

# First validation of the model of sustainable mental health: Structural model validity and the indirect role of adaptation

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## Abstract

**Objectives:** There is a growing interest in mental well-being as a vital outcome in clinical practice in addition to mental illness. The model of sustainable mental health (SMH) was recently introduced to delineate how interventions can improve mental health by targeting barriers and resources of adaptation to life stressors, improving the ability to adapt and thereby reducing mental illness and improving mental well-being. The aim of the current study is to empirically validate the conceptual model of SMH as well as the assumed indirect role of ability to adapt.

**Methods:** This study used an existing dataset of the general population with self-reported reduced well-being due to the corona crisis ( $n = 849$ , mean age 53 years,  $SD = 15$ ). Measurements of mental illness (depression and anxiety), mental well-being, ability to adapt, a specific barrier for adaptation (i.e., repetitive negative thinking), and a specific resource for adaptation (i.e., positive reframing) were included. Structural equation modeling was used to assess both the structural validity of the model and the indirect effect of ability to adapt.

**Results:** An acceptable to good fit was found for the model of SMH and all paths between the proposed elements of

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the model were significant and in the hypothesized direction. Ability to adapt served as an indirect pathway through which repetitive negative thinking ( $B = 0.149$ , 95% confidence interval [CI] = 0.016–0.028) and positive reframing ( $B = 0.163$ , 95% CI = 0.065–0.123) were linked with mental illness and mental well-being.

**Conclusion:** The current study provides the first empirical support of the internal validity of the model of SMH in a sample of the general population with reduced well-being, suggesting that barriers and resources to adaptation have an effect on mental illness and mental well-being through the ability to adapt. The model of SMH may therefore be a good model to use in research and clinical practice for developing, implementing, and evaluating a balanced treatment approach targeting both barriers and resources for adaptation.

