Validation of the Mental Health Continuum - Short Form, revised.

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Abstract

The Mental Health Continuum - Short Form is the most widely used self-report questionnaire for assessing the positive mental health of an individual. This 14 item containing questionnaire has been revised since studies showed that participants had problems in understanding the items. This study aimed to validate this revised version by investigating psychometric properties, through the use of a cross-sectional, online study, in which the researcher looks at the factorial structure, internal consistency, and convergent/divergent validity of the revised and original Mental Health Continuum - Short Form. This was conducted in a sample of University students (*N*=108). For the assessment of convergent/divergent validity, two additional psychological constructs related to well-being were taken into account, these being stress and self-esteem. These constructs were measured with the use of the Perceived Stress Scale and the Rosenberg Self-esteem test. The confirmatory factor analysis demonstrated a poor fit for the four-factor model of the revised Mental Health Continuum - Short Form. The four factors consisted of emotional well-being, psychological well-being, societal well-being, and relational well-being, with the factor societal well-being performing poorly. This study also observed a poor fit for the three-factor model of the Mental Health Continuum - Short Form. The internal consistency for both versions showed to be good for the total scale, with Cronbach's α of .89. For the subscale of societal well-being, it performed less with a Cronbach's α of .65. This indicated that the subscale of societal well-being needs further improvement for usability. Convergent and divergent validity with related questionnaires was good. From the gathered information it shows that the revised version needs further evaluation, for the societal well-being scale in its current form performs poorly according to this research, leading to the conclusion that it is not recommended based on these results to use the revised version over its predecessor.

Keywords: Well-being, psychometric properties, questionnaire, factorial analysis, internal consistency, convergent validity, divergent validity, stress, self-esteem.

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1. Introduction

Mental health is often viewed as the opposing element of mental illness, both located on one continuum (Greenspoon & Saklofske, 2001). Recently this integrated proposition of psychopathology and well-being, being part of one continuum has been challenged due to strong scientific evidence that shows that psychopathology and well-being are related yet independent constructs which contribute to mental health (Keyes, 2002; Lamers, Westerhof, Bohlmeijer, Ten Klooster, & Keyes, 2011; Wang, Zhang, & Wang, 2011). Well-being can be defined as a positive outcome that brings meaning to people and to many sectors in society; it says something about the perception of individuals and signals if their lives are going well. If an individual can realize his or her abilities, can cope with the daily stressors of life, can work productively, and can contribute to the community, a state of well-being can be realized (World Health Organization, 2004). It is further defined as a multidimensional construct that incorporates emotional, psychological, and social well-being of an individual (Keyes, 2005; Diener, Suh, Lucas, & Smith 1999). Well-being is made up of these three core components being measured as three different subscales defined as emotional well-being which focalizes on happiness by defining well-being in of life satisfaction, psychological well-being which looks at well-being from a personal perspective e.g. self-acceptance, purpose in life, and social well-being which emphasizes well-being in relation with others (Diener, Suh, Lucas, & Smith, 1999; Keyes, 2005).

A considerable body of evidence shows that high levels of well-being are associated with positive outcomes in relationship with mental health (Chida, & Steptoe, 2008; Diener, Helliwell, & Kahneman, 2010; Huppert, 2009). Psychopathology and positive mental health are two distinct continua, and it is important that there are good measurement tools for both continua. Well-being is increasingly targeted in interventions and evaluated in intervention studies; therefore, it is of importance to have valid and reliable instruments for further investigation of well-being.

The Mental Health Continuum - Long Form (MHC-LF) is an instrument that is used for assessing positive mental health (Keyes, 2005). This survey consists of 40 items and is valid and reliable. However, due to its total of 40 items, participants need to retain their focus for an extended period when filling it out. For the practical and clinical use of this tool, the length of the MHC-LF is less desirable, for it is not uncommon that participants need to fill out multiple surveys during an assessment. Questionnaires in clinical use are preferably shorter if participants are asked to fill out multiple, making it less of a burden for the participants (Vickers, 2007). Keyes (2002) shortened the length of the MHC-LF, creating a

survey that included the most valuable items, this being the Mental Health Continuum - Short Form (MHC-SF) consisting out of 14 items.

The MHC-SF contains three subscales that measure emotional well-being (EWB), psychological well-being (PWB), and social well-being (SWB),. EWB is based on Diener, Suh, Lucas, & Smith (1999) and consists of three items that focus on the hedonic aspects of well-being: happiness, interest, and life satisfaction, the presence of positive- and absence of negative emotions (Diener, Suh, Lucas, & Smith, 1999). PWB is based on Ryff (1989) and consists of six items that measure self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy, and purpose in life. SWB is based on Keyes (1998) and consists of five items that also focus on social contribution, social integration, social actualization, social acceptance, and social coherence. Both PWB and SWB are focussed on the eudaimonic perspective of well-being, which says that well-being is defined in the extent that a person is able to fully positive function (Keyes, 1998). Significant aspects here are the ability of a person to find meaning in one's life and to search for self-actualization.

Evaluation of the MHC-SF showed that it is a reliable and valid instrument for measuring mental health in clinical and non-clinical settings (Franken et al., 2018; Guo et al., 2015; Keyes et al., 2008; Lamers et al., 2011). The English version was evaluated in four communities in South Africa with a sample size of 1050, where it was shown through the use of factor analysis that the instrument replicated the three-factor structure of EWB, SWB, and PWB as found in US samples (Keyes et al., 2008). When looking at the internal reliability, the MHC-SF scored .74, here the total score of the MHC-SF correlated with .52. It had a measure of positive affect between .35 and .40 with measures of generalized self-efficacy and satisfaction with life. It scored between .30 and .35 with measures of coping strategies, sense of coherence, and community collective self-efficacy (Keyes et al., 2008). A psychometric evaluation of the MHC-SF in Chinese adolescents showed that the Cronbach's α coefficients for sub-scales as well as the total scale were all above .80, indicating good reliability (Guo et al., 2015). Confirmatory factor analysis also confirmed the three-dimensional structure of the Chinese version of the MHC-SF. The MHC-SF was also validated in the Netherlands in a representative clinical sample (Franken et al., 2018), and confirmed the theoretically based arrangement of the 14 items in the three subscales of well-being. Subscales showed in the study that they have good internal reliability.

Although the MHC-SF has been found a useful scale in measuring the levels of well-being of an individual and that it has sufficient validity and reliability, the subscale SWB seemed to perform less well compared to EWB and PWB. According to G. J. Westerhof

(personal communication, March 7, 2019), multiple items on the PWB and SWB scales were found to be confusing for participants; this is also reported with interviews in a study by Köhle (2010). The study by Köhle (2010) also showed that participants had difficulties to respond correctly to statements about the frequency in which feelings arose in the past month. This showed a need for some revision of the MHC-SF, abbreviated as the MHC-SF-R.

