notable

that participants who filled out the revised MHC-SF version reported significantly higher levels of SWB, PWB, and overall mental well-being compared to the original version of the MHC-SF.

### *Self-esteem*

In total, 1273 participants filled out the self-esteem survey (Table 2). The participants reported overall high levels of Self-esteem (M=54.92 out of a possible 70; SD=10.48). Furthermore, a t-test was performed to check for potential differences between the two groups that filled out the original and the revised MHC-SF versions. The results of the t-test revealed no significant differences between the two versions (Table 3).

### *Life satisfaction*

Regarding the life satisfaction scale, 1274 participants filled out the survey (Table 2). Here, participants reported moderate to slightly high levels of life satisfaction (25.40 out of a maximum of 35; SD=5.75). Additionally, a t-test was conducted to test whether there are differences between the two groups that filled out the MHC-SF versions. The results showed that no significant difference was found (Table 3).

**Table 2**  
*Descriptives of Revised MHC-SF, Original MHC-SF, Self-esteem and Life Satisfaction*

Variable of interest	N	M	SD
Revised MHC-SF <sup>1</sup> average score	681	3.35	0.88
EWB		3.67	1.00
SWB		3.20	0.92
PWB		3.41	1.00
Original MHC-SF <sup>2</sup> average score	648	2.95	0.88
EWB		3.63	0.97
SWB		2.34	1.06
PWB		3.12	1.02
Self-esteem <sup>3</sup>	1273	54.92	10.48
Life satisfaction	1274	25.40	5.75

<sup>1</sup> scores calculated from the MHC-SF-R on a 6 Point Likert scale (0 = never, 5 = (almost) always)

<sup>2</sup> scores calculated from the MHC-SF on a 6-Point Likert scale (0= never, 5 = every day)

<sup>3</sup> 7-Point Likert scale (1 = strongly disagree, 7= strongly agree)

**Table 3**  
*T-Test of Revised MHC-SF and Original MHC-SF*

Variable of interest	t	df	p
Total scale	-8.07	13030	0.00
EWB	-0.80	1330	0.43
SWB	-15.62	1290.65	0.00
PWB	-5.20	1330	0.00
Self-esteem	-0.25	1296	0.80
Life satisfaction	-0.25	1293	0.80

## Reliability

In order to answer the first research question, a reliability analysis was conducted, analyzing the MHC-SF-R and the original version of the MHC-SF regarding Cronbach's alpha (Table 4). The total scale of the MHC-SF-R showed outstanding reliability ( $\alpha=0.93$ ). The subscales EWB ( $\alpha=0.87$ ), SWB ( $\alpha=0.85$ ), and PWB ( $\alpha=0.84$ ) showed good internal consistency as well. To further interpret these results, Cronbach's alpha if item deleted and the item-total correlation were calculated for the revised MHC-SF version (see Appendix Table 1). Here, it is noticeable that item 5 displays the lowest item-total correlation ( $r=0.47$ ), meaning that this item adds least to the internal consistency. Further, item 14 displays the strongest item-total correlation ( $r=0.76$ ), and thus adds most to the internal consistency. However, when looking at the Cronbach's alpha if item deleted statistics it becomes apparent that the calculated Cronbach's alpha does not change noticeably and is thus remaining excellent.

The reliability measure of the original MHC-SF scale displayed also an outstanding reliability ( $\alpha=0.90$ ). Here, the subscales EWB ( $\alpha=0.86$ ), and PWB ( $\alpha=0.85$ ) showed good internal consistency. The SWB subscale showed moderate but still acceptable internal consistency ( $\alpha=0.72$ ). The item total correlation values of the original MHC-SF version showed that item 6 displays the lowest item total correlation ( $r=0.53$ ). The strongest item total correlation was found for item 14 ( $r=0.71$ ). Thus, item 6 adds least to the internal consistency of the scale, and item 14 adds most to the internal consistency of the scale. When observing the Cronbach's alpha if item deleted statistics, no notable change in the internal consistency can be observed.

When comparing the Cronbach's alpha measures of both scales statistically, it becomes apparent that significant differences exist on the total scale ( $\chi^2(1, N= 1315) = 18.33, p= 0.00$ ), as well as on the SWB sub-scale ( $\chi^2(1, N= 1315) = 55.58, p= 0.00$ ). This means that the internal consistency of the revised MHC-SF total scale and SWB sub-scale is significantly higher compared to the original MHC-SF. No differences regarding the internal consistency were found on the EWB and PWB sub-scale of both versions.