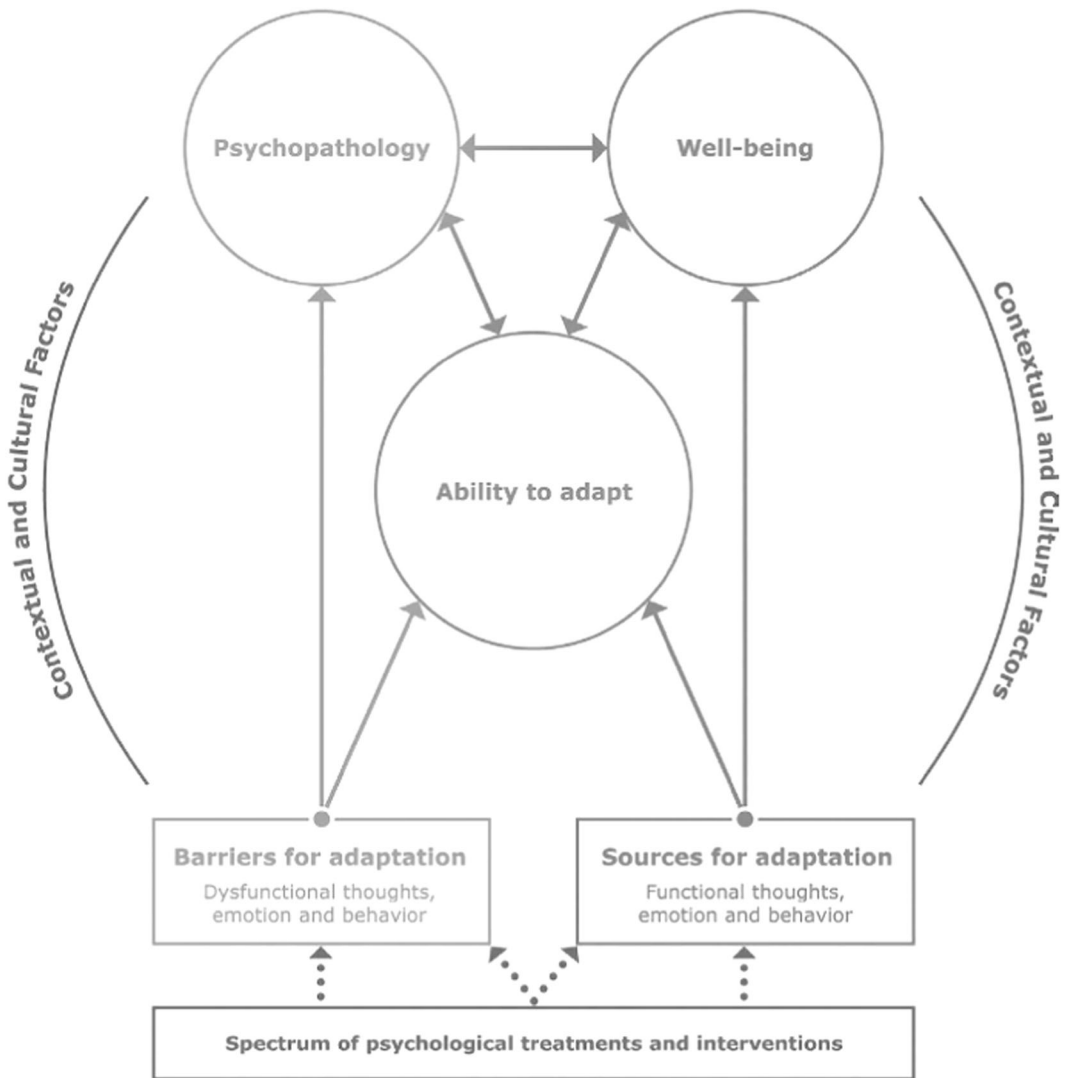
#### KEYWORDS

adaptation, implementation model, mental health care, positive psychology, psychopathology, well-being

## 1 | INTRODUCTION

In the last decades, the dominant focus of treatment in mental health care has been on reducing mental disorders and symptoms of psychopathology (Maddux, 2009). This has been successful to a certain degree, but also criticized for the tendency to over-medicalize and overlooking positive dimensions of life (Bentall, 2010; Gilbert, 2019). Mental health is more than the absence of illness. The humanistic and positive psychology movements underscored the need for focusing on positive aspects of mental health (Jahoda, 1958; Ryff, 1989; Seligman & Csikszentmihalyi, 2000). There is increasing evidence that well-being focused and positive psychology interventions (PPIs) are effective to improve mental health in clinical populations (Carr et al., 2020; Chakhssi et al., 2018; Schueller & Parks, 2014; Weiss et al., 2016). This growing interest in positive mental functioning is shown in new approaches such as positive psychiatry and positive clinical psychology (Barlow, 2014; Jeste & Palmer, 2015; Wood & Johnston, 2016). However, innovative frameworks are needed to systematically integrate well-being focused and PPIs in mental health care. To this end, the model of sustainable mental health (SMH) was recently introduced (Bohlmeijer & Westerhof, 2020, 2021), and the current study aims to make a first step towards examining the validity of this theoretical model.

The model of SMH has been proposed as an heuristic model for practitioners and researchers for developing, implementing and evaluating a balanced treatment approach, including both complaint and strength oriented components (Bohlmeijer & Westerhof, 2020, 2021). The model of SMH describes that mental health includes both the absence of mental illness and the presence of mental well-being (see Figure 1). While mental illness refers to mental suffering and malfunctioning, mental well-being can be described in terms of feeling well (e.g., experiencing positive emotions and life satisfaction), and doing well in life (e.g., experiencing psychological growth, self-acceptance, reaching goals, and feeling part of society; Diener et al., 1985; Keyes, 1998; Ryff, 1989). The model of



**FIGURE 1** Model of sustainable mental health. From a new model for sustainable mental health (p. 158) by Bohlmeijer and Westerhof (2020). Reprinted with permission.

SMH further proposed that both aspects of mental health are, at least partially, dependent on a continuous, underlying process of adapting to minor and major challenges in life. The presence of barriers such as cognitive biases and dysfunctional schemata can impede effective adaptation. On the other hand, the presence of resources, such as positive emotions, use of strengths, self-compassion and positive relationships will facilitate effective adaptation. Psychological treatments and interventions can improve mental health by targeting barriers or resources to a persons' ability to adapt, or a combination of both. PPI's will generally focus on promoting resources enhancing the ability to adapt, resulting in reduced mental illness and higher levels of mental well-being. The model is also ecological, in acknowledging that people are functioning in various contexts (relationships, communities, organizations) and that these contexts may sustain barriers or promote resources. However, examining this component of the model is outside the scope of the current study.