The MHC-SF-R has alterations in the PWB and SWB subscales compared to the MHC-SF. The PWB items were formulated differently with the intent that the items were easier to understand for the participants. SWB was separated into two different subscales, named societal well-being (SOCWB) and relational well-being (RELWB). SOCWB was revised from the original SWB, whereas RELWB consisted of newly developed questions with the intention to improve measuring social well-being, making the MHC-SF-R a 19 items survey. Furthermore, changes were made in formulation about the timeframe in which certain feelings arose. In the MHC-SF questions were phrased in a timespan of a month, the revised version asks for feelings felt in the past week. This was done so that the information recollected by the participants is in a shorter time frame, making it less of a burden. The goal of the revised items was to make them easier to understand and more clear.

The primary aim of this study was to validate the MHC-SF-R. This study will look at the factorial structure, internal consistency, and convergent/divergent validity with the use of two other questionnaires that measure related psychological constructs. As a secondary aim, the MHC-SF and MHC-SF-R were compared on the aforementioned three psychometric properties (factorial structure, internal consistency, convergent/divergent validity), to observe if the tools differ in measuring psychometric properties. The MHC-SF-R was adapted on the basis of previously stated limitations and is expected that it will show similar or better internal consistency and convergent/divergent validity. For further exploring the convergent/divergent validity, two psychological constructs were used, which are stress and self-esteem. These indicators were chosen due to the relationship it has with ones well-being and personal functioning (Dragos, 2010; Du, Li, Chi, Zhao, & Zhao, 2015; Du, Bernardo, & Yeung, 2015; Sapolsky, 2004). It is expected that stress levels could be related to an individual's personal well-being based on the literature by Dragos and Sapolsky (2010; 2004). Sapolsky (2004) observed that stress experienced in disproportionate amounts has a relationship with well-being, implying it could affect the overall mental health of an individual. The effects of high amounts of stress seem to be associated with negatively influencing a person's state of psychological- and overall well-being. The Perceived Stress Scale (PSS) will be used to examine if there is a divergent validity between the subdomains

and total score of well-being. This study will also look at the Rosenberg Self-Esteem test (RSE) in relation to well-being. The RSE is a scale that measures global self-worth in both positive and negative feelings of oneself (Rosenberg, 1965). In several studies, it was shown that high feelings of self-esteem are related to well-being (Du, Li, Chi, Zhao, & Zhao, 2015; Du, Bernardo, & Yeung, 2015). The psychological construct self-esteem was chosen due to previously done research that revealed that self-esteem correlated with the total scores of the MHC-SF (Keyes et al., 2008; Lamers et al., 2011). It is expected to see similar results when compared with the total scores of the MHC-SF-R.

With this specified, the following hypotheses were formulated:
H1: The four-factor structure of the MHC-SF-R will be confirmed (EWB, PWB, SOCWB, & RELWB) with an acceptable model fit.

H2.1: the expectation to see at least an acceptable internal consistency ($\alpha > .70$) for the four subscales of the MHC-SF-R and the total scale.

H2.2: the expectation that the MHC-SF-R will show intercorrelations of the subscales with at least moderate strength

H3.1: the expectation to see at least moderate, significant negative correlations of the MHC-SF-R's total- and subscale scores, with the total PSS scores.

H3.2: the expectation to see at least moderate, significant positive correlations of the MHC-SF-R's total- and subscale, with the total RSE scores.

H4: the expectation that the MHC-SF-R will show a higher or similar internal consistency and convergent/divergent validity, relative to the MHC-SF.

2. Methods

2.1. Design

This study is designed as a cross-sectional survey in which participants fill out a questionnaire containing several measuring scales. The study was ethically approved by the Behavioural, Management and Social Sciences (BMS) Ethics Committee of the University of Twente. The approval can be requested at the BMS with the registration number 190441.

2.2. Participants

The participants in this study were recruited through the use of convenience sampling. English speaking students aged 18 and older were chosen as the target group. The spread of this link and response of participation was mostly succeeded via the researchers' acquaintances on WhatsApp and Facebook, where it was not further monitored. Exclusion criteria were being younger than 18 years, an inadequate proficiency of English (e.g., beginner or intermediate level), and not being enrolled as a student at a University or an Applied University.

From the 11th of April till the 6th of May 2019, 125 subjects were recruited. 125 opened the link to the survey of which 6 were excluded due to not meeting the English proficiency criterion, and 3 subjects were excluded due to not being enrolled as a student. Furthermore, 7 subjects did not finish the survey in its entirety, resulting in the data not being recorded. 1 outlier was removed from the analyses due to causing the data to differentiate substantially from the normal distribution. The final sample consisted of 108 participants, 53 of which filled in the MHC-SF-R and 55 the MHC-SF, with age ranging from 18 to 31 years (M= 22.03, SD= 2.65). Approximately 55% were female, and 45% male. Moreover, approximately 73% were German, 14% Dutch, and 13% stated to be from another nationality. For both groups (MHC-SF-R and MHC-SF), demographic characteristics were assessed. There were no significant age differences between those who completed the MHC-SF-R and those who completed the MHC-SF. Group MHC-SF-R included 47% female and 53% male with a mean age of 22.47 and SD= 2.95 years, group MHC-SF included 44% female and 56% male with a mean age of 21.6 and SD= 2.27. There were also no large differences found in the distribution of the nationalities between test groups. Group MHC-SF-R included 72% German, 15% Dutch, and 13% of other nationalities, for the MHC-SF this was 75% German, 13% Dutch, and 12% of other nationalities.

2.3. Instruments

2.3.1. The Mental Health Continuum - Short Form Revised

The MHC-SF-R is a revised version of the MHC-SF. The MHC-SF-R is a self-administered questionnaire containing 19 items in total, measuring overall mental well-being. Well-being is divided into four dimensions consisting of emotional well-being (3 items), psychological well-being (6 items), societal well-being (6 items), and relational well-being (4 items). The items are answered with a 6-point Likert scale ranging from never (0) to almost always (5) on how often they felt or experienced a specific feeling in the past week. The interpretation of the outcome was made with the sum scores of the MHC-SF-R's total- and subscale scores. The total scale has a scoring range from 0 to 95 with the subscale scores: EWB 0 to 15, PWB 0 to 30, SOCWB 0 to 30, and RELWB 0 to 20. A higher score implies that the individual perceived the feeling of well-being in the past week more frequent, indicating a higher level of well-being.