**Table 4**

*Internal Consistency (Cronbach's Alphas and Corresponding Confidence Intervals) for the Revised and Original MHC-SF Including Chi-Square Statistics for Testing Statistical Significance Between Cronbach's Alphas*

	Revised MHC-SF (N=665)	CI (95% lower)	CI (95% upper)	Original MHC-SF (N=650)	CI (95% lower)	CI (95% upper)	$\chi^2$	p
Total scale	0.93	0.92	0.94	0.90	0.89	0.91	18.33	0.00*
EWB	0.87	0.86	0.88	0.86	0.84	0.87	0.79	0.37
SWB	0.85	0.83	0.87	0.72	0.76	0.81	55.58	0.00*
PWB	0.84	0.82	0.86	0.85	0.83	0.87	0.60	0.44

*Note.* Chi-Square statistics calculated according to Diedenhofen & Musch (2016) with (df=1); \* = p < 0.05

### Factor structure

To answer the second research question, an exploratory factor analysis with a direct oblimin rotation was performed. The results of the exploratory factor analysis suggest a four-factor model for the MHC-SF-R (Table 5). All items load the strongest on the first component, which explains 45.8% of the total variance. Here, factor loadings ranged from 0.50 (item 5) to 0.81 (item 14). What stands out here is that the new SWB items (item 15-18) show stronger factor loadings than the reformulated SWB items (item 4-8). Including the second component, the explained total variance increases to 53.3%. Here, the results disclosed that only item 5 ( $r=0.40$ ) and item 7 ( $r=0.43$ ) load on the second factor. The third component only shows one factor loading above 0.4, namely item 5 ( $r=0.46$ ). This component increased the total variance explained to 59.9%. The fourth component is revealing only one notable factor loading (item 8,  $r=0.43$ ), increasing the total variance explained to 65.6%. Noteworthy here is that the new SWB items (item 15-18) load only on the first factor, while some of the reformulated items (item 5,7,8) showed to load on multiple factors. Nevertheless, the scree plot indicates that the biggest drop in the total variance explained can be observed at component 2. Thus, it can be argued that a one-factor solution might be preferable

When comparing these results to the results of the exploratory factor analysis of the original MHC-SF, it becomes apparent that a three-factor structure is suggested for the original MHC-SF (see Appendix Table 3). Further, all items displayed the strongest factor loadings on the first component. This is the same for both MHC-SF versions. Another similarity that can be observed is the scree plot and the total variance explained (see Appendix Figure 2). Here, the original MHC-SF also showed the biggest drop in the total variance explained at the second component. Thus, it can be argued that a one factor solution might be also preferable for the original MHC-SF.

### Table 5

*Factor loadings MHC-SF-R*

Item	Component 1	Component 2	Component 3	Component 4
1 (EWB)	0.71	-0.37	0.16	-0.19
2 (EWB)	0.74	-0.32	0.16	-0.02
3 (EWB)	0.75	-0.45	0.18	-0.14
4 (SWB)	0.56	0.25	0.19	-0.58
5 (SWB)	0.50	0.40	0.46	0.01
6 (SWB)	0.58	0.1	0.15	0.36
7 (SWB)	0.53	0.43	0.06	0.08
8 (SWB)	0.55	0.38	0.29	0.43
9 (PWB)	0.7	-0.28	0.1	0.33
10 (PWB)	0.73	-0.26	0.19	0.2
11 (PWB)	0.68	0.03	-0.35	0.09
12 (PWB)	0.57	0.38	0.02	-0.24
13 (PWB)	0.69	0.04	-0.12	0.01
14 (PWB)	0.81	-0.14	0.11	-0.14
15 (SWB)	0.76	0.13	-0.03	-0.25
16 (SWB)	0.76	0.01	-0.36	-0.01
17 (SWB)	0.74	0.1	-0.45	0.02
18 (SWB)	0.73	0.08	-0.46	0.09

*Note. Rotation Method: Oblimin with Kaiser Normalization*

**Convergent validity***Association between revised MHC-SF and self-esteem*

To check whether well-being (measured by the revised MHC-SF) is associated with self-esteem, a Pearson's  $r$  correlation has been conducted (Table 6). The results revealed a positive moderate correlation between self-esteem and the total scale of the revised MHC-SF ( $r=0.43$ ), the subscale EWB ( $r=0.48$ ), as well as the subscale PWB ( $r=0.48$ ). A weak correlation was found between self-esteem and SWB ( $r=0.30$ ).

*Association between revised MHC-SF and life satisfaction*



In order to reveal a possible association between well-being (revised MHC-SF) and life satisfaction, a Pearson's  $r$  correlation has been conducted (Table 6). A strong positive correlation was found between life satisfaction and EWB ( $r=0.61$ ). Furthermore, moderate correlations were detected between life satisfaction and PWB ( $r=0.51$ ), as well as between life satisfaction and the total scale of the revised MHC-SF ( $r=0.51$ ). Nevertheless, a weak association between life satisfaction and SWB was found ( $r=0.39$ ).

**Table 6** *Bivariate correlations of the variables revised MHC-SF, Self-esteem and life satisfaction (N=681)*

Variable	1	2	3	4	5	6
1. revised MHC-SF total score	-	<b>0.79**</b> [0.76; 0.83]	<b>0.94**</b> [0.93; 0.95]	<b>0.93**</b> [0.92; 0.94]	<b>0.43**</b> [0.36; 0.50]	<b>0.51**</b> [0.45; 0.58]
2 EWB		-	<b>0.63**</b> [0.57; 0.68]	<b>0.72**</b> [0.68; 0.76]	<b>0.48**</b> [0.40; 0.55]	<b>0.61**</b> [0.55; 0.67]
3 SWB			-	<b>0.78**</b> [0.74; 0.81]	<b>0.30**</b> [0.23; 0.38]	<b>0.39**</b> [0.31; 0.46]
4 PWB				-	<b>0.48**</b> [0.40; 0.55]	<b>0.51**</b> [0.45; 0.57]
5 Self-esteem					-	<b>0.53**</b> [0.47; 0.59]
6 Life satisfaction						-