The SMH model is based on empirical findings (see Bohlmeijer & Westerhof, 2020 for an extensive overview). The importance of both mental illness and mental well-being as vital outcomes of mental health care is also underlined in the distinction made between clinical and personal recovery (Skar-Fröding et al., 2022; Slade, 2010). Where clinical recovery is mainly focused on symptom reduction, personal recovery is described by patients in terms of five important recovery processes that are closely related to psychological well-being: connectedness, hope and optimism, identity, meaning in life, and empowerment (with the acronym CHIME; de Vos et al., 2017; Leamy et al., 2011). Another line of research has shown that mental illness and mental well-being are two related but discernible phenomena (two-continua) (e.g., de Vos et al., 2018; Keyes, 2005; Lamers et al., 2015; Trompeter et al., 2017; Westerhof & Keyes, 2010). Mental well-being has also been shown to have a protective effect on mental illness (Grant et al., 2013; Keyes et al., 2010; Wood & Joseph, 2010). For instance, changes in well-being can predict levels of mental illness up to 6 months later (Lamers et al., 2015), and high levels of well-being at one moment reduces the risk of mood and anxiety disorders and improve recovery from these disorders 3 years later (Schotanus-Dijkstra et al., 2019, 2017). Taken together, these findings support the inclusion of both mental illness and mental well-being as essential aspects of SMH. This upper part of the model, stating that both well-being and distress are related but distinct dimensions of mental health, is equal to the model of complete mental health as developed by Keyes (2005). The model of SMH extends this model by adding the ability to adapt as the generic underlying process and barriers and resources for adaptation as exogenous variables. The model thus states that mental illness and mental well-being can be seen as outcomes that are directly and indirectly (via a sense of the ability to adapt) influenced by the presence or absence of dysfunctional psychological processes (hindering the ability to adapt, hence barriers) and functional psychological processes (promoting the ability to adapt, hence resources).

Furthermore, the importance of “*the ability to adapt and to self-manage, in the face of social, physical and emotional challenges*” has previously been proposed as a new concept of health (Huber et al., 2011). The ability to adapt can be described as the perceived ability to readjust and actively deal with the psychosocial consequences of challenging events (Franken et al., 2023). Such challenges can be short-term daily hassles that require immediate adjustments (Lazarus & Folkman, 1984), intermediate challenges that require self-management (Barlow et al., 2002), or long-term challenges that require assimilation and accommodation of lifegoals (Kashdan & Rottenberg, 2010). The ability to adapt has been related to both mental well-being and mental illness (Franken et al., 2023; Londono & Mcmillan, 2015). In addition, meta-analyses have shown the impact of psychological interventions targeting barriers or resources to adaptation, on mental illness and mental well-being (e.g., Chakhssi et al., 2018; Cuijpers et al., 2014; Driessen et al., 2015; Sin & Lyubomirsky, 2009; Weiss et al., 2016).

A strength of the model of SMH is that it facilitates a more comprehensive assessment of dysfunctional and functional processes related to mental illness and well-being, while avoiding a simplistic dichotomy between “negative” versus “positive” psychology (Bohlmeijer & Westerhof, 2021). However, empirical studies examining the model as a whole are lacking.

The aim of the current study is therefore twofold. The first aim is to empirically validate the conceptual model of SMH. The second aim is to assess the indirect effect of ability to adapt between a specific barrier and resource and well-being and distress. To study this, we applied structural equation modeling (SEM) on an existing dataset of the general population with self-reported reduced well-being due to the corona crisis, and focus on an evidence-based, specific example of a barrier (i.e., repetitive negative thinking), and an evidence-based, specific example of a resource (positive reframing). Repetitive negative thinking is a style of thinking about one's problems or negative experiences, that is repetitive, intrusive, and difficult to disengage from (Ehring et al., 2011). It feels unproductive and captures mental capacity. It includes processes of rumination and worry and is related to the onset and maintenance of mental illness, such as depression, anxiety disorder and posttraumatic stress disorder (e.g., Moulds et al., 2020; Nolen-Hoeksema et al., 2008; Watkins & Roberts, 2020). Positive reframing is a type of emotion regulation, in which people cognitively change how they perceive the situation in a positive way (Gross & John, 2003). Previous literature has shown that positive reappraisal is positively associated to well-being

(e.g., Hu et al., 2014), and negatively to anxiety and depressive symptoms (e.g., Garnefski & Kraaij, 2006; Wiltink et al., 2011). We expected that ability to adapt would play an indirect role in the effect of repetitive negative thinking on mental illness and the effect of positive reinterpretation on mental well-being.