2.3.2. The Mental Health Continuum - Short Form

The MHC-SF is a self-administered questionnaire containing 14 items in total, measuring overall mental well-being. Well-being is divided into three dimensions consisting of emotional well-being (3 items), psychological well-being (6 items), and social well-being (5 items). The items are answered with a 6-point Likert scale ranging from never (0) to almost always (5) on how often they felt or experienced a specific feeling in the past month. The interpretation of the outcome was made with the mean scores of the MHC-SF's total- and subscale scores. The total scale has a scoring range from 0 to 70, and the subscale scores are for EWB 0 to 15, PWB 0 to 30 and SWB 0 to 25. A higher score implies that the individual perceived the feeling of well-being in the past month more frequent, indicating a higher level of mental well-being.

The MHC-SF has shown good internal consistency (> .80) and discriminant validity in adolescents (age 12-18) and in groups of adults in the United States, South Africa, and in the Netherlands (Keyes et al., 2008; Lamers et al., 2011; Westerhof & Keyes, 2009). For the test-retest reliability, it showed that the MHC-SF scored an average of .68 over a three month period, and a .65 over a nine month period (Lamers et al., 2011). According to the above-mentioned studies, the MHC-SF's psychometric properties can be considered adequate to good.

2.3.3. The Perceived Stress Scale

The Perceived Stress Scale (PSS; Cohen et al., 1983) is a self-administered questionnaire containing 10 items that measure to what extent individuals experienced levels of stress in the past month. The questionnaire makes use of a five-point Likert Scale ranging from never (0) to very often (4). As an example: "In the last month, how often have you been upset because of something that happened unexpectedly?". 4 items (4, 5, 7, & 8), were reversed scored, as an example of the formulation: "In the last month, how often have you felt that you were on top of things?". The scale has a scoring range from 0 to 40, with higher scores reflecting higher levels of perceived stress. The 10-item PSS has shown acceptable reliability (.71) in previous research (Mitchell et al. 2008; Roberti et al., 2006; Taylor, 2015). In the current study, the PSS had an internal consistency that was considered high (Cronbach's $\alpha = .81$).

2.3.4. Rosenberg Self-Esteem Scale

The Rosenberg Self-Esteem test is a self-administered questionnaire containing 10 items in total, which measure global self-worth (Rosenberg, 1965). These 10 items measure positive and negative feelings about the self, 5 items are phrased positively and 5 items are phrased negatively. The scale is developed to be unidimensional; all items in the test are answered using a 4-point Likert scale format ranging from (1) strongly disagree to (4) strongly agree. It includes questions like: "I feel that I'm a person of worth, at least on an equal plane with others" and "I wish I could have more respect for myself". The five items that are stated negatively in the RSE are reversed scored, it has a scoring range from 10 to 40. A higher score reflects that the individual has a higher degree of self-esteem. The scale shows an internal consistency of $\alpha = .77$ (Rosenberg, 1965), and high reliability (0.85), (Silber & Tippett, 1965, Shorkey & Whiteman, 1978). In the current study, the RSE had an internal consistency that was considered high (Cronbach's $\alpha = .86$).

2.4. Procedure

The survey was administered through the online software program Qualtrics and was available for participation from the 12th of April till the 6th of May 2019. Participants that were undergraduates at the University of Twente were able to fill out the survey through the University of Twente's online SONA-systems and receive SONA study points as a reward for participating. For students not enrolled at the University of Twente, it was accessible through an anonymous link that was sent to participants through mail, WhatsApp, and Facebook. If a participant clicked on the anonymous link that led to the questionnaire (which

could be via mail, Whatsapp, Facebook, or through the SONA platform), he or she was shown a brief introduction about the research before the start of the survey. Online informed consent was obtained prior to starting the survey, and the participation in this study could only be continued if it was agreed upon. In the following, participants were asked about their age, education, English proficiency, followed by gender and nationality. English proficiency was asked through a scale in which the participant could state his or her level.

After completion of the points as mentioned above, the participants were asked to fill out the MHC-SF, participants were randomly assigned to the existing and revised version of the MHC-SF. Half of the participants received the MHC-SF-R and the other half the MHC-SF. The assignment to one of the two conditions was succeeded via the randomizer function on Qualtrics; this is the tool that was used to create the survey for this research. A roughly equal distribution was visible in the two conditions. Two independent groups were established through this division, which was done to prevent response bias. After filling in the MHC-SF-R or MHC-SF subjects were asked to complete the PSS and the RSE. The respondents were asked during these measuring scales to fill out how much he or she agreed upon specific statements. The collection of data could only be completed if a participant completely finished filling in all items and reached the end of the survey. Here an ending message was shown, thanking the respondent for his or her time and for filling out the survey.

2.5. Data analysis

The data were analyzed using IBM SPSS Statistics 24 and LISREL 10.10. With the Shapiro-Wilk test, it showed that both the PSS and RSE were normally distributed. However, the Shapiro-Wilk test showed no normality for the other (sub)scales. The Shapiro-Wilk test is a strict test in the indication of a normal distribution, Q-Q-plots were used for further analysis and showed that scales were approximately normally distributed. After the exclusion of 1 participant to indicate normality for the subscale PWB of the MHC-SF-R, the remaining 108 were taken into further analyses.

A confirmatory factor analysis (CFA) was applied to test if there was evidence for the four-factor structure of the MHC-SF-R (EWB, PWB, SOCWB, and RELWB). For the measuring of the factorial structure, the rules of structural equation modeling were applied, which looked at chi-square, differentiation frequency, and RMSEA (Root Mean Square Error of Approximation). These were measured with the use of Lisrel 10.10 to see the fit of the model. A good model fit is defined by Hooper, Coughlan, & Mullen, (2008) as having an RMSEA below .8. Moreover, the normal maximum likelihood estimation method was used,

since the robust maximum likelihood estimation method could not be applied due to the limited number of participants. For the factor loadings Hair, Black, Babin, & Anderson (2014) defined factor loadings > .5 as acceptable and > .7 as ideal loadings. The Chi-Square gives information about the fit when χ 2 value is large and the *p*-value is below the level of significance. In this study, a significance level $p < .05$ was used, and for the RMSEA a cut-off score of .06 was used, for it indicates a good fit (Hu & Bentler, 1999). The three-factor model of the MHC-SF was also analyzed in this study.