Note. Significant correlations are in boldface; \*\*Correlation is significant at the 0.01 level (2-tailed)

### ***Comparison between original and revised MHC-SF's correlations***

To investigate which of the two versions performs better considering the convergent validity, the results of the correlational analyses were compared (Table 6 and Table 7). Looking at the Confidence Intervals (CI's) of the correlation it becomes apparent that no significant differences between the versions can be detected when comparing the correlations of the variables self-esteem and life satisfaction with the MHC-SF total and subscales. However, it is notable that the only significant differences between the different versions can be observed when looking at the SWB subscale. Here, the SWB scale of the revised version seems to perform significantly better considering the convergent validity, as the CI's do not overlap and higher correlation coefficients can be observed with the MHC-SF-R total scale, EWB, and PWB.

### **Table 7**

*Bivariate correlations of the variables Original MHC-SF, Self-esteem and Life Satisfaction (N=650)*

Variable	1	2	3	4	5	6
1. Sample 2 total score	-	<b>0.73**</b> [0.69; 0.77]	<b>0.87**</b> [0.85; 0.89]	<b>0.92**</b> [0.91; 0.93]	<b>0.48**</b> [0.41; 0.54]	<b>0.56**</b> [0.39; 0.52]
2 EWB		-	<b>0.47**</b> [0.40; 0.53]	<b>0.62**</b> [0.54; 0.65]	<b>0.54**</b> [0.47; 0.60]	<b>0.60**</b> [0.54; 0.66]
3 SWB			-	<b>0.67**</b> [0.63; 0.72]	<b>0.31**</b> [0.24; 0.38]	<b>0.30**</b> [0.22; 0.37]
4 PWB				-	<b>0.44**</b> [0.37; 0.50]	<b>0.39**</b> [0.31; 0.69]
5 Self-esteem					-	<b>0.54**</b> [0.42; 0.57]
6 Life satisfaction						-

Note. Significant correlations are in boldface; \*\*Correlation is significant at the 0.01 level (2-tailed). Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of plausible population correlations that could have caused the sample correlation (Cumming, 2014).

To find out if the relationship between self-esteem and mental well-being is dependent on the version of the MHC-SF, a moderation analysis in form of a multiple linear regression was performed (Table 8). The examined model was significant ( $F(3,1286) = 139.3$ ,  $p < 0.05$ ). A significant positive relationship between self-esteem and mental well-being was detected ( $b = 0.05$ ,  $[0.03, 0.06]$ ,  $p < 0.05$ ). This confirms the findings of the previously reported positive Pearson's correlation that self-esteem has a positive influence on mental well-being. Furthermore, the moderation effect of the sample on the relationship of self-esteem and mental well-being has been detected to be insignificant ( $b = 0.00$ ,  $[-0.01, 0.00]$ ,  $p = 0.25$ ), and therefore the relationship is not moderated by the version of the MHC-SF. Furthermore, no moderation effect was found on subscale level (See appendix Table 6, Table 8, Table 10). This means that the relationship between self-esteem and each sub-scale total score is not moderated by the type of MHC-SF version.

**Table 8**

*Moderation analysis, self-esteem, sample (total score) and the moderation effect predicting Mental health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.02	0.38	-0.72	0.76	0.04	0.97
Sample	-0.33	0.12	0.10	0.56	2.80	0.01
Self-esteem	0.05	0.01	0.03	0.06	6.83	0.00

Moderation effect (self-esteem)	0.00	0.0	-0.01	0.00	-1.15	0.25
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*Note. Dependent variable: Mental health total score; Adjusted R<sup>2</sup> = 0.25; F(3.00,1286.00) = 139.3; p<0.05*

To test if the relationship between life satisfaction and mental well-being is dependent on the version of the MHC-SF, a moderation analysis in form of a multiple linear regression was performed (Table 9). The examined model was detected to be significant ( $F(3,1288) = 161.95, p < 0.05$ ). The independent effect of sample on mental health total (Constant) was detected to be not significant ( $b = 0.10, [-0.10, 0.29], p = 0.33$ ). This means that the sample does not influence mental well-being. Furthermore, a significant positive relationship between life satisfaction and mental well-being was detected ( $b = 0.06, [0.04, 0.09], p < 0.05$ ). This suggests that life satisfaction has a positive influence on mental well-being. Furthermore, the moderation effect of the sample on the relationship of self-esteem and mental well-being has been detected to be insignificant ( $b = 0.00, [0.00, 0.01], p = 0.27$ ), and therefore the relationship is not moderated by the version of the MHC-SF. Additionally, further moderation analyses revealed no moderation effect of the type of MHC-SF version on the relationship between life satisfaction and each sub-scale total score (See appendix Table 7, Table 9, Table 11).

**Table 9**

*Moderation analysis, life satisfaction, sample (total score) and the moderation effect predicting Mental health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.93	0.31	0.31	1.55	2.96	0.00
Sample	0.10	0.10	-0.10	0.29	0.10	0.33
Life satisfaction	0.06	0.01	0.04	0.09	5.25	0.00
Moderation effect (sample x life satisfaction)	0.00	0.00	0.00	0.01	0.00	0.27

*Note. Dependent variable: Mental health total score; Adjusted R<sup>2</sup> = 0.27; F(3,1288) = 161.95; p < 0.05*

## Discussion

The aim of this study was to validate whether the revised version of the MHC-SF is displaying worse, comparable, or even superior psychometric properties compared to the original version of the MHC-SF.

