Evaluation of the psychometric properties of a more inclusive Mental Health Continuum Short-Form: examination of internal consistency, factor structure, and convergent validity using self-esteem and life satisfaction

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August 23th, 2022

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Abstract

Background: This paper aimed to investigate the psychometric properties of a revised MHC-SF version in comparison to the original MHC-SF on a total and subscale level. For the revision, the response format, the item formulation has been changed and four items regarding closer social relationships have been added. The internal consistency, factor structure and convergent validity with concepts of self-esteem and life satisfaction have been assessed and compared. **Methods:** Data from the personality core module and the well-being study of the LISS-panel have been used. The original MHC-SF was assessed with the 14-item version (Keyes, 2002). The revised MHC-SF encompassed 18 items. Self-esteem was measured with the Rosenberg self-esteem scale (Rosenberg, 1965). Life satisfaction was measured with the satisfaction with life scale (Diener et al., 1985). Cronbach's alpha, exploratory factor analyses, Pearson correlations and moderation analyses have been conducted**. Results:** The revised version displayed good to excellent internal consistency and performs similar the original version, despite higher levels with regards to the SWB subscale. A one-factor model was suggested similar to the original MHC-SF. Convergent validity could be shown with regards to both self-esteem and life satisfaction the total scale as well the EWB and PWB sub scales of the revised MHC-SF on a similar level as the original MHC-SF. **Discussion:** Despite the changes made in the revised MHC-SF, the questionnaire was able to maintain the psychometric qualities of the original MHC-SF. Thus, the psychometric properties are promising and need to be more extensively tested in the future.

Introduction

Towards a definition of mental health

In the past, mental health was traditionally conceptualized as the absence of mental illness (Keyes, 2002; Westerhof & Keyes, 2010). This conceptualization might be explained since psychiatry is based on the medical model of mental health and illness (Greenspon & Saklofske, 2001). Based on physical medicine, it is conceptualized to focus on abnormalities for mental health as well. According to the medical model, physiological and psychological abnormalities need to be removed to be considered as healthy. However, this model does not consider other influential factors like biology and social factors (Heenan, 2007).Thus, within the biopsychosocial model of mental health the interrelatedness between the biological, psychological, cognitive, emotional, and social factors with regards to mental illness were highlighted (Engel, 1997). Still, the focus is on the absence of a disease.

However, with growing interest in positive psychology and its focus on positive personality traits and positive facets of mental health (positive mental health) or mental well-being, the viewpoint in mental health has been adjusted (Burns et al., 2011; Seligman & Csikszentmihalyi, 2000). Correspondingly, the World Health Organization (WHO) (2004) defined mental health as 'a state of well-being in which the individual realizes his or her own abilities, can cope with normal stresses of life, can work productively and fruitfully, and is able to make contribution to his or her community' (p.12). Thus, mental health can be viewed as a state of positive functioning, which is beyond the mere absence of mental illness (Keyes, 2002). Corresponding well-being interventions demonstrated to improve distress as well as well-being with regards to the general population, but also in the clinical setting (Chakhssi et al., 2018; Spijkerman et al., 2016; van Agteren et al., 2021). Thus, well-being plays a crucial role in terms of recovering from mental illness as well as for relapse prevention (Iasiello et al., 2022). This leads to the fact that appropriate measurement tools for well-being are needed in the clinical setting (Bohlmeijer & Westerhof, 2021).

Relation of well-being and mental health - The two continua model

According to the two continua model of mental health, mental well-being and mental illness are moderately related to each other, but still different axes. Thus, one continuum of the model covers the presence or absence of psychopathology, whereas the other continuum illustrates the presence or absence of mental well-being (Keyes, 2005; Westerhof & Keyes, 2010). Accordingly, an individual can suffer from mental illness and display low well-being. But it can also be the case that an individual displays a rather high level of well-being despite the mental illness (Lamers et al., 2011). Consequently, mental health can be viewed best as the presence of mental well-being and similarly the absence of mental illness (Westerhof & Keyes, 2010). Thus, it is of importance to have instruments displaying good validity and reliability measures not only for psychopathology but also for investigating mental well-being.

Measuring well-being

The self-report of people's own well-being encompasses two major traditions of ways of living, namely the hedonic and eudaimonic viewpoint (Ryan & Deci, 2001). According to Kahneman et al. (1999) the hedonic viewpoint encompasses pleasure and happiness. Thereby, it focuses on the *emotional* aspects of *well-being*, namely on happiness, interest in life, life satisfaction, presence of positive emotions and absence of negative emotions (Diener et al., 1999; Lamers et al., 2011). Contrary, the eudaimonic aspect conceptualizes well-being as beyond happiness (Ryan & Deci, 2001). Eudaimonic well-being deals with the individual's level of functioning in life and realizing one's potential (Keyes, 1998; Ryan & Deci, 2001; Waterman, 1993). The focus of eudaimonia is thus mainly on psychological and social well-being. *Psychological well-being* can be described in six dimensions of optimal functioning proposed by Ryff (1989). Namely, self-acceptance, positive relations, autonomy, environmental mastery, purpose in life as well as personal growth. Besides, *social well-being* is based on Keyes' (1998) model including the domains of social contribution, social integration, social actualization, social acceptance as well as social coherence.

Currently, there are several questionnaires available that measure mental well-being. Some of the questionnaires are measuring well-being only partly, include aspects of psychopathology or are relatively long (Lamers et al., 2011). Correspondingly, the mental health continuum- long form (MHC-LF) was developed for measuring well-being based on the three dimensions emotional well-being (EWB), psychological well-being (PWB) and social well-being (SWB). The MHC-LF encompasses 40 items and was shown to be a valid and reliable measure for mental health (Keyes, 2005). However, one major limitation is still the number of items. As long questionnaires require a longer attention period from respondents, the aim is to keep questionnaires as short as possible (Gongol et al, 2014; Kahneman, 1973). Thus, the MHC-SF with only 14 items was developed (Keyes, 2008). For the EWB the three items measure happiness, interest in life and life satisfaction. The PWB scale encompasses one item per dimension proposed by Ryff's six dimensions of optimal functioning (i.e., self-acceptance, positive relations, autonomy, environmental mastery, purpose in life as well as personal growth). For the SWB scale of the MHC-SF one item per dimension (i.e., social contribution, social integration, social actualization, social acceptance as well as social coherence) was derived.

Psychometric details of MHC-SF

Many studies in different countries have investigated the psychometric properties of the MHC-SF. The MHC-SF was shown to be a reliable and valid measure among clinical and non-clinical samples (Echeverría et al., 2017; Franken et al., 2018; Keyes et al., 2008; Lamers et al., 2011). Also cross-culturally the MHC-SF displayed good psychometric properties (Joshanloo et al., 2013; Lamers et al., 2012).