The internal consistency (Cronbach's α) of the total scale and subscales of the MHC-SF-R were measured with reliability analysis. This is measured by using Cronbach's alpha to determine if the items of the scale and its subscales have different or the same underlying properties. Reliability values > .7 are acceptable, > .8 high, and >.9 as excellent according to Kline (2000) and Nunnally, & Bernstein (1995). Cronbach's alpha values < .7 are referred to as unacceptable. Intercorrelations of the subscales were examined with correlation analysis (Pearson), to further measure the MHC-SF-R's internal consistency. Interpretation for correlations was made with the rules of Cohen (1988), A correlation coefficient of .10 is thought to represent a weak or small association; a correlation coefficient of .30 is considered a moderate correlation; a correlation coefficient of .50 or larger is thought to represent a strong or large correlation. The cut-off point off ≤ .70 was used to determine if subscales were sufficiently distinct while maintaining some relationship with each other. Internal consistency and intercorrelations were also examined for the MHC-SF, for comparison purposes.

The convergent and divergent validity was measured with the use of Pearson's correlation analysis. Correlations between the MHC-SF-R (subscales) and the scores of the PSS and RSE were measured. The correlation analysis (2-tailed) was conducted, and will also be measured for the MHC-SF, interpretation for correlations were made with the rules of Cohen (1988).

3. Results

3.1. Factor structure

The findings of this study showed that the MHC-SF-R has a poor fit (χ 2 (3, N = 53) = 226.37, p <.05; RMSEA: .102). Figure 1 displays that the correlations between the subscales were in the acceptable or ideal loadings (ranging between .57 and .87), except for EWB - RELWB (.45). The factor loadings on EWB scored highest, having three items in the ideal loading range of > .7 (items 1, 2, and 3). Lowest factor loadings were measured in the subscale SOCWB, which were all except for item 5, below the .5 cut-off (see Figure 1). Furthermore, item 13 of the subscale PWB showed a factor loading below the .5 cut-off. The factor loadings of the items ranged from .17 to .92. For the subscales of the MHC-SF the following factor loadings were found, EWB: (.76 - .94); PWB: (.30 - .69); SOCWB (.17 - .84), RELWB (.55 - .8).

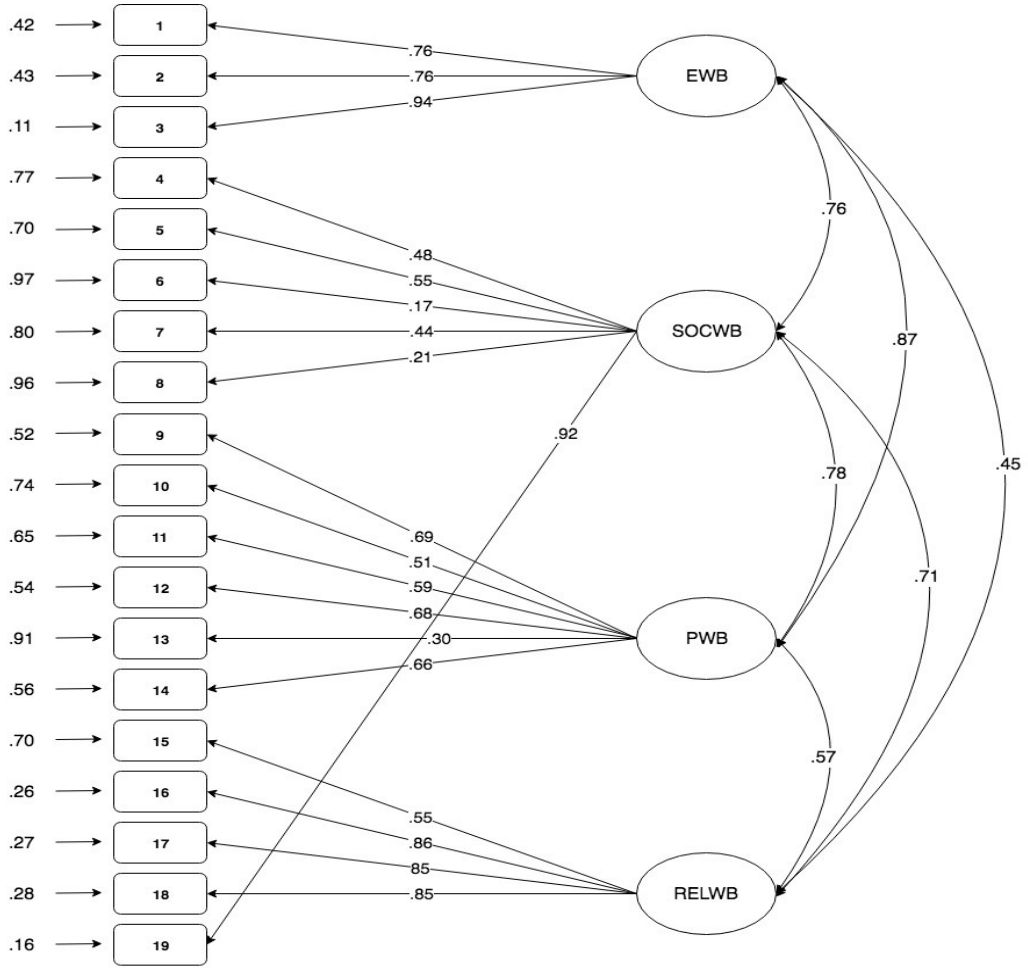

Figure 1. Confirmatory Factor Analysis of the MHC-SF-R with a four-factor model

For the findings on the MHC-SF (see Figure 2) it showed slightly smaller factor loadings. Making the fit of the MHC-SF poor (χ 2 (2, N = 55) = 117.34, p <.05; RMSEA: .103), with factor loadings ranging from .56 to .84. For the subscales of the MHC-SF, acceptable to high standardized factor loadings were found, EWB: (.56 - .83); PWB: (.58 - .71); SWB (.61 - .84). The highest factor loadings of the MHC-SF were on the SWB subscale.