The results of the first research question (What is the internal consistency of the revised MHC-SF considering both total and sub-scale level and to what extent is it similar to the internal consistency of the original MHC-SF?) revealed that the reliability (determined by Cronbach's  $\alpha$ ) on both, total scale and sub-scale level is comparable to the reliability of the original MHC-SF version. The SWB-scale of the revised MHC-SF even disclosed a noticeable superiority in terms of the internal consistency, compared to the SWB scale of the original MHC-SF version. Thus, the revised MHC-SF version showed an excellent performance considering the internal consistency. Previous studies on the original version of the MHC-SF found similar results in terms of reliability. In fact, the study of Lamers et al. (2011), found a Cronbach's alpha coefficient of 0.88. Another study by Lujten et al. (2019) found a Cronbach's alpha coefficient of 0.85. Therefore, the results of the current study are in line with the previous findings of other studies and underline the fact that the MHC-SF (and thus also the MHC-SF-R) is a reliable measurement instrument, with high internal consistency.

The outcome of the analysis of the second research question (What is the factor structure of the revised MHC-SF considering both the whole scale and the sub-scales and to what extent is it similar to the original MHC-SF version?) disclosed a four-factor model. This was contrary to the expectations, since the items meant to measure only three factors (EWB, SWB, PWB). However, when looking at the factor loadings and the total variance explained, a single-factor solution might seem more appropriate. Therefore, the results for this sample suggest that the MHC-SF-R measures well-being as whole without distinctively discriminating between the three subscales (EWB, SWB, PWB). Nevertheless, when comparing the results of the factor analyses of the MHC-SF-R with the original version of the MHC-SF, it seems like a single-factor solution is preferable here as well (See Appendix Table 2). This has been an ongoing debate whether a single, two-factor, bi-factor, hierarchical, or three-factor solution is best suitable for the MHC-SF (Iasiello, 2022). Some argue that well-being is best described by a single factor, hierarchical or bi-factor solution, while others prefer to conceptualize well-being in terms of eudaimonic and hedonic well-being (two-factor solution) (Iasiello, 2022). Keyes proposed to conceptualize well-being in form of EWB, PWB, and SWB, preferring a three-factor solution (Iasiello, 2022). A study by Iasiello et al. (2022), showed that a bi-factor model fits best, at least statistically. Other studies stressed and supported the superiority of a three-factor structure over a single- or two factor structure (Keyes et al., 2008; Doré et al., 2017). Thus, further investigation is necessary to determine the consistent factor structure of the MHC-SF-R and the original MHC-SF to be

able to possibly get closer to solving this ongoing debate. Nevertheless, the FA disclosed further noticeable findings. Most noticeable was that the newly added items of the SWB scale performed well in comparison to the old SWB items, when looking for a 1-factor solution. The new SWB items only showed to load on the first factor, while the reformulated items of the original scale loaded on the other factors as well. Specifically, item 5 showed factor loadings above 0.4 on component 1, 2 and 3. Item 7 and item 8 also disclosed to load on more than one factor. While item 7 loaded on component 2, item 8 loaded on factor 4. Interestingly, all these items (item 5,7,8) are reformulated items of the SWB scale. Thus, it is possible that the reformulation of these items affected the factor structure of the MHC-SF-R. This is also indicated when comparing it with the factor structure of the original MHC-SF version. Here, only three components were extracted and the items 5,7, and 8 showed factor loadings above 0.4 only on the first factor. Thus, the reformulated items (5,7,8) showed to load on multiple factors, as the original items (5,7,8) only loaded on the first factor.

The results of the third research question (What is the convergent validity of the revised MHC-SF using life satisfaction and self-esteem and to what extent is it similar to the original MHC-SF version?) demonstrated acceptable convergent validity. The correlational analysis disclosed that life satisfaction correlates strongly with EWB and moderately with the total scale of the MHC-SF-R, as well as self-esteem correlating moderately with PWB and the total scale. Those results are to some extent in line with previous findings. Specifically, when looking at the study of Lamers et al. (2011), who found a weak correlation of self-esteem with PWB, and a moderate correlation of life satisfaction with EWB. However, contrary to the findings of Lamers et al. (2011) self-esteem correlates equally well with the revised EWB scale as it does with the revised PWB scale. This makes the convergent validity of the revised PWB scale questionable, as self-esteem was expected to show its strongest correlation with the PWB scale. Additionally, the confidence intervals of the correlations disclosed significant differences between the revised and the original version. The SWB scale of the revised version displayed higher correlations in terms of convergent validity than the original SWB scale. The SWB scale showed statistically significant differences with stronger intercorrelations for the revised total, EWB, and PWB sub-scale. Thus, the adjusted SWB scale has improved in terms of convergent validity compared to the original one. Additionally, also the EWB scale showed a significant improvement regarding the correlations, as it showed significantly higher correlations not only with the SWB scale, but also with the PWB scale. This was further supported by moderation analysis, since no moderation effect of the MHC-SF version was detected. This means that no significant