Good internal consistency (α > 0.80) of the MHC-SF total scale could be demonstrated for adolescents in the Netherlands and adults in Italy, Poland and in South Africa (Karaś et al., 2014; Keyes, 2005; Lamers et al., 2011; Petrillo et al., 2015; Westerhof & Keyes, 2010). Further, the EWB (α=0.83) and PWB (α=0.83) subscale displayed high internal consistency (Lamers et al., 2011). However, the SWB subscale (α=0.74) demonstrated adequate levels of internal consistency (Lamers et al., 2011). Moreover, moderate test-retest reliability over 9 month was found, which leads to the conclusion that the MHC-SF seems to be sensitive to change and stable (Lamers et al, 2011; Petrillo et al, 2015).

The discriminant validity of the MHC-SF was found to be good with respect to other instruments that measure mental illness (Lamers et al., 2011; Perugini et al., 2017). However, the convergent validity was found to be moderately acceptable with respect to the subscales of the MHC-SF and other validation measures (life-satisfaction, self-esteem, positive affect, happiness, individual functioning, involvement in society) (Keyes et al., 2008; Lamers et al., 2011; Petrillo et al., 2015).

Moreover, with respect to the factor structure different models were tested in the literature. Namely, a single-factor model with measuring general well-being, a two-factor model measuring hedonic and eudaimonic well-being and a tripartite model measuring EWB, SWB and PWB, a bifactor model including the tripartite structure with a separate additional factor and a hirachical model measuring a tripartite structure with an overarching factor of general well-being (Iasiello et al., 2022). Overall, the tripartite and the bifactor model demonstrated acceptable model fit (Iasiello et al., 2022; Keyes et al., 2008; Karaś et al., 2014; Lamers et al., 2011). However, the one- and two- factor model showed poorer fit (Iasiello et al., 2022).

Issues with MHC-SF

Besides the promising advantages of the MHC-SF, there are also some shortcomings of the instrument when facing practice in mental health care. It was reported that clients have difficulties with the time frame of the response format, as the questionnaire requires to estimate frequencies of the feelings during the past month (e.g., once or twice a month). As revealed in a study by Köhle (2010), participants reported to find it generally difficult to rate the frequency of feelings. Moreover, the recall bias could also influence the difficulty and accuracy of recalling the feelings from the past month. Recall bias generally encompasses the difficulties of individuals to recall past events, as in the MHC-SF (Gotlin et al., 2020). This can cause over- or underestimation of reporting experience (Gotlin et al., 2020). Besides, clients reported difficulties with some of the item formulations (e.g., '... that you had experiences that challenged you to grow and become a better person') (Köhle, 2010). Additionally, especially the items of the SBW scale were perceived as abstract and confusing with regards to what is meant by some items (e.g., 'How often do you feel that society is becoming a better place for you?'). These difficulties could lead to lower

response or higher drop-out rates due to confusion. Moreover, it could decrease in validity as misunderstandings about the content of the items could lead different answers. Further, items of for SWB subscale covering closer social relationships were rated as missing. This could lead to lower validity as parts of the concept of social well-being are not measured with the MHC-SF.

Revised version of MHC-SF

Corresponding to the issues with the original MHC-SF, a revised version was developed. The revision encompasses three changes. Namely, a different scaling, simplified items and new items. Firstly, the time frame of the response format was changed from a rating about the last month to a rating scale about the last week. Additionally, the answer options were changed as well. Instead of options estimating the precise frequency (e.g., once a week or every day) of the corresponding feelings, estimated answer categories (e.g. seldom or often) were implemented. Those estimated answer categories were previously shown to not decline the psychometric characteristics of the MHC-SF (Schotanus-Dijkstra et al., 2016). Secondly, the items were simplified and thus less abstract so that the broader Dutch population should be able to understand the items. Thereby, it was ensured to avoid a loss of content validity, as each item is supposed to measure one dimension of well-being (Keyes, 2005). This change was made in correspondence with prof. Corey Keyes, the creator of the MHC-SF. Thirdly, four items covering everyday social well-being aspects of closer relationships were added. These items include dimensions of contribution, satisfaction, relatedness, and support.

Convergent Validity Constructs

In order to examine convergent validity in this study, measures for self-esteem and life satisfaction will be used.

Self-esteem can be conceptualized as one person's (positive or negative) evaluation of one's self-worth (Caqueo-Urízar et al., 2022; Du et al., 2017). These evaluations can encompass domains like social and ethnic integration and performance (Abdel-Khalek, 2016). Self-esteem does not only entail one's own perception about oneself but is also about the perception by others (Schmidt & Padilla, 2003). Generally, individuals with more self-esteem were found to be more resilient, more optimistic, and happier, whereas people with lower self-esteem are more likely to suffer from mental illness (Abdel-Khalek, 2016). As previous studies demonstrated that self-esteem is moderately associated with the MHC-SF on a total score ($r = 0.34$) as well as EWB ($r = 0.39$) and PWB ($r = 0.33$) level, it was decided to take self-esteem as a validation construct (Lamers et al., 2011).

Besides, life satisfaction refers to the perception and cognitive evaluation of one's recent life situation (Diener et al., 1985). Individuals with higher life satisfaction are ascribed to have more positive

social relationships, higher occupational and educational success, better health conditions (Antaramian, 2017). People with lover levels of perceived life satisfaction were shown to be more vulnerable to mental health issues like depressive disorders and suicidal ideation (Goldbeck et al., 2007). Earlier research demonstrated that life satisfaction and the MHC-SF are moderately associated with each other with regards to the total scale (r = 0.39) and EWB subscale (r = 0.49) (Lamers et al., 2011; Pertrillo et al., 2015).

Research questions

1. What is the internal consistency of the revised MHC-SF version on a total scale and subscale level and to what extent is the internal consistency similar to the original MHC-SF?
2. What is the factor structure of the revised MHC-SF and to what extent is it similar to the original MHC-SF?
3. What is the convergent validity of the revised MHC-SF with regards to measures of self-esteem and life satisfaction and to what extent is it similar to the original MHC-SF?

Methods

Design and Procedure

This study makes use of an exploratory, non-experimental, longitudinal survey, the LISS (Longitudinal Internet studies for the Social Sciences) panel administered by CentERdata (Tilburg University, The Netherlands). The panel covers different modules. Namely, health, religion and ethnicity, social integration and leisure, family and household, work and schooling, personality, politics and values and different economic situations (i.e., assets, income, and housing). Further, other background variables and assembled studies were investigated. Within the panel, 6,969 households were randomly selected from the population register by Statistics Netherlands to participate in this study. In this paper, data from the personality module of the 12. Wave between May and June 2020 were selected. Precisely, data regarding self-esteem and life satisfaction.

Moreover, data from a separately assembled study about well-being by Westerhof and ten Klooster (2020) were included for this study, for which 3,572 participants of the LISS panel were selected. This survey assessed the mental health of participants in May 2020. The demographic characteristics for this paper were correspondingly derived from the well-being survey.