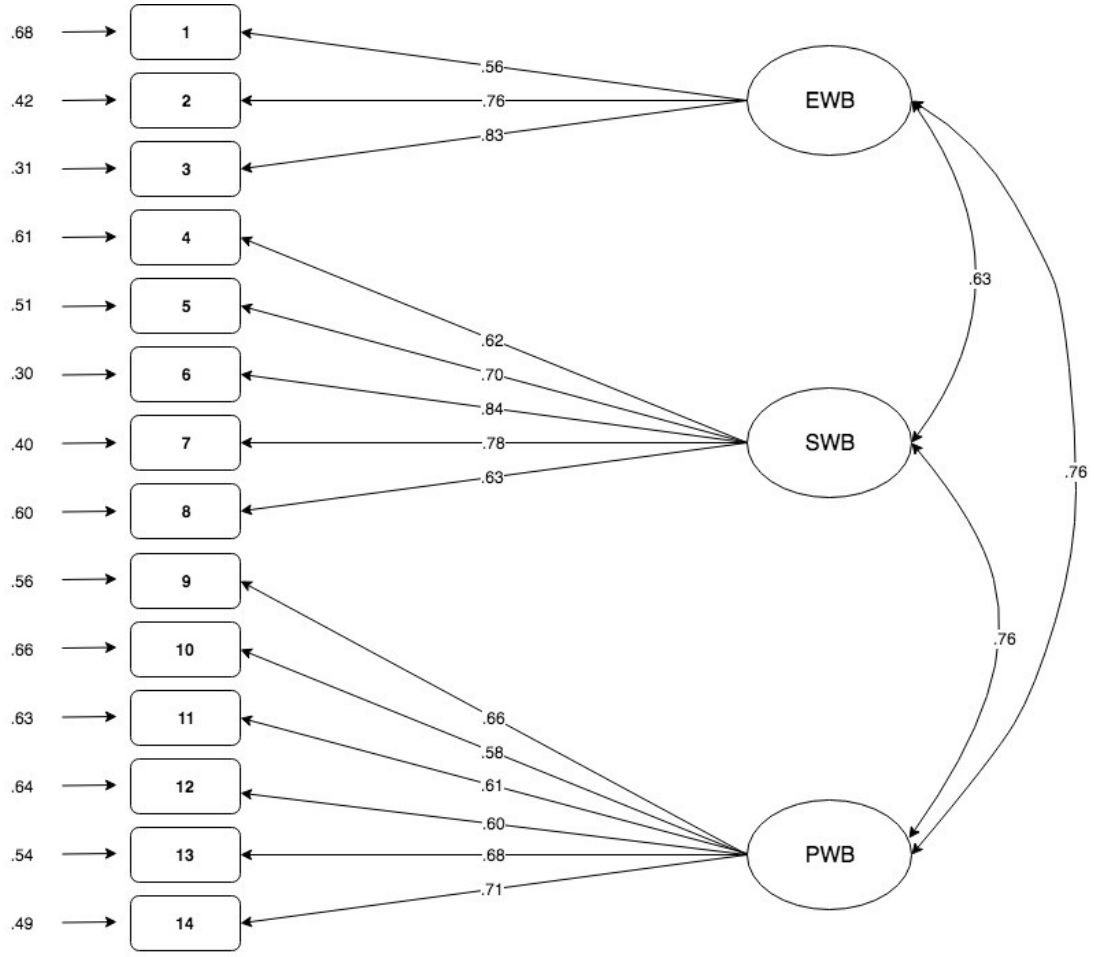

Figure 2. Confirmatory Analysis of the MHC-SF with a three-factor structure

3.2. Internal consistency and intercorrelations

In Table 1, Cronbach's α of the MHC-SF-R, the MHC-SF, and their subscales are shown. For the MHC-SF-R it shows that the internal consistency was good for the total scale (α = .89). For emotional- and relational well-being it showed good internal consistency, with α being .88 and .86 and for psychological well-being, it was acceptable (α = .74). The lowest score was found for the societal well-being subscale, with an α of .65. The MHC-SF showed good internal consistency with α = .89 for the total scale, and alphas > .75 for the subscales.

Table 1
Internal Consistency of the MHC-SF-R and MHC-SF

(Sub)scales	Cronbach's α	(Sub)scales	Cronbach's α
MHC-SF-R	.89	MHC-SF	.89
Emotional WB	.88	Emotional WB	.77
Societal WB	.65	Social WB	.83
Psychological WB	.74	Psychological WB	.81
Relational WB	.86		

Note. 'WB' stands for well-being.

Means, standard deviations (*SD*), and intercorrelations of the subscale scores can be found in Table 2. The findings indicate that the subscales are related to each other, but sufficiently distinct, the correlations were positive and ranged from moderate to strong. The strongest positive correlation was found between the subscales PWB and EWB. The score of SOCWB in relation to EWB was weaker but still within the moderate range.

Table 2
Intercorrelations, Means, and Standard Deviations of Subscales of the MHC-SF-R

(Sub)scales	*M* (*SD*)	Emotional WB	Societal WB	Psychological WB	Relational WB
MHC-SF-R	67.08 (11.61)				
Emotional WB	10.55 (2.93)	-			
Societal WB	19.04 (3.40)	.36**	-		
Psychological WB	22.60 (4.05)	.69**	.49**	-	
Relational WB	14.89 (3.56)	.43**	.60**	.51**	-

Note. 'WB' stands for well-being;
** indicates p <.01.

The means, standard deviations, and intercorrelations between subscales of the MHC-SF can be found in Table 3. Findings here showed that the subscales, in general, were sufficiently related yet distinct enough to one another. All found correlations were positive and within the range of moderate strength, and were below the .70 cut-off score, making them distinct enough.

Table 3
Intercorrelations, Means, and Standard Deviations of Subscales of the MHC-SF

(Sub)scales	*M* (*SD*)	Emotional WB	Social WB	Psychological WB
MHC-SF-R	43.82 (11.34)			
Emotional WB	10.51 (2.41)	-		
Social WB	12.91 (5.32)	.48**	-	
Psychological WB	20.40 (5.49)	.57**	.63**	-

Note. 'WB' stands for well-being;
** indicates p <.01.

3.3. Convergent and divergent validity with the PSS and RSE

In Table 4, the findings concerning the convergent/divergent validity of the MHC-SF-R, PSS, and RSE are shown. The findings showed that the total scores of the MHC-SF-R and the PSS scores were significantly, strongly ($r \geq -.50$), and negatively correlated. It also showed a significant negative and strong association between the scores of the subscale PWB (MHC-SF-R) and the total scores of the PSS. The subscale SOCWB showed a significant but weak correlation to the PSS (< -.30), for the other subscales it ranged from moderate to strong, negative correlations. Moreover; the findings showed that the total scores of the MHC-SF-R and the RSE had a significant and strong, positive correlation. Here it also showed a significantly strong and positive relationship between the total scores of the subscale PWB and the RSE total scores. It also showed a significantly strong and positive correlation for EWB. SOCWB and RELWB correlated with moderate strength. The PSS showed the strongest negative associations with the subscale EWB. The RSE showed the strongest positive association with the subscale PWB.

Table 4
Pearson Correlations: MHC-SF-R with PSS and RSE scores

(Sub)scales	PSS	RSE
MHC-SF-R	-.54**	.61**
Emotional WB	-.68**	.57**
Societal WB	-.28*	.38**
Psychological WB	-.52**	.68**
Relational WB	-.31*	.34*

Note. 'WB' stands for well-being;
*indicates $p < .05$; ** indicates $p < .01$.