differences were found between the two different MHC-SF versions, in terms of the relationship between EWB and life satisfaction, PWB and self-esteem, as well as on total scale level. Hence, the MHC-SF-R performed equally well as the original MHC-SF in terms of convergent validity. The only exception is the revised SWB scale as explained above. Here, a significant superiority of the revised SWB scale could be observed over the original one. Thus, this indicates that the revised MHC-SF, as well as the original MHC-SF, measure the intended constructs (EWB, PWB) and can therefore be conceptualized as acceptable measurement instruments in terms of convergent validity. However, it is notable that the moderation analyses showed contradictory results for the independent effect of the MHC-SF version on the MHC-SF score (Table 8 and Table 9). The first moderation run on self-esteem (Table 8) showed an independent effect of the MHC-SF version, while the second moderation run on life satisfaction did not (Table 9). An explanation for this might be possible intercorrelations of life satisfaction. However, this should be further investigated for future research purposes.

### **Strengths and limitations**

When taking a closer look at the uniqueness of the study it becomes apparent that this study has both its strong, and weak points. One of the strengths of this study is the fact, that this was the first evaluation of the psychometric properties of this specific MHC-SF-R version. This was the first time that these data were analyzed, which makes this study unique and innovative. Furthermore, another factor facilitating the uniqueness of this study is the possibility of comparing the MHC-SF-R to the original version with a between-person design. As the participants were randomized, the risk of selection bias was prevented, allowing the researcher to draw unbiased comparisons between the two versions. This direct comparison helps the process of developing an MHC-SF version that is widely acceptable and thus not afflicted with the current complaints that were reported. Additionally, the fact that both samples contained participants of similar age, gender, marital status, and educational background, as a result of the randomization, is also beneficial for drawing comparisons, and enhances the samples representativeness of the Dutch population. Thus, the findings are generalizable to Dutch adults.

Nevertheless, the study also has its limitations. One of these limitations is the fact that no test-retest reliability was assessed. Hence, it is unknown yet whether the MHC-SF-R is producing consistently the same results on different points in time. Moreover, only two validation constructs were used and thus the inspected convergent validity is not as

meaningful as it would be when using multiple constructs as validation measures. Furthermore, the predictive and discriminant validity was not assessed within this study.

### **Future research**

Future research should be directed towards assessing the psychometric properties on a clinical sample to be able to obtain generalizable results also among the target population. Further, including all three revised versions of the MHC-SF would be beneficial for drawing more comparisons, as well as evaluating which of these versions is the preferable option for practical use in the clinical setting. Additionally, examining the strong and weak points of each MHC-SF version would be interesting, as it could increase the knowledge pool about the measurement instrument to construct a superior version of the MHC-SF-R out of all those combined strong points of the different versions. Thus, it could be possible to establish an advanced MHC-SF version, to provide the optimal measure for mental well-being. Furthermore, the factor structure of the MHC-SF-R should be checked and validated throughout multiple samples, as this study failed to find an unambiguous factor structure. Since the factor structure of both MHC-SF versions were contradictory to previous findings, this should further be examined. Moreover, it would be interesting to further inspect the SWB sub-scale to see whether it consistently outperforms the original SWB sub-scale.

### **Practical implications**

This study provided support for the revised MHC-SF, as well as the original MHC-SF to be a reliable and valid measure. However, one should be cautious when considering to actively use the MHC-SF-R in practice, due to its ambiguous factor structure. Before using the MHC-SF-R in daily practice, a consistent factor structure should be established first to avoid the risk of items measuring a different construct than intended. However, as there is more supported evidence for the MHC-SF, the MHC-SF should be preferred over the revised version when considering the usage of an MHC-SF version in clinical practice. Even though that overall, the psychometric quality did not improve significantly, it also did not deteriorate. Thus, further revision is necessary to be able to tell whether the revised MHC-SF version is perceived as practice friendlier than the original MHC-SF. Nevertheless, the results showed some promising findings.

### **Conclusion**

The findings of this study do not support previous evidence in terms of the factor structure. Even though, both scales demonstrated good internal consistency and comparable convergent validity, the ambiguous factor structure for both scales should be investigated further, before claiming that the one version is practice friendlier than the other. Nevertheless, this study found some promising results for the revised MHC-SF version. Especially the revised SWB sub-scale showed promising results, as the new SWB items showed to perform well in terms of internal consistency and factor structure. The reformulated items of the SWB scale should be further investigated to detect whether the reformulation actually simplified the items or whether the reformulation even had a negative effect on the items psychometric performance. However, it is safe to say that this study found support for the psychometric similarity and comparability of the revised MHC-SF and the original MHC-SF, at least for the assessed psychometric properties. Hence, this study hopefully serves as a starting point to pave the way for further gathering of knowledge about the different revised MHC-SF versions and its psychometric properties, so that the best possible MHC-SF version will be used in future clinical practice for the sake of measuring positive mental health accurately.