Participants

As the participation in the LISS panel is voluntary and a random sample was drawn from those LISS panel participants for the well-being study, the sample size for the present study varied. Within the

personality core study of the LISS panel, 5,859 participants completed the entire survey in 2020. For examining self-esteem, 1273 people filled in all corresponding items. Regarding life satisfaction, 1274 people filled in all respective items. Within the well-being study, 2,719 participants took part in the entire study. The participants of the well-being study were divided into four groups. Each group was assigned to a different version of the questionnaire. For this paper, the first group and second group were analyzed. This first group had to answer a MHC-SF version with revised items, a different response format and new items on social well-being. In total, 664 people participated in this group. The second group had to answer the original MHC-SF. Overall, 648 people participated in the second group. As the LISS panel and the well-being survey were not simultaneously administered, the data had to be merged.

Instruments

Personal background variables

For assessing the demographic variables, self-constructed questions regarding the sex, birth year, marital status, and highest education were administered. For the variable sex, the patients had to choose between the answer options ‘male’ or ‘female’. For indicating the participants marital status, one could choose between 4 answer options, namely ‘married’, ‘separated’, ‘divorced/widower’ and ‘never been married’. Next, the participants could choose between seven answer options to indicate their highest education level. These options were ‘Primary school’, ‘vmbo (intermediate secondary education, US: junior high school’, ‘havo/vwo (higher secondary education/preparatory university education, US: senior high school)’, ‘mbo (intermediate vocational education, US: senior high school)’, ‘wo (university)’, ‘not yet completed any education’, as well as ‘not yet started an education’.

MHC-SF

The original MHC-SF encompasses 14 items across three dimensions (Keyes, 2002). All items can be found in the appendix (see Appendix Table 13). Three items cover the EWB scale (e.g. ‘During the past month, how often do you feel satisfied with your life?’), five items for the SWB scale (e.g. ‘During the past month, how often do you feel that you had something important to contribute to society?`), and six items for PWB (e.g. During the past month, how often do you feel that you had experiences that challenged you to grow and become a better person?’). The participants are asked to rate the prevalence of every feeling over the past month on a 6-point Likert scale, ranging from 0 (never) to 5 (every day). Accordingly, a total average score and an average score for every subscale were created with a higher score indicating a higher level of well-being.

MHC-SF revised

The revised version of the MHC-SF consists of 18 items. All full items can be found in the appendix (see Appendix Table 12). Again, three items cover the EWB scale (e.g., `I am happy`) and 6 items cover the PWB scale (e.g., `I feel like my life has a meaning`). Regarding the SWB scale, 4 items have been added so that SWB is measured by 9 items in total (e.g., `I share joys and sorrows with people`). These new items cover every day social contact e.g., about closer relationships. Additionally, the revised version changed the response format. Correspondingly, the participants had to indicate their feelings over the past week on a 6-point Likert scale ranging from 0 (never) to 5 (almost always). Moreover, the items were rephrased and thereby simplified and less ambiguous. Again, a total average score and an average score for every subscale were created with a higher score indicating a higher level of well-being.

Self-esteem

To measure the participants level of perceived self-esteem, the Rosenberg Self-Esteem Scale (RSE) was adapted and included in the LISS panel (Rosenberg, 1965). This questionnaire contains 10 items (e.g., `On the whole, I am satisfied with myself`). The items could be answered on a 7-point Likert scale ranging from 1 (Strongly agree) to 7 (Strongly disagree). The questionnaire was not scored according to the corresponding manual due to variations with regards to the answer options. Instead, reversed items were recoded and a sum score was derived with a higher score indicating higher levels of self-esteem. The internal consistency of previous studies was shown to be good or even excellent and Cronbach's α ranged from 0.77 to 0.95 (Tijdink et al., 2016; Sinclair et al., 2010; Robins et al., 2001)

Life satisfaction

The participants' level of life satisfaction was measured using the satisfaction with life scale (Diener et al., 1985). It contains five items (e.g., `I am satisfied with my life`) that could be answered on a 7-point Likert scale ranging from 1 (strongly agree) to 7 (strongly disagree). Then, the scores were summed, and the sum scores were categorized according to the manual (Diener et al., 1985). The internal consistency was shown in previous studies to be good with an α ranging from 0.82-0.87 (Arrindell et al., 1999; Maroufizadeh et al., 2016; Shevlin et al., 1998).

Data analysis

All analyses were conducted using the statistical software SPSS IBM 25 (Wagner III, 2019). First, all relevant data of the core study of the LISS panel and the well-being study were merged. Then, all data were screened for valid cases in terms of answering all items for the variables of interest. Accordingly, missing cases and missing responses were deleted. Afterwards, the data were recoded and scored according to the

corresponding manuals, averaged, or summed. Furthermore, new variables for the total scores and the subscales of both MHC-SF versions were created separately. Additionally, new variables for the total MHC-SF score, EWB, SWB, and PWB score were created derived from both MHC-SF versions.

To select the fitting measurement tools for further analysis, the data were analyzed in terms of their normality. Therefore, the data were checked in terms of using the psychometric properties Skewness and Kurtosis (see Appendix Table 1). All variables were ranged between -1 and 1 and thus met the criteria for normality, except for the EWB subscale of the original MHC-SF. However, due to the sample size (N=648) this subscale was considered as normally distributed (Chang et al., 2008). Thus, it was opted for parametric tests.

Next, a t-test and a Chi-Square test with the demographics of the participants of the revised and original MHC-SF was executed to determine whether there is a difference between the demographics of both groups. Then, the demographic variables (age, sex, marital status and highest education) were analyzed using descriptive analyses (means (M), standard deviations (SD) and frequencies) to get some first insights into the sample. Accordingly, the descriptives of the variables of interest (original MHC-SF total score, original MHC-SF EWB, original MHC-SF SWB, original MHC-SF PWB, revised MHC-SF total score, revised MHC-SF EWB, revised MHC-SF SWB, revised MHC-SF PWB, self-esteem, and life satisfaction) were analyzed by using descriptive analyses (means (M), standard deviations (SD)) to get insights into the responses. To be able to compare possible differences between the participants who filled out the revised version and participants who filled out the original MHC-SF version statistically, a t-test with the variables of interest (MHC-SF total score, EWB, SWB, PWB, self-esteem and life satisfaction) was executed.

Then, to answer the first research question Cronbach's alpha of the revised MHC-SF total score as well as EWB, SWB and PWB subscales were analyzed to examine the internal consistency. Furthermore, the corrected item total correlation and Cronbach's alpha if item deleted were computed to detect which items contribute least to the internal consistency of the scale for the revised MHC-SF. In regards to comparability of the two MHC-SF versions, the reliability on a total scale as well as subscale level was also calculated for the original MHC-SF version. To be able to compare the data of the revised and original version of the MHC-SF qualitatively, the corresponding confidence intervals and chi-square tests were calculated with the aid of the corcon tool (Diedenhofen & Musch, 2016).

To answer the second research question, an exploratory factor analysis (EFA) was performed with an direct oblimin rotation to analyze the underlying factor structure of the revised MHC-SF. Again for comparability reasons, an EFA was performed for the original MHC-SF version as well.