In Table 5, findings showed that the total scores of the MHC-SF and the PSS scores were significant and with moderate strength ($r \geq -.30$), and negatively correlated. It also showed a significant negative and moderate association between the scores of the subscale EWB and SWB (MHC-SF) and the total scores of the PSS. The results showed a significant negative but weak ($r < -.30$) correlation between the scores of the PWB subscale of the MHC-SF and the PSS. Moreover; the findings showed that the total scores of the MHC-SF and the RSE had a significant and strong, positive correlation ($r \geq .50$). The scores of the RSE and the subscale PWB of the MHC-SF showed a significant, positive, and strong correlation.

The total score of the MHC-SF in correlation with the RSE was slightly higher than the MHC-SF-R. Overall the subscales PWB, and EWB of the MHC-SF-R had stronger correlations with the PSS and RSE in comparison with the MHC-SF. Only the subscale SWB of the MHC-SF showed stronger correlations (-.45 for PSS, and .47 for RSE) when comparing it to the SOCWB and RELWB of the MHC-SF-R.

Table 5

Pearson Correlations: MHC-SF with PSS and RSE scores

(Sub)scales	PSS	RSE
MHC-SF	-.43**	.62**
Emotional WB	-.38**	.49**
Societal WB	-.45**	.47**
Psychological WB	-.29*	.60**

Note. 'WB' stands for well-being;
*indicates $p < .05$; ** indicates $p < .01$.

4. Discussion

4.1. General discussion

The primary aim of this study was to evaluate the psychometric properties of the MHC-SF-R, a self-report questionnaire that is used for assessing positive mental health. All model fit indices for the four-factor structure of the MHC-SF-R indicated a non-acceptable fit for the model. This resulted in the rejection of the first hypothesis. The results, however, showed a high internal consistency for the total scale, and acceptable till high for the subscales EWB, PWB, & RELWB, accepting hypothesis 2.1 for those scales. The internal consistency for the subscale SOCWB scored a Cronbach's α below the cut-off score, which means that hypothesis 2.1 is rejected for this subscale. Hypothesis 2.2 was accepted, MHC-SF-R showed intercorrelations with at least moderate strength. For hypothesis 3.1 negative correlations of at least moderate strength were shown between the MHC-SF-R's total scale, and all except for one subscale in relation to the PSS. Correlations between the PSS and the total score of the MHC-SF-R, and the subscales PWB & EWB were strong and negative. However, the subscale SOCWB showed a negative correlation below the cut-off score, rejecting hypothesis 3.1 for SOCWB. As expected, established positive correlations of at least moderate strength were found between the total score of the MHC-SF-R and all subscales when correlated with the total score of the RSE. Hypothesis 3.2 was accepted.

The secondary aim of this study was to compare the observed psychometric properties of the MHC-SF-R with the original MHC-SF to analyze if they differed in performance. In terms of the factorial structure, the MHC-SF-R and MHC-SF showed comparable results. For the MHC-SF, no evidence was found that the three-factor structure was a good model fit, and no evidence was found for a correlation of the three-factor model. This was surprising for it was in contrast with pre-existing literature about the MHC-SF (Karas, Keyes, 2005; Keyes et al., 2008; Lamers et al., 2011; Lim, 2014). All items of the MHC-SF showed sufficient factor loadings, while some of the items of the subscales SOCWB, and PWB (MHC-SF-R) showed insufficient factor loadings. What was remarkable in terms of internal consistency was that the MHC-SF-R's SOCWB subscale performed poorly in comparison to the MHC-SF's SWB subscale, the MHC-SF-R outperformed in all other scales. For the convergent and divergent validity, slightly better results were found for the MHC-SF-R, these results showed that the validity was mostly satisfactory, but factorial analysis and reliability tests showed that the SOCWB subscale needed improvement. Hypothesis 4 was accepted in terms of internal consistency for all scales except for the comparison between the SOCWB subscale (MHC-SF-R) and the SWB subscale (MHC-SF). Regarding convergent validity, hypothesis 4 is

accepted for the comparison of the total score and subscales: EWB and PWB. For the subscales of SOCWB and RELWB, hypothesis 4 was rejected.

The findings of the comparison of the MHC-SF-R and the MHC-SF make it seem that the factorial validity of the MHC-SF-R is lower when comparing it with the MHC-SF; however, the MHC-SF-R also shows high internal consistency and high convergent/divergent validity for the total scale. Therefore, the main findings will be discussed in more depth in the following part. Moreover, strengths, limitations, and possibilities for future research will also be mentioned later on.

4.1.1. Factor structure

In this study, the researcher looked at the model fit of the MHC-SF-R and MHC-SF with the use of factorial analyses. Both models, however, showed unexpectedly a poor model fit, which goes against the original literature of evaluation of the MHC-SF (Lim, 2014; Karas, Keyes, 2005; Lamers et al., 2010), which means that the established fit indices for the MHC-SF-R's four-factor structure were not acceptable, as the three-factor structure for the MHC-SF. These findings were surprising since a large body of previous research shows a stable three-factor solution for the MHC-SF (Lim, 2014; Karas, Keyes, 2005; Lamers et al., 2010). A possible explanation for these findings could be that the sample size was small and consisted of only students.

The two models are both composed of different factorial structures and contain alterations in the formulation of the items. This implies that the models cannot be compared to full extend because the fit indices do not indicate the same item nor contain the same factor structure. However, this study looks at how and if the tools differ in measuring, making the comparison between the suitability of the fit for both models. The MHC-SF performed slightly better in contrast with the MHC-SF-R, based on fit indices that were closer to the values which indicate an acceptable model fit by Hu & Bentler (1999), and Hair et al. (2014). Moreover, the MHC-SF-R shows three very low factor loadings on items 6 ("I accept others as they are", SOCWB), 8 ("The way our society works makes sense to you", SOCWB), and 13 ('I stand up for myself', PWB), all scoring below an acceptable loading. In comparison, the MHC-SF shows on all of its items acceptable to high factor loadings.

The items 6, 8, and 13, of the MHC-SF-R, scored below the level of an acceptable loading, which is remarkable. A possibility for these results could be that the alterations in reformulating the questions could have created more ambiguity for the respondents, instead of the opposite. This was for the previous scale mentioned by Köhle (2010), where it was

reported that participants had problems with the comprehensibility of the social well-being subscale. When scoping out on items 6 and 8 and look at the societal well-being scale as a whole it shows a remarkable range of factor loadings, from .17 till .92, of which two items were scoring > .50. Item 19 scored .92, making it the most fitted for societal well-being construct. This begs the question if the other items need a reformulation or if they genuinely fit the SOCWB domain. Item 13 of the MHC-SF-R, which was part of psychological well-being, scored a loading of .30, here it seemed the reformulation also created more ambiguity. A possible explanation could be that the item phrased as: 'I stand up for myself' is rather a general statement, an alternative formulation could be that one is confident to think or express one's own ideas and opinions. This might specify the question more on the individuals.