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## Appendix

**Table 1**  
Normality Testing (Skewness and Kurtosis)

Variable	N	Skewness Statistic	SE	Kurtosis Statistic	SE
1.MHC-SF revised Total score	681	-0.70	0.09	0.33	0.19
2.EWB		-1.00	0.09	0.72	0.19
3.SWB		-0.58	0.09	0.19	0.19
4.PWB		-0.73	0.09	0.26	0.19
5.MHC-SF original Total score	650	-0.31	0.10	-0.21	0.19
6.EWB		-1.10	0.10	1.48	0.19
7.SWB		0.94	0.10	-0.51	0.19
8.PWB		0.49	0.10	-0.22	0.19
9.Self-esteem	1298	-0.73	0.07	0.13	0.14
10.Life satisfaction	1295	-0.98	0.07	0.95	0.14

**Table 2**  
*Corrected Item Total Correlation and Cronbach's Alpha if Item Deleted of the Revised MHC-SF*

Item (Subscale)	Corrected item-total Correlation	Chronbach's alpha if item deleted
Item 1 (EWB)	0.64	0.92
Item 2 (EWB)	0.67	0.92
Item 3 (EWB)	0.69	0.919
Item 4 (SWB)	0.51	0.924
Item 5 (SWB)	0.47	0.924
Item 6 (SWB)	0.54	0.922
Item 7 (SWB)	0.50	0.925
Item 8 (SWB)	0.52	0.923
Item 9 (PWB)	0.64	0.92
Item 10 (PWB)	0.67	0.919
Item 11 (PWB)	0.62	0.92
Item 12 (PWB)	0.53	0.923

Item 13 (PWB)	0.64	0.92
Item 14 (PWB)	0.76	0.917
Item 15 (SWB)	0.72	0.918
Item 16 (SWB)	0.70	0.919
Item 17 (SWB)	0.69	0.919
Item 18 (SWB)	0.68	0.919

**Table 2***Corrected Item Total Correlation and Cronbach's Alpha if Item Deleted of the original MHC-SF*

Item (Subscale)	Corrected item-total Correlation	Chronbach's alpha if item deleted
Item 1 (EWB)	0.57	0.90
Item 2 (EWB)	0.62	0.89
Item 3 (EWB)	0.58	0.90
Item 4 (SWB)	0.57	0.90
Item 5 (SWB)	0.55	0.90
Item 6 (SWB)	0.53	0.90
Item 7 (SWB)	0.58	0.90
Item 8 (SWB)	0.57	0.90
Item 9 (PWB)	0.70	0.89
Item 10 (PWB)	0.58	0.90
Item 11 (PWB)	0.65	0.89
Item 12 (PWB)	0.54	0.90
Item 13 (PWB)	0.65	0.89
Item 14 (PWB)	0.71	0.89

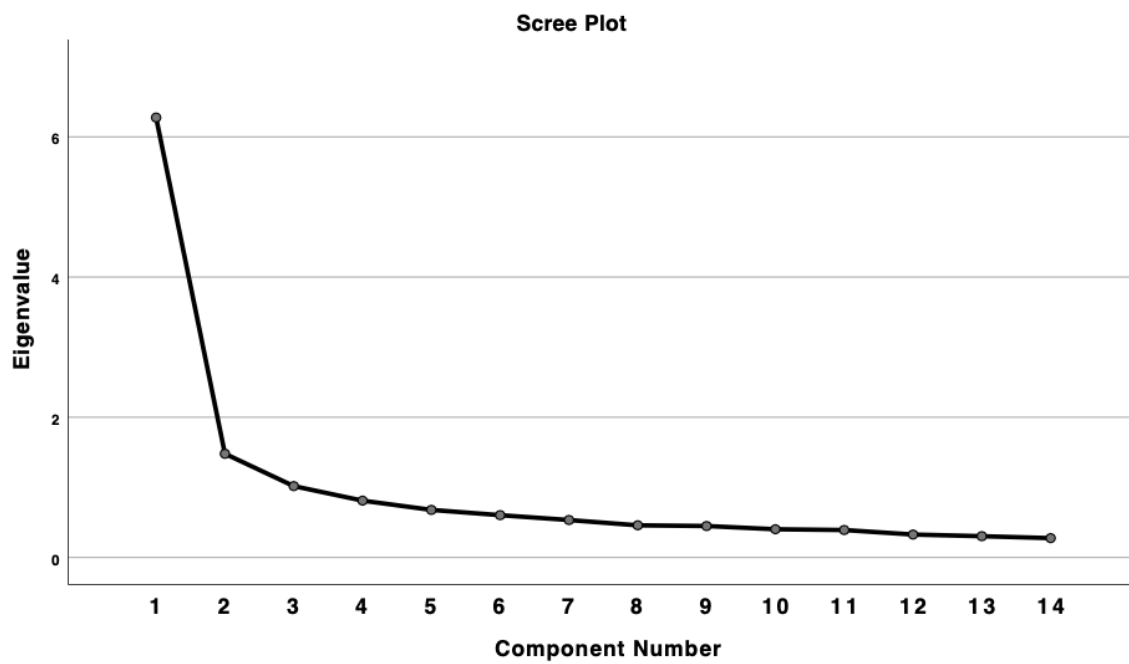
**Table 3***Factor Loadings Original MHC-SF*

Item	Component 1	Component 2	Component 3
1 (EWB)	0.77	-0.06	-0.10
2 (EWB)	0.77	0.03	-0.25
3 (EWB)	0.73	-0.14	-0.30
4 (SWB)	0.72	0.09	-0.29
5 (SWB)	0.71	-0.44	0.17