To answer the third research question, bivariate correlation analyses using Pearson's *r* were conducted with the revised MHC-SF as well as self-esteem, and satisfaction with life to examine the convergent validity. These analysis were also conducted with the original MHC-SF and compared with the aid of the

corresponding confidence intervals. The interpretation of the correlation coefficients was made according to the following ranges: a coefficient of 0.00-0.30 was assumed to be negligible, a coefficient of 0.30-0.50 was interpreted as low, a coefficient of 0.50-0.70 was considered as moderate. Further, a correlation coefficient of 0.70-0.90 interpreted as high and a coefficient of 0.90-1.00 was assumed to be very high (Mukaka, 2012).

To confirm the results of the correlation analyses, eight moderation analyses with the aid of the Preacher and Hayes process tool were performed, to check whether the relationship between either Life satisfaction or self-esteem and mental health is moderated by the type of sample (Hayes, 2017). Therefore, the analyses were performed with the type of MHC-SF version as a moderating variable on a total scale and on a subscale level (EWB, SWB, PWB). The mental health score (on a total score and subscale level) was used as the dependent variable and either self-esteem or life satisfaction as the independent variable.

Results

Descriptives of the study group

Overall, no difference in regards to the demographics of the participants of the revised and original MHC-SF was found (see Table 1). The age of the participants ranged from 19 to 93 and the average participant was 48 years old. More than half of the participants are female (52.2%). The majority of the participants are married (45.1%). Overall, one fourth of the participants completed college (25.2%).

Table 1
Demographics (N= 1312)

Characteristic	Range	M (SD)	N	%	t(df)	p	χ^2 (df)	p
1.Participants age in years	18-93	48(19.29)			0.18 (1313)	0.73		
2.Sex					0.60 (1313)	0.11	0.31 (1)	0.86
Male			627	47.8				
Female			685	52.2				
3.Marital status					0.33 (1313)	0.36	3.228 (4)	0.52
Married			592	45.1				
Separated			123	9.4				
Divorced/ widower			62	4.7				
Never been married			535	40.8				
4.Education					-1.05 (1310)	0.75	3.00 (5)	0.81
Primary school			80	6.1				
vmbo (intermediate secondary education, US: junior high school)			224	17.1				
havo/vwo (higher secondary education/ prepatory university education, US: senior high school)			165	12.6				
mbo (intermediate vocational education, US: junior college)			312	23.8				
Hbo (higher Vocational education US: collage)			331	25.2				
Wo(university)			200	15.2				

Descriptives of the variables of interest

Revised and original MHC-SF

In total, 664 participants filled in the revised version of the MHC-SF and for the original version of the MHC-SF 650 people filled in the questionnaire (see Table 2 and Table 3). Significant differences were found regarding the mean item score of the total scale ($t(1282.24)=7.93$ ($p<0.05$)). Participants of the revised MHC-SF had a .36 higher total score (revised MHC-Sf M=3.31; original MHC-SF M=2.95). The biggest significant differences were found on the SWB subscale ($t(1200.96)=16.82$ ($p<0.05$). Accordingly, people who filled in the revised MHC-SF displayed a .97 higher score on the SWB subscale (revised MHC-SF M=3.31; original MHC-SF M = 2.34). Further, significant differences on the PWB subscale were found ($t(1269.01)=4.39$ ($p<0.05$). Correspondingly, participants of the revised MHC-SF demonstrated .23 higher score of PWB (revised MHC-SF M=3.35; original MHC-SF M=3.12). Moreover, no significant differences on the EWB subscale between the revised and original MHC-SF versions were found ($t(1313.00)=-1.30$ ($p=0.19$)). Meaning that participants of the revised and original version of the MHC-SF scored similarly on the EWB subscale.

Self-esteem

1273 people filled in the questions regarding self-esteem (see Table 2). No statistical differences of self-esteem was found in the participants who filled out either the revised or original MHC-SF version. (t(1275)=-1.23 (p=0.22)). Generally, the participants display higher levels of self-esteem (M=54.92).

Life satisfaction

Generally, 1274 people filled in the life satisfaction questions (see Table 2). No statistical difference of life satisfaction was detected in the participants who filled out either the revised or original MHC-Sf version (t(1274)=-1.30 (p=0.22)). Overall, the participants were slightly satisfied with their lives (24.4%).

Table 2

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

Variable of interest	N	M	SD
Revised MHC-SF[1] average score	664	3.31	0.77
EWB		3.57	0.96
SWB		3.21	0.79
PWB		3.35	0.86
Original MHC-SF[2] average score	648	2.95	0.88
EWB		3.63	0.97
SWB		2.34	1.06
PWB		3.12	1.02
Self-esteem[3]	1273	45.92	10.48
Life satisfaction	1274	25.40	5.75

[1] scores calculated from the MHC-SF-R on a 6 Point Likert scale (0 = never, 5 = (almost) always)
[2] scores calculated from the MHC-SF on a 6-Point Likert scale (0= never, 5 = every day)
[3] 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	7.93	1282.24	0.00
EWB	-1.30	1312	0.19
SWB	16.82	1200.96	0.00
PWB	4.29	1269.01	0.00
Self-esteem	-1.23	1275	0.22
Life satisfaction	-1.30	1274	0.22

Reliability

To answer the first research question (What is the internal consistency of the revised MHC-SF version on a total scale and subscale level and to what extent is the internal consistency similar to the original MHC-SF?) the internal consistency in terms of Cronbach's alpha was analyzed (see Table 4). The

total scale of the revised MHC-SF displayed excellent reliability (α=0.93). On a subscale level, good reliability could be demonstrated for each subscale ((EWB: α=0.88), (SWB: α=0.87), (PWB: α=0.85). To further interpret the results on an item-level, Cronbach's alpha if item deleted and the item-total correlation were calculated for the revised version (see Appendix Table 3). Items 5 (r=0.49) and 6 (r=0.44), which belong to the original SWB subscale items demonstrated the lowest item-total correlation. This means that items 5 and 6 added least to the internal consistency. Besides, item 14 belonging to the PWB subscale demonstrated the highest item-total correlation (r=0.78) and thus adds most to the internal consistency of the revised MHC-SF. Additionally, all newly added items for the SWB subscale displayed high item-total correlations (item 15 (r=0.72, item 16 (r=0.70), item 17 (r=0.75) and item 18 (r=0.73)). Nevertheless, when examining Cronbach's alpha if item deleted it was demonstrated that the internal consistency does not change when deleting either of the items and remains to be excellent.

In comparison to the original MHC-SF significant differences between Cronbach's alpha were found on a total scale level (χ^2(1, N= 1315) =18.33, p= 0.00) as well as with regards to the SWB subscale (χ^2(1, N=1315)=83.34, p=0.00). Meaning that the Cronbach's alpha of the total scale of the revised MHC-SF (α=0.93) is significantly higher than Cronbach's alpha of the total scale of the original MHC-SF (α=0.90). Additionally, Cronbach's alpha of the SWB subscale of the revised MHC-SF (α=0.87) is significantly higher than Cronbach's alpha of the SWB subscale of the original MHC-SF (α=0.72). For the EWB and PWB subscales no significant differences between Cronbach's alphas could be observed. When looking at the item-total correlation, it is noticeable that item 6 belonging to the SWB subscale displayed lowest correlation in both versions (revised r= 0.44; original r=0.53) (see Appendix Table 5). Also, in both versions item 14 belonging to the PWB subscale displayed highest item-total correlation (revised r=0.78; original r=0.71). Also when comparing the Cronbach's alpha if item deled, the internal consistency of both versions does not change when deleting either of the items.