An interesting finding was that the created subdomain relational well-being had 1 item that was acceptable in terms of factor loading and the remaining 3 all in the ideal range (Hair et al., 2014), implying that this new domain could be an appropriate subscale in terms of factor loadings for the MHC-SF(-R). Observing that the new scale was performing well, the assumption can be made that this part was missing in the previous MHC-SF, where it was all in the SWB subscale — making it a suitable contribution to the MHC-SF(-R).

4.1.2. Intercorrelations

For the MHC-SF-R, the intercorrelations between the total- and subscales scores were higher than the intercorrelations within the subscales. It is implying that the MHC-SF-R scores reflect the outcome of its subscales. This is also in line with previously done research (Franken et al., 2018; Guo et al., 2015; Keyes et al., 2008; Lamers et al., 2011). The same pattern was found for the MHC-SF. For both measuring instruments, the intercorrelations of the subscales were scored moderate to high. Suggesting the subscales are measuring their constructs of well-being, without being too similar. The highest scores for both MHC-SF-R and MHC-SF were found in the subscale psychological well-being, this is also in line with previous literature (Keyes et al., 2008; Lamers et al., 2011).

4.1.3. Internal consistency

The MHC-SF-R's showed an acceptable to high internal consistency for all scales except for the SOCWB subscale. For the total scale, the MHC-SF-R showed a Cronbach's α of .89; the MHC-SF also showed a Cronbach's α of .89. This indicated that both instruments perform equally well in terms of internal consistency. However, the lower-scoring SOCWB scale of

the MHC-SF-R was outperformed by the SWB subscale of the MHC-SF. Existing literature pointed out that the SWB was a lower scoring scale (Keyes, 2005; Keyes, 2006; Keyes et al., 2008; Lamers et al., 2011; Westerhof & Keyes, 2010).

In this study, the SOCWB scale performed less than the SWB scale, which was remarkable. The items for the SOCWB were partly an adaptation of the SWB scale, with the intent of creating more unambiguous questions for respondents to answer. However, the results indicate that the changed items do not, or at least in this study, measure the social domain of well-being better when compared to the original SWB subscale of the MHC-SF. This could mean that the alterations created less clear questions in the measuring instrument. One characteristic of the items on social well-being stood out; most items are strongly dependent on how people perceive society. The statements partly, do not address a person directly but instead asks for general assumptions of society. This raises questions if the content of the societal dimension adds information about the well-being of an individual. In the previously mentioned study by Keyes (1998), it is said that the domain of social well-being, or in the case of the MHC-SF-R, underlying structures might cause difficulties for its internal consistency. The social well-being dimension showed problems in its internal consistency, and it seemed that the alteration of the MHC-SF-R did not resolve this difficulty of measurement.

The remaining part of the SWB was adapted in the MHC-SF-R as was the relational well-being subscale. The RELWB did show a high internal consistency, implying this subscale is reliable for what it wants to measure. This potentially could lead to a further narrowing down of fine-tuning the previous subscale of social well-being.

4.1.4. Convergent and divergent validity

Convergent and divergent validity was analyzed in this study for the MHC-SF-R total- and subscales; this was done with the use of two other psychological constructs that have an effect on one's well-being. These psychological constructs were stress and self-esteem (Sapolsky, 2004; Du, Li, Chi, Zhao, & Zhao, 2015).

The MHC-SF-R showed mostly moderate till strong, negative correlations to the related construct stress. Only the subscale SOCWB did not confirm the H3.1 in terms of strength, scoring just below the .30 cut-off. For the total and other subscales, the MHC-SF-R supports the convergent validity for the psychological construct of stress. The literature mentioned in this study has emphasized stress in relation to well-being, however, speculative reasoning behind the weaker correlation between stress en SOCWB could be that stress

affects more on an individual level (Cohen et al., 1983; Diener, Suh, Lucas, & Smith, 1999) and less in terms of underlying structures that have to do with social well-being or societal well-being (Keyes, 1998). The strongest negative correlation was observed between EWB and stress, which is also in line with the research of Weinstein, Brown, and Ryan (2007). When looking at the findings of the MHC-SF-R's total score in relation to the psychological construct self-esteem, the established correlation coefficients were high. The data showed that the subscales of EWB and PWB correlated strongly in relation to the RSE total score. The total score of the MHS-SF-R also had a strong positive relation to the scores of the RSE.

When comparing the correlations between the MHC-SF-R and the PSS with the correlations between the MHC-SF and the PSS, the MHC-SF-R had larger negative correlations on the total-, EWB-, and PWB scales. Indicating that the relationship between these (sub)scales and the psychological construct of stress was stronger for the MHC-SF-R. The MHC-SF seemed to have larger negative correlations for the SWB subscale when compared with the SOCWB and RELWB of the MHC-SF-R. Since SOCWB and RELWB (MHC-SF-R), aim to measure the construct of social well-being and findings indicate insufficient or weak correlations compared to other subscales, it indicates weaker relationships between the constructs social well-being and stress or self-esteem. For the RSE the MHC-SF-R had greater positive correlations for PWB and EWB scales and was the total scale in relation to the RSE for both almost identical. The RSE did correlate greater with the MHC-SF's SWB scale, compared with the MHC-SF-R. Indicating that self-esteem also shows larger correlations with the social well-being scale of the MHC-SF.

4.2. Strengths and limitations

The conducted study has some strong points. It focused on a well-defined population, namely college and university students, mostly of German and Dutch nationality, which to a great extent was in their 20s. Another important consideration was the manner in which the participants were divided into groups that filled in the MHC-SF-R and MHC-SF, which was automatically sorted by the survey design of the study. Through this automatically randomized method, sampling bias was eliminated, and the target population was represented best. No substantial differences were found between the two groups when looking at age, gender, or nationality (see Participants) The randomizer also took into account for the non-completers, meaning it strived to divide the participants in a 50/50 manner so that the end sample would not consist out of unequally distributed groups due to participants not finishing the survey. Another strength of this study was the ease of partaking in this study through its

online accessibility. Through several channels, it was possible to partake in the study: social media, WhatsApp, e-mail, and the SONA-page of the University of Twente, making it less of a burden to participate.