6 (SWB)	0.67	-0.52	0.23
7 (SWB)	0.67	-0.16	-0.47
8 (SWB)	0.66	-0.51	0.25
9 (PWB)	0.63	0.35	0.14
10 (PWB)	0.63	0.35	-0.11
11 (PWB)	0.63	0.08	0.40
12 (PWB)	0.61	0.30	0.30
13 (PWB)	0.60	0.34	-0.13
14 (PWB)	0.57	0.49	0.32

Note. Rotation Method: Oblimin with Kaiser Normalization

**Figure 1**  
Scree Plot revised MHC-SF

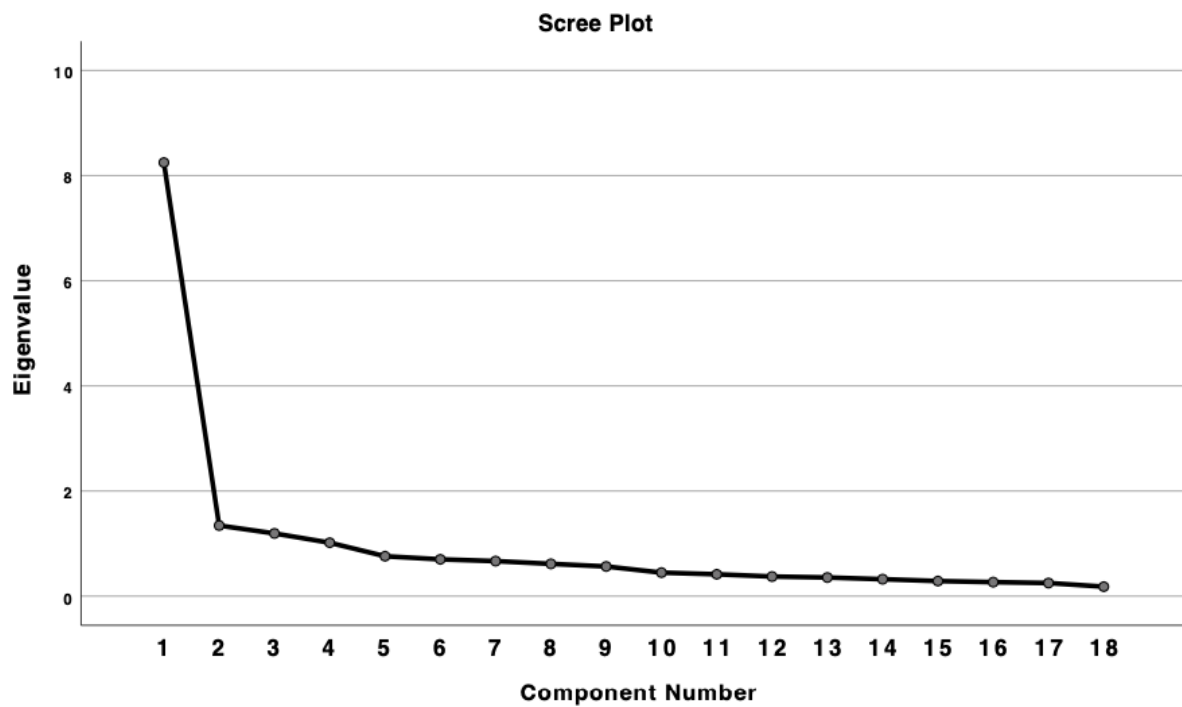


**Table 5**  
Total variance explained revised MHC-SF

Component	Cumulative e%
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<b>1</b>	45.823
<b>2</b>	53.286
<b>3</b>	59.914
<b>4</b>	65.560

**Figure 2**  
Scree Plot Original MHC-SF



**Table 6**

*Moderation Analysis, Self-esteem, Sample (EWB) and the Moderation Effect Predicting Mental health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.41	0.41	-0.39	1.21	1.02	0.31
Sample	0.19	1.28	-0.06	0.44	1.51	0.13
Self-esteem	0.06	0.01	0.4	0.07	7.85	0.00
Moderation effect (sample x self- esteem)	0.00	0.00	-0.01	0.00	-1.28	0.20

*Note. Dependent variable: Emotional well-being total score; Adjusted  $R^2=0.26$ ;  $F(3,1291) = 150.75$ ;  $p<0.05$*

**Table 7**

*Moderation Analysis, Life Satisfaction, Sample (EWB) and the Moderation Effect Predicting Mental Health (total score)*

Variable	B	SE	CI	CI (95% upper)	t	p
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			(95% lower)			
Constant	1.05	0.32	0.43	1.68	3.30	0.00
Sample	-0.02	0.10	-0.22	0.17	-0.24	0.81
Life satisfaction	0.10	0.01	0.07	0.12	8.01	0.00
Moderation effect (sample x self- esteem)	0.00	0.00	-0.02	0.01	0.61	0.54

Note. Dependent variable: Emotional well-being total score; Adjusted  $R^2=0.37$ ;  $F(3,1294) = 250.09$ ;  $p<0.05$

**Table 8**

*Moderation Analysis, Self-esteem, Sample (SWB) and the Moderation Effect Predicting Mental Health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	-0.58	0.45	-1.48	0.31	-1.29	0.20
Sample	0.57	0.14	0.29	0.85	4.03	0.00
Self-esteem	0.04	0.01	0.02	0.05	4.62	0.00
Moderation effect (sample x self- esteem)	0.00	0.00	-0.01	0.00	-1.04	0.30