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)	χ^2	p
Total scale	0.93	0.93	0.94	0.90	0.89	0..91	18.33	0.00*
EWB	0.88	0.87	0.90	0.86	0.84	0.87	3.43	0.06
SWB	0.87	0.85	0.88	0.72	0.76	0.81	83.34	0.00*
PWB	0.85	0.83	0.87	0.85	0.83	0.87	0.00	1.00

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

Factor structure

To answer the second research question (What is the factor structure of the revised MHC-SF and to what extent is it similar to the original MHC-SF?) the factor structure was analyzed using an EFA with a direct oblimin rotation (see Table 5, Figure 1 and Appendix Table 3, Appendix Table 4 and Appendix Figure 1). Overall, the results suggested a three-component factor structure for the revised MHC-SF. When looking at the individual factor loadings, the results revealed that all items of the revised MHC-SF version loaded mostly on the first factor, which explains 48.12% of the total variance. On the first factor, the factor loadings ranged from 0.47 (item 17) to 0.87 (item 18). When including the second component the explained variance increases to 55.45 % with item 9 (0.45) loading on this component. Taking the third factor into account, the variance explained increases to 61.37%. Correspondingly, item 1 (0.65) loads on this component. When taking a closer look at the scree plot and the elbow criterion, the largest decrease in total variance explained can be noted at the second component. Thus, a one-factor solution might suit best.

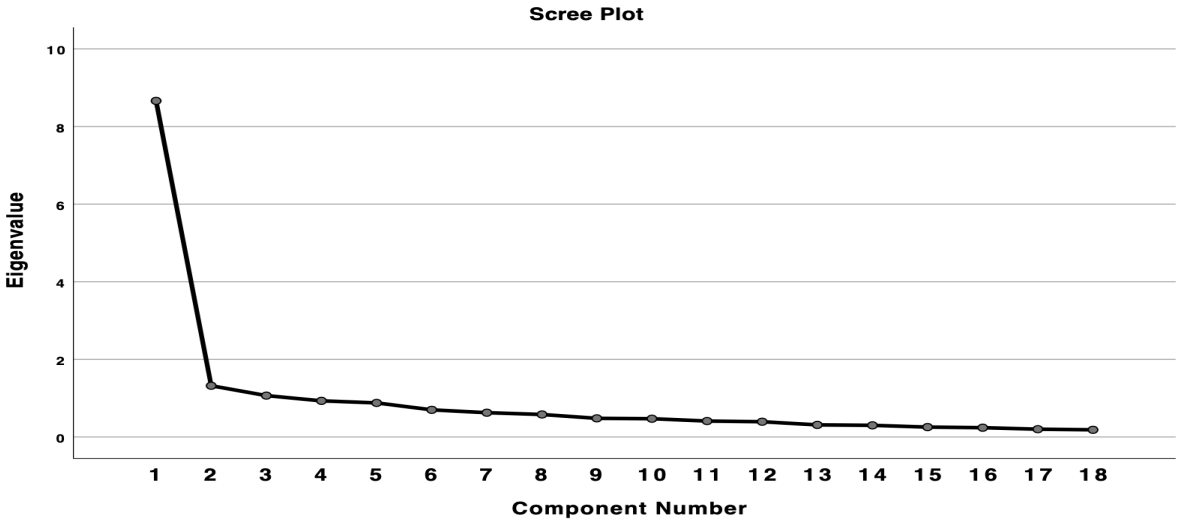
When comparing the results to the EFA of the original MHC-SF, it can be stated that both analyses suggested a three-component factor structure (see Table Appendix Table 4, Appendix Figure 1). Additionally, all items of the original MHC-SF loaded mostly on the first factor, which is similar to the results of the reversed MHC-SF. Further, when looking at the scree plot and the elbow criterion for both versions the largest decrease in total variance explained can be noted at the second component. Accordingly, it can be concluded that a one-factor solution might suit best for both versions. Consequently, the results of the CFA of the revised MHC-SF are similar to the results of the original MHC-SF.

Table 5
Factor Loadings Revised MHC-SF

Item	Component 1	Component 2	Component 3
1(EWB)	0.82	-0.15	0.65
2(EWB)	0.79	0.32	-0.29
3(EWB)	0.77	-0.46	-0.12
4(SWB)	0.76	0.23	0.15
5(SWB)	0.75	0.23	0.15
6(SWB)	0.75	-0.32	0.08
7(SWB)	0.74	0.15	-0.33
8(SWB)	0.73	-0.36	-0.06
9(PWB)	0.72	0.45	-0.10
10(PWB)	0.71	0.22	-0.23
11(PWB)	0.71	-0.35	0.08
12(PWB)	0.68	0.18	0.13
13(PWB)	0.68	0.08	0.32
14(PWB)	0.60	0.27	-0.22
15(SWB)	0.55	0.32	0.38
16(SWB)	0.53	0.12	0.39
17(SWB)	0.47	0.08	0.33
18(SWB)	0.87	0.08	0.01

Note. Rotation Method: Oblimin with Kaiser Normalization

Figure 1
Scree Plot EFA of Revised MHC-SF



Convergent validity

To answer the third research question (What is the convergent validity of the revised MHC-SF with regards to measures of self-esteem and life satisfaction and to what extent is it similar to the original MHC-SF?) Pearson´s correlation analyses were conducted and further supported by moderation analyses.

To examine the association between self-esteem, life satisfaction, total mental health, EWB, SBW and PWB of the revised version of the MHC-SF, self-esteem and life satisfaction, a Pearson's r rest was computed (see table 6). The test revealed moderate positive correlations between self-esteem and the total mental health score (r=0.60), EWB (r=0.61) and PWB (r=0.62). Meaning that participants with either higher levels of a total mental health score, EWB or PWB display also reported higher levels of self-esteem. Moreover, a low positive association of SWB (r= 0.48) and self-esteem was found, indicating that participants with higher levels of SWB also displayed higher levels of self-esteem.

Furthermore, the test revealed moderate positive associations of life satisfaction and the total mental health score (r=0.60), EWB (r=0.68) and PWB (r=0.65). Meaning that participants with either higher levels of a total mental health score, EWB or PWB display also reported higher levels of life satisfaction. Furthermore, a low positive association of SWB (r= 0.48) and life satisfaction was found, indicating that participants with higher levels of SWB also displayed higher levels of life satisfaction.