The strength of this study being online also brings its weaknesses because the survey is prone to superficial and or untruthful answers of participants. This could be explained by participants giving a socially desirable answer to personal questions instead of being truthful (Paulhus, 1991). Superficiality in answers could be caused by the possibility of exploiting the SONA-system. Students of the University of Twente gain SONA-credits for completing studies; this could lead to participants filling in the survey without a lot of effort. This could affect the reliability and validity if participants partake in this study with only the intention of gaining SONA-credits, and focuses less on the study itself.

Furthermore, a participant would only fill out one of both versions of the measuring instrument. This resulted in a weakened power of the confirmatory analysis, due to the division into two groups. The factorial analyses consisted of approximately 50 participants per group. The applied method for the CFA in most of the existing literature (i.e. Keyes, 2014; Lamers et al., 2010) was the robust maximum likelihood method, which was not possible in this study due to the limited size of participants. Ideally, the participants would have filled out both versions of the MHC-SF; however, due to both being highly similar data could be biased. This could be due to exhaustion or boredom by the participant, which could lead to respondent fatigue (O'Reilly-Shah, 2017). Another limitation is that this study did not include another survey of well-being, as Karas (2014) did, to have an extra validation for the measurement of well-being. However, many well-being surveys are lengthy or not as useful as the MHC-SF, in measuring well-being, including the Survey of Midlife Development (MIDUS, 2002) could have potentially provided more information about the measurement of well-being within the participants, but also creates a risk for respondent fatigue.

4.3. Practical implications

In this study, the results showed that the four-factor model could not support the MHC-SF-R. The model showed that the societal well-being subscale had poor factor loadings and internal consistency, making it based on the data not applicable for use at this stage. The relational well-being subscale did perform well in this study, which makes it suitable for its use to further establish the measurement of social well-being, although being only a part of the previous social well-being subscale of the MHC-SF. This still creates implications for accurately measuring the social well-being as a whole, seeing societal well-being, consisting

out of 5 items which unfortunately did not perform as was expected to. Remarkably the MHC-SF-R showed lower factor loadings for the psychological well-being subscale when compared with the MHC-SF. The subscale emotional well-being of the MHC-SF-R did perform better compared to the MHC-SF-R, which implies that the revised version of this subscale is suitable for use.

It does need to be mentioned that in this study, the MHC-SF also showed no reliable support of its three-factor structure, which goes against existing literature. Therefore it is possible that the MHC-SF-R's and the MHC-SF's factorial structure are similar. Overall, the MHC-SF is still more supported by the literature (Lamers et al., 2011) and this study showed no substantial evidence to advise the usage of the MHC-SF-R over the MHC-SF.

4.4. Future research

This study is to the best of knowledge the first time that the psychometric properties of the MHC-SF-R were being evaluated. The current findings contributed to the potential use of the MHC-SF-R as a measuring instrument and created a basis for comparison for future studies. These future studies should focus on further improving the MHC-SF-R's factorial structure. If the current study would be repeated with larger sample sizes, it could control this limitation of this study. With the use of larger sample sizes, more accurate confirmatory analysis can be executed. Furthermore, a different sampling method should be applied, so that is tested in a more representative sample, that does not only include students. This can also result in fewer possibilities for potential bias or neglect during participation, i.e., the SONA-credits could lead to superficial participation, which, as a result, can influence the data. Additionally, more properties need to be further analyzed like the test-retest reliability as Lamers et al. (2011) did for the MHC-SF.

As already mentioned throughout this study the societal well-being domain of the MHC-SF-R showed lacking reliability and validity, and further evaluation is needed if the MHC-SF-R wants to show improvement in its ability to measure psychometric properties of this domain of well-being. It seems likely future versions need to compare the MHC-SF's societal well-being and the MHC-SF's original social well-being, to see if alterations can be made based on the information known about both instruments. Corrections in the formulations of the items was likely an influencer for the current findings, these corrections and the previous items of the social well-being subscale need further evaluation for future improvements. For example, the social well-being subscale has questions that ask the participant how they perceive society. However, these questions often do not directly address

the individual but are asked in general assumptions. The same goes for some items of the psychological well-being scale of the MHC-SF-R, where questions are expressed in a manner in which too much interpretation space is possible for the participant. For example, item 13 ("I stand up for myself"), could also be formulated as: 'I am able to express or act on my own ideas'. The corrected items did not improve when compared with the previous MHC-SF. As a final comment, future studies could also add different or more psychometric constructs, not only taking stress and self-esteem into account.

4.5. Conclusion

The findings of the present study currently offer no statistical evidence to support the four-factor model of the MHC-SF-R. Although the total scale showed good internal consistency and convergent validity, unfortunately, it also showed a bad fit for the model as a whole and problems within and between subscales. The addition of the relational well-being scale showed to be a step in the right direction for the evaluation of social well-being. However, due to the poor factor loadings and lack of internal consistency of the societal well-being subscale, an improvement in measuring social well-being has not been made yet. At this point in time, the MHC-SF-R is not deemed fit to be a valid measuring instrument. This study, however, hopes to be the start of the improvement in the validation and usefulness of the MHC-SF-R for a possibility to measure positive mental health more accurate in the future. The MHC-SF-R is still in a testing and developmental phase; future adaptations and research could potentially create an improved version of the MHC-SF; concluding that for now, the MHC-SF is a more valid instrument.

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6. Appendix

The Mental Health Continuum - Short Form, Revised

The next questions concern feelings that people can have. Read each item carefully and mark the answer that best represents how often you have experienced the feeling during the PAST WEEK.

	Never	Rarely	Some-times	Regu-larly	Often	(Almost) always
I am happy	0	1	2	3	4	5
I am interested in life	0	1	2	3	4	5
I am satisfied with my life.	0	1	2	3	4	5
I make a valuable contribution to our society	0	1	2	3	4	5
I think our country is developing well.	0	1	2	3	4	5
I accept others as they are.	0	1	2	3	4	5
I belong to a group of people.	0	1	2	3	4	5
I understand how our society works.	0	1	2	3	4	5
I accept myself as I am.	0	1	2	3	4	5
I am able to master my life.	0	1	2	3	4	5
I share love and sorrow with some people.	0	1	2	3	4	5
I can develop myself.	0	1	2	3	4	5
I stand up for myself.	0	1	2	3	4	5
I feel my life has purpose.	0	1	2	3	4	5
I can mean something for others.	0	1	2	3	4	5
I am satisfied with my social contacts.	0	1	2	3	4	5
I feel connected to other people.	0	1	2	3	4	5
I can rely on other people.	0	1	2	3	4	5
I find my place in this society.	0	1	2	3	4	5