Note. Dependent variable: Social well-being total score; Adjusted  $R^2=0.24$ ;  $F(3,1291) = 332.52$ ;  $p<0.05$

**Table 9**

*Moderation Analysis, Life Satisfaction, Sample (SWB) and the Moderation Effect Predicting Mental Health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.28	0.38	-0.47	1.03	0.74	0.46
Sample	0.32	0.12	0.09	0.56	2.70	0.01
Life satisfaction	0.05	0.01	0.02	0.08	3.20	0.00
Moderation effect (sample x self-esteem)	0.00	0.00	0.00	0.01	0.90	0.37

Note. Dependent variable: Social well-being total score; Adjusted  $R^2=0.25$ ;  $F(3,1294) = 144.80$ ;  $p<0.05$

**Table 10**

*Moderation Analysis, Self-esteem, Sample (PWB) and the Moderation Effect Predicting Mental Health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.55	0.43	-0.30	1.40	1.27	0.20
Sample	0.08	0.14	-0.18	0.35	0.63	0.53
Self-esteem	0.04	0.01	0.03	0.06	5.35	0.00
Moderation effect (sample x self-esteem)	0.00	0.00	0.00	0.01	0.47	0.64

Note. Dependent variable: Psychological well-being total score; Adjusted  $R^2=0.23$ ;  $F(3,1291) = 125.23$ ;  $p<0.05$



**Table 11***Moderation Analysis, Life Satisfaction, Sample (PWB) and the Moderation Effect Predicting Mental Health (total score)*

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	1.60	0.37	0.88	2.31	4.36	0.00
Sample	-0.13	0.11	-0.35	0.10	-1.11	0.27
Life satisfaction	-0.05	0.01	0.02	0.08	3.40	0.00
Moderation effect (sample x self-esteem)	0.01	0.00	0.00	0.02	2.47	0.01

Note. Dependent variable: Psychological well-being total score; Adjusted  $R^2=0.22$ ;  $F(3,1294) = 124.36$ ;  $p<0.05$

**Table 12**

Revised MHC-SF Items with Corresponding Subscale

Item Number	Subscale	In de afgelopen week, hoe vaak had u de volgende gevoelens?
1	EWB	Ik ben gelukkig.
2	EWB	Ik ben geïnteresseerd in het leven.
3	EWB	Ik ben tevreden met mijn leven.
4	SWB	Ik doe iets waardevols voor onze samenleving.
5	SWB	Ik denk dat ons land zich goed ontwikkelt.
6	SWB	Ik accepteer anderen zoals ze zijn.
7	SWB	Ik hoor bij een groep mensen, mijn buurt of stad.
8	SWB	Ik begrijp hoe onze samenleving werkt.
9	PWB	Ik accepteer mezelf zoals ik ben.
10	PWB	Ik heb grip op mijn leven.
11	PWB	Ik deel lief en leed met enkele mensen.
12	PWB	Ik word uitgedaagd om te groeien.
13	PWB	Ik durf mijn ideeën te uiten.
14	PWB	Ik heb het gevoel dat mijn leven zin heeft.
15	SWB	Ik kan iets betekenen voor anderen.
16	SWB	Ik ben tevreden met mijn sociale contacten.
17	SWB	Ik voel me verbonden met andere mensen
18	SWB	Ik kan bij andere mensen terecht.

Note. 6-point Likert-scale ranging from 0 to 5. 0= Nooit, 1= Eén of twee keer per maand, 2= Ongeveer 1 keer per week, 3= 2 of 3 keer per week, 4= Bijna elke dag, 5= Elke dag

**Table 13**  
Original MHC-SF Items with Corresponding Subscale

Item Number	Subscale	In de afgelopen maand, hoe vaak had u het gevoel...
1	EWB	...dat u gelukkig was?
2	EWB	...dat u geïnteresseerd was in het leven?
3	EWB	...dat u tevreden was?
4	SWB	...dat u iets belangrijks hebt bijgedragen aan de samenleving?
5	SWB	...dat u deel uitmaakte van een gemeenschap (zoals een sociale groep, uw buurt, uw stad)?
6	SWB	...dat onze samenleving beter wordt voor mensen?
7	SWB	...dat mensen in principe goed zijn?
8	SWB	...dat u begrijpt hoe onze maatschappij werkt?
9	PWB	...dat u de meeste aspecten van uw persoonlijkheid graag mocht?
10	PWB	...dat u goed kon omgaan met uw alledaagse verantwoordelijkheden?
11	PWB	...dat u warme en vertrouwde relaties met anderen had?
12	PWB	...dat u werd uitgedaagd om te groeien of een beter mens te worden?
13	PWB	...dat u zelfverzekerd uw eigen ideeën en meningen gedacht en geuit hebt?
14	PWB	...dat uw leven een richting of zin heeft?

Note. 6-point Likert-scale ranging from 0 to 5. 0= Nooit, 1= Eén of twee keer per maand, 2= Ongeveer 1 keer per week, 3= 2 of 3 keer per week, 4= Bijna elke dag, 5= Elke dag