Table 6
Bivariate Correlations of the Variables Revised MHC-SF, Self-esteem and Life Satisfaction (N=665)

Variable	1	2	3	4	5	6
1. Revised MHC-SF 1 total score	-	**0.81**** [0.77; 0.84]	**0.95**** [0.94; 0.96]	**0.93**** [0.94; 0.96]	**0.60**** [0.54; 0.66]	**0.60**** [0.54; 0.66]
2 EWB		-	**0.66**** [0.60; 0.70]	**0.70**** [0.66; 0.76]	**0.61**** [0.63;0.73]	**0.68**** [0.56; 0.66]
3 SWB			-	**0.81**** [0.78; 0.84]	**0.48**** [0.41;0.55]	**0.48**** [0.42; 0.55]
4 PWB				-	**0.62**** [0.56; 0.68]	**0.56**** [0.49;0.62]
5 Self-esteem					-	**0.54**** [0.50; 0.61]
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).

For comparing the correlations of the revised MHC-SF with the original MHC-SF the corresponding confidence intervals were analyzes (see Table 6 and Table 7). The associations of the revised MHC-SF with regards to the *total score and life satisfaction, EWB and self-esteem, SWB and self-esteem, SWB and life satisfaction* as well as *PWB and self-esteem* were found to be stronger than the corresponding associations with the original MHC-SF. However, no significant differences of the revised and original MHC-SF in terms of the correlations of the *total score and self-esteem, EWB and self-esteem* as well as *PWB and self-esteem* was found. Meaning that the priorly mentioned associations are statistically similar.

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. Original MHC-SF total score	-	**0.73**** [0.69; 0.77]	**0.87**** [0.85; 0.89]	**0.92**** [0.91; 0.93]	**0.48**** [0.41; 0.54]	**0.56**** [0.39; 0.52]
2 EWB		-	**0.47**** [0.40; 0.53]	**0.62**** [0.54; 0.65]	**0.54**** [0.47; 0.60]	**0.60**** [0.54; 0.66]
3 SWB			-	**0.67**** [0.63; 0.72]	**0.31**** [0.24; 0.38]	**0.30**** [0.22; 0.37]
4 PWB				-	**0.44**** [0.37; 0.50]	**0.39**** [0.31; 0.69]
5 Self-esteem					-	**0.54**** [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 further analyze the convergent validity and to compare the correlations between the two MHC-SF versions and self-esteem, a moderation analysis was conducted (see table 8). The overall model was found to be significant ($F(3,1272) = 200.9$, $p<0.05$). However, the interaction effect of self-esteem and MHC-SF version is not significant (b=0.00, [-0.01, 0.00], p=0.44). Thus, it can be concluded that the type of MHC-SF version based on the total scale of the MHC-SF does not moderate the relationship between self-esteem and mental health. Moreover, when looking at the subscale level, further moderation analyses revealed that none of the subscales (EWB, SWB, PWB) influenced the relationship between self-esteem and mental health.(see Appendix table 6, Appendix table 8 and Appendix table 10). Thus, the priorly revealed stronger correlations of the revised MHC-SF cannot be confirmed statistically.

Table 8

Moderation Analysis, Self-esteem, Sample and the Moderation Effect Predicting Mental health (Total Score)

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	1.16	0.33	0.52	1.80	3.54	0.00
Sample	-0.24	0.21	-0.65	0.17	-1.14	0.25
Self-esteem	0.05	0.01	0.04	0.06	7.98	0.00
Moderation effect (self-esteem)	0.00	0.00	-0.01	0.00	-0.77	0.44

Note. Dependent variable: Mental health total score; Adjusted $R^2 = 0.32$; $F(3.00,1272.00) = 200.9$; $p<0.05$

To further test the convergent validity and to compare the correlations of both MHC-SF versions and life satisfaction, a moderation analysis was conducted (see table 9). The overall model was found to be significant (F (3,1273) =0.31, p<0.05). Nevertheless, the interaction effect of life satisfaction and MHC-SF version is not significant (b=-0.01, [-0.01, -0.02], p=0.27). Accordingly, it can be stated that the type of MHC-SF version on a total scale level does not moderate the relationship between life satisfaction and mental health. Additionally, when examining the influence of the subscales (EWB, SWB and PWB), the results revealed no significant moderating effect on the relationship of life satisfaction and mental health (Appendix table 7, Appendix table 9, Appendix table 11). Consequently, the previous revealed stronger correlations of the revised MHC-SF cannot be supported statistically.

Table 9

Moderation Analysis, Life Satisfaction, Sample and the Moderation Effect Predicting Mental health (Total Score)

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	1.53	0.28	0.98	2.08	5.48	0.00
Sample	-0.20	0.18	-0.55	0.15	-1.13	0.26
Life satisfaction	0.09	0.01	0.07	0.11	8.03	0.00
Moderation effect (sample x self-esteem)	-0.01	0.01	-0.02	0.01	-1.11	0.27

Note. Dependent variable: Mental health total score; Adjusted R^2=0.31; F(3,1273) = 188.38; p<0.05

Discussion

Overall, the main aim of this paper was to examine the psychometric properties of the revised MHC-SF and to compare it with the original MHC-SF in terms of the internal consistency, factor structure, and convergent validity. On a total scale level excellent internal consistency and on a subscale level good internal consistency could be demonstrated. Regarding the internal consistency of total scale and the SWB subscale of the revised MHC-SF performed better than the original version. Further, a one-dimensional factor design was suggested, which is similar to the original MHC-SF. Moreover, both versions of the MHC-SF performed equally well in terms of the convergent validity.

The first aim of this study was to examine the internal consistency of the revised MHC-SF version on a total scale and subscale level in comparison to the original MHC-SF. The revised MHC-SF demonstrated a higher internal consistency in regards to the total score as well as for the SWB subscale. In line with literature, the SWB subscale of the original MHC-SF performed less well compared to the other

subscales (Keyes, 2005; Keyes, 2006; Keyes et al., 2008; Lamers et al., 2011), Westerhof & Keyes, 2010). The improvement of the SWB scale for the revised version could be due to the four newly added items, since scales including more items tend to be more reliable (Dorst, 2011). Accordingly, it can be concluded that the aim of making the SWB subscale stronger in terms of its internal consistency was achieved. Regarding the total scale, the revised version was able to display minor superiority in terms of the internal consistency. Still, both versions demonstrated excellent internal consistency. Compared to previous studies concerning the internal consistency of the original MHC-SF on a total scale level good levels ranging from 0.85 to 0.88 were shown (Keyes, 2009; Lamers et al, 2011; Luijten et al, 2019). Accordingly, it can be concluded that dispite changes in terms of response format, wording of the items and additional items, high levels of internal consistency could be maintained.

The second aim of this study was to examine the factor structure of the revised MHC-SF also in comparison to the original MHC-SF. A one-factor solution was shown to be most appropriate for the revised and well as the original MHC-SF version. Correspondingly, the revised version seems to perform similarly. These findings partly contradict the findings of past research. According to literature, a tripartite factor structure and the bifactor model demonstrated acceptable fit, whereas the one-factor model, as found in this study, demonstrated poorer fit. (Iasiello et al., 2022; Keyes et al., 2008; Lamers et al., 2011). However, it can be argued that the one-factor model showed poorer fit compared to other models (e.g. bifactor model or a tripartite structure) due to the number of items and the number of different components of well-being that is measured within the MHC-SF (Iasiello et al., 2022). According to Reise et al. (2014) measurement scales with a high number of items and diverse underlying constructs leads to poorer fit of the one-factor model. The results indicate questionability about the division into three subscales and its theoretical model, if there seems to be just one underlying factor. As only a EFA has been conducted, further research with CFA is needed to test other structures like the hierarchical model in order to be able to answer the question if a division into three subscales is useful. Further, even though the SWB subscale performed better in terms of the internal consistency, the (old and new) items of this subscale are not loading on a single separate factor. Thus, the intention to make the SWB subscale stronger could not be reached entirely, as it would imply that the corresponding items of the SWB subscale would load on a different factor than the other items. Considering all items loading on one factor leads to the assumption that the items of the SWB subscale cannot differentiate enough to be considered as a distinct (underlying) dimension. This highlights the prior suggestion for the need to further evaluate the dimensionality of the revised MHC-SF.

The third aim was to assess the convergent validity of the MHC-SF with measures of self-esteem and life-satisfaction in comparison to the original MHC-SF. Both MHC-SF versions performed equally well in terms of the convergent validity. Minor differences in strength of the associations were detected with regards to the total score and life satisfaction, EWB and self-esteem, as well as with regards to PWB

and self-esteem. Hereby, the revised MHC-SF versions displayed stronger associations to the validation measures self-esteem and life satisfaction. A study by Lamers et al. (2011) made use of the same constructs (i.e., self-esteem and life satisfaction) of the LISS panel. Comparing the results, it can be noted that the revised MHC-SF used in this paper displayed stronger associations with regards to life satisfaction and the total scale as well as the EWB subscale than the associations found by Lamers et al. (2011). Furthermore, the associations of self-esteem and the total scale, EWB and PWB seem to be stronger than the associations found in the study by Lamers et al. (2011). In line with the findings by Lamers et al. (2011) the SWB subscale was also least associated with self-esteem and life satisfaction. As the validation measures are only representing parts of the subscales, it is advised for future research to take validation measures into account that are better representing the subscales. To further substantiate the previously found associations, moderation analyses were conducted. No difference- neither on a total scale level nor on a subscale level could be detected with the regards to the relationship of mental health and both self-esteem and life satisfaction. Accordingly, the previously mentioned stronger associations of the revised MHC-SF could not be confirmed with the moderation analyses. More research is needed to examine possible reasons that could have caused absent difference of the MHC-SF versions. Thus, one has to be cautious when interpreting the comparisons of the associations of the revised MHC-SF with self-esteem and life satisfaction.

Strength and limitations

One major strong point of this paper is the availability of two large samples (for the revised MHC-SF and the original MHC-SF) drawn by means of randomization from a nationally representative cohort, the LISS panel (Scherpenzeel, 2011). The randomization prevents selection bias and thus biased results and allows comparability of groups, in this case the type of MHC-SF version (Suresh, 2011). Correspondingly, all population units had an equal chance of being selected for the study in general, but also for the different MHC-SF versions. As demonstrated in the results of the demographics, it was shown that the participants did not differ regarding their demographic background (age, gender, marital status and highest education), thus the further results are better comparable. Another strength of this study is that the sample is representative for the Dutch population. Thus, the findings are generalizable to Dutch adults.

Furthermore, the availability of two large samples in this study is quite unique. It allows comparison between the psychometric properties of the two versions of the MHC-SF directly. Previous studies rather focused on comparing samples in a cross-cultural manner. Accordingly, direct comparison as in this study is not possible.

However, this study also has its limitations. Regarding the factor structure an EFA was conducted to explore the underlying theoretical structure. However, for future research a confirmatory factor analysis (CFA) should be conducted to test measurement invariance between the two versions of the MHC-SF.

Additionally, regarding the reliability only the internal consistency was assessed. Thus, for future research, the test-retest reliability should be assessed to examine the consistency over time. Also, in this study no predictive validity with longitudinal data was assessed. Additionally, only two measures for testing the convergent validity were selected. For future research, it is advisable to examine more measures for convergent validity to be able to focus on specific measures referring to a certain subscale. Furthermore, discriminant validity was not assessed and is thus advised to examine in the future with the aid of tools measuring mental illness for instance. Moreover, as the data are generalizable to Dutch adults, further clinical testing is needed to be able to evaluate the revised MHC-SF specifically in the clinical setting. This step is necessary in order to be able to purposefully use the tool not only for the general population but also in the clinical setting. An additional limitation is that these findings refer to the Dutch population only. Thus, for further research it is suggested to evaluate the revised MHC-SF in different countries to be able to possibly broaden the generalizability of these findings.

Further, between-subjects design also has its shortcomings. Due to this fact, no within-subjects comparison between the original and revised MHC-SF was possible. However, if the participants would have filled in both, the revised MHC-SF and the original MHC-SF, there would be an increase in terms of the participant burden (Myin-Germeys & Kuppens, 2021). This could lead to response bias as both MHC-SF versions are despite the changes still resembling.

Another limitation of this study is the comparison of only one revised MHC-SF version with the original MHC-SF. As three different revisions of the MHC-SF were developed and filled in by participants, it would be of added value to compare all three revised versions with each other, but also with the original version. Based on that, it is recommended for future research to take into account all three revised versions in order to be able to evaluate which version performs best in terms of the psychometric properties, which is beneficial for actually implementing a revised version of the MHC-SF in practice.

Practical implication and conclusion

To conclude, it can be stated that the revised MHC-SF displays high levels of internal consistency and performs equally well as the original MHC-SF with slight improvements on the SWB subscale. The intention to increase the internal consistency of the SWB subscale of the revised MHC-SF could be partly achieved. Even though improvements of the SWB subscale are detectable in terms of internal consistency, the corresponding items of the SWB subscale were able to load on one separate factor . The analysis of the factor structure leaves room for future investigations in terms of possible underlying factors. Even though this study displayed promising psychometric properties of the revised MHC-SF in terms of the internal consistency and convergent validity, it is still a relatively new and unvalidated measurement instrument, thus one should be cautious when using it in practice. Thus, further validation is suggested and desired, as

it is important to have a good measurement tool for mental well-being to be able to provide an adequate alternative models focusing on pathology only. In comparison to the original MHC-SF it can be concluded, that after making items of the MHC-SF less ambiguous and changing the response format as well as adding items about closer social well-being the psychometric qualities could be maintained.

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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	665	-0.48	0.10	0.61	0.19
2.EWB		-0.60	0.10	0.22	0.19
3.SWB		-0.31	0.10	0.38	0.19
4.PWB		-0.60	0.10	0.81	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	1273	-0.94	0.07	0.71	0.13
10.Life satisfaction	1274	-0.70	0.97	-0.28	0.13

Table 2

Corrected Item Total Correlation and Chronbach'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)	0.70	0.93
Item 2 (EWB)	0.68	0.93
Item 3 (EWB)	0.72	0.93
Item 4 (SWB)	0.64	0.93
Item 5 (SWB)	0.49	0.93
Item 6 (SWB	0.44	0.93
Item 7 (SWB)	0.55	0.93
Item 8 (SWB)	0.50	0.83
Item 9 (PWB)	0.65	0.93

Item 10 (PWB)	0.70	0.93
Item 11 (PWB)	0.66	0.93
Item 12 (PWB)	0.54	0.93
Item 13 (PWB)	0.64	0.93
Item 14 (PWB)	0.78	0.93
Item 15 (SWB)	0.72	0.93
Item 16 (SWB)	0.70	0.93
Item 17 (SWB)	0.75	0.93
Item 18 (SWB)	0.73	0.93

Table 3
Total Variance Explained Revised MHC-SF

Component	Cumulative e%
1	48.12
2	55.45
3	61.37

Table 4
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

Table 5

Corrected Item Total Correlation and Chronbach's Alpha If Item Deleted of the Original MHC-SF

Item (Subscale)	Corrected item-total Correlation	Cronbach'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

Figure 1
Scree Plot Original MHC-SF

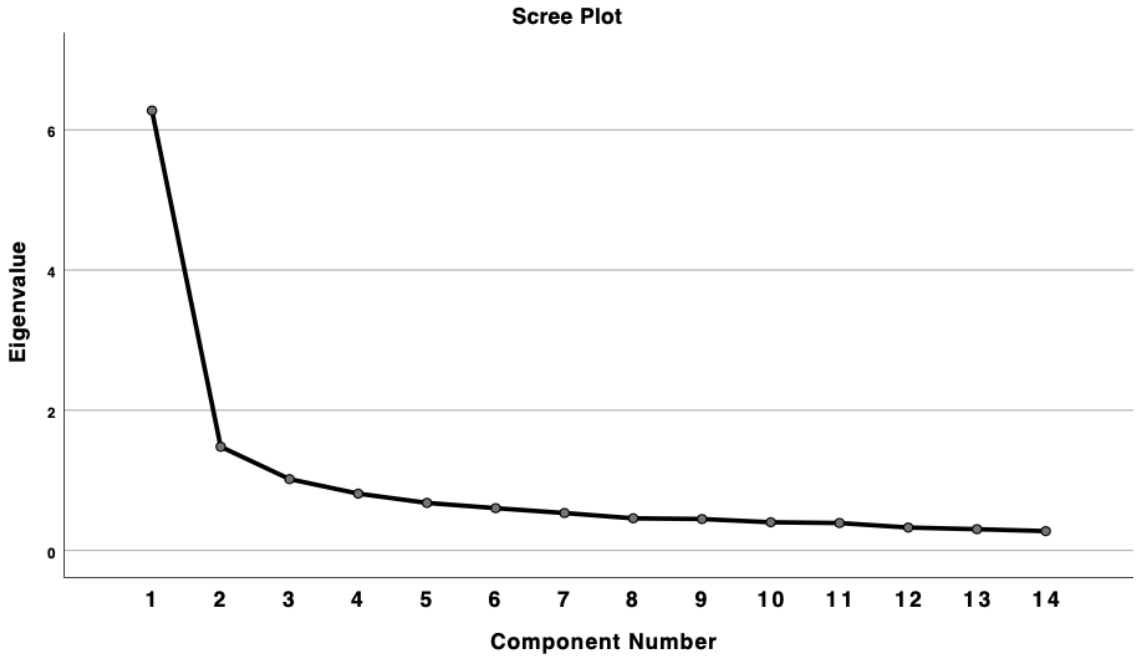

Table 6

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

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.48	0.37	-0.25	1.20	1.30	0.19
Sample	0.06	0.01	0.43	0.07	8.46	0.00
Self-esteem	0.14	0.24	-0.33	0.61	0.59	0.56
Moderation effect (sample x self-esteem)	0.00	0.00	-0.02	0.01	-0.53	0.60

Note. Dependent variable: Mental health (EWB); Adjusted R^2=0.33; F(3,1272) = 207.85; p<0.05

Table 7

Moderation Analysis, Life Satisfaction, Sample and the Moderation Effect Predicting Mental Healt h(EWB))

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.56	0.29	-0.02	1.13	1.90	0.06
Sample	0.12	0.01	0.10	0.14	10.49	0.00

Life satisfaction	0.21	0.19	-0.16	0.57	1.09	0.27
Moderation effect (sample x self-esteem)	-0.01	0.01	-0.02	0.01	-1.04	0.30

Note. Dependent variable: Mental health(EWB) ; Adjusted R^2=0.41; F(3,1273) = 297.44; p<0.05

Table 8

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

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	2.01	0.40	1.22	2.80	5.00	0.00
Sample	0.04	0.01	0.02	0.05	5.32	0.00
Self-esteem	-0.74	0.26	-1.24	-0.23	-2.86	0.00
Moderation effect (sample x self-esteem)	-0.00	0.00	-0.01	0.01	-0.64	0.52

Note. Dependent variable: Mental health (SWB); Adjusted R^2=0.30; F(3,1272) = 182.43; p<0.05

Table 9

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

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.56	0.29	-0.02	1.13	1.90	0.06
Sample	0.11	0.01	0.10	0.14	10.49	0.00
Life satisfaction	0.21	0.19	-0.16	0.57	1.01	0.27
Moderation effect (sample x self-esteem)	-0.01	0.01	-0.02	0.01	-1.04	0.30

Note. Dependent variable: Mental health (SWB); Adjusted R^2=0.41; F(3,1273) = 297.44; p<0.05

Table 10

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

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	0.59	0.38	-0.15	1.32	1.57	0.12
Sample	0.56	0.01	0.04	0.7	8.32	0.00
Self-esteem	0.05	0.24	-0.42	0.52	0.20	0.84

Moderation effect (sample x self-esteem)	-0.01	0.00	-0.01	0.01	-1.40	0.16

Note. Dependent variable: Mental health (PWB); Adjusted R^2=0.28; F(3,1272) = 170.95; p<0.05

Table 11

Moderation Analysis, Life Satisfaction, Sample and the Moderation Effect Predicting Mental Health (PWB))

Variable	B	SE	CI (95% lower)	CI (95% upper)	t	p
Constant	1.33	0.32	0.69	1.98	4.05	0.00
Sample	0.09	0.01	0.07	0.12	7.17	0.00
Life satisfaction	-0.02	0.21	-0.43	0.40	-0.06	0.95
Moderation effect (sample x self-esteem)	-0.01	0.01	-0.03	0.01	-1.28	0.20

Note. Dependent variable: Mental health (PWB) ; Adjusted R^2=0.23; F(3,1273) = 126.70; 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= Zelden, 2= Soms, 3= Regelmatig, 4=Vaak, 5= (Bijna) altijd

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