## 2 | MATERIALS AND METHODS

### 2.1 | Design and procedure

To examine the model of SMH, this study used the questionnaire data of an RCT on the effectiveness of a gratitude intervention app during the Covid-19 pandemic (January–May 2021). Results concerning the effectiveness of, and satisfaction with, the intervention are published elsewhere (Kloos et al., 2022). Participants were recruited via radio and newspaper items and through social media, to test a gratitude intervention app with daily exercises for 6 weeks. The recruitment message targeted people who were experiencing reduced well-being due to the corona crisis.

Participants completed a baseline questionnaire online, after which they were randomized to either receive the intervention immediately (intervention group,  $n = 424$ ) or 6 weeks later (waitlist control group,  $n = 425$ ). The current study used the baseline data of all participants before randomization ( $n = 849$ ), and all available T1 data ( $n = 723$ ), which was completed 6 weeks later. Measurements included mental illness (i.e., anxiety, depression), mental well-being, ability to adapt, and a specific barrier (i.e., repetitive negative thinking) and resource (i.e., positive reframing). The Ethics Committee of the faculty of Behavioural, Management and Social Sciences of the University of Twente approved the RCT (no. 201071)

### 2.2 | Participants

Participants were Dutch and Flemish adults aged 18 years and older, in possession of an email address and of a smartphone or tablet to use the gratitude intervention app. People were excluded if they had severe anxiety symptoms or (moderately) severe depressive symptoms, as measured with the Generalized Anxiety Disorder-7 (GAD-7) (Spitzer et al., 2006) and Patient Health Questionnaire (Kroenke et al., 2001), respectively.

Table 1 shows participant characteristics. Participants had a mean age of 53 years ( $SD = 15$ , range 18–83 years). Participants were predominantly female (80%), Dutch (78%), or Belgian (20%). Most were highly educated (81%), employed (65%), married or in civil partnership (57%), living with a partner (41%), or with partner and children (27%).

### 2.3 | Measurements

All constructs of interest for the current study were measured using existing Dutch versions of validated questionnaires.

#### 2.3.1 | Mental illness

Mental illness was operationalized as feelings of depression and anxiety.

**TABLE 1** Baseline characteristics of participants in the total sample.

	Total (n = 849)
Age, M (SD)	52.9 (14.5)
Gender, n (%)	
Female	677 (80)
Male	169 (20)
Not defined	3 (0)
Nationality n (%)	
Dutch	666 (78)
Belgian	173 (20)
Other	10 (1)
Education, n (%)	
Low	107 (13)
Intermediate	56 (7)
High	686 (81)
Employment, n (%)	
On payroll or entrepreneur	551 (65)
Retired	181 (21)
Unemployed, volunteering	91 (11)
Student	26 (3)
Marital Status, n (%)	
Married or civil partnership	483 (57)
Never been married	205 (24)
Divorced or widowed	161 (19)
Living situation, n (%)	
With partner or LAT	344 (41)
With partner and child(ren)	233 (27)
Alone	190 (22)
With child(ren)	38 (5)
With parent(s) or others	37 (4)

### Depression

The 9-item Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001; Zuihoff et al., 2010) was used to measure depressive symptoms during the past 2 weeks. Each PHQ-9 item measures one criterium for depression (e.g., "Little interest or pleasure in doing things") on a scale from 0 (not at all) to 3 (nearly every day). Total sum scores can be interpreted as follows: 0–4 = minimal depression, 5–9 = mild depression, 10–14 = moderate depression, 15–19 = moderately severe depression, 20–27 = severe depression (Kroenke et al., 2001). The PHQ-9 showed acceptable to good reliability in the current sample (T0  $\alpha = 0.72$ ; T1  $\alpha = 0.82$ ).

### Anxiety

GAD-7 (Donker et al., 2011; Spitzer et al., 2006) was used to assess anxiety symptoms during the past 2 weeks. Each item (e.g., "Worrying too much about different things") is scored on a scale from 0 (not at all) to 3 (nearly every day). Total sum scores range from 0 to 21, with higher scores indicating more generalized anxiety symptoms. Severity scores between 0 and 4 indicate minimal anxiety, between 5 and 9 mild anxiety, between 10 and 14 moderate anxiety, and between 15 and 21 severe anxiety. The scale demonstrated acceptable to good reliability in the current sample (T0  $\alpha = 0.77$ , T1  $\alpha = 0.87$ ).

### 2.3.2 | Mental well-being

Well-being was measured with the 14-item Mental Health Continuum Short Form (MHC-SF; Keyes, 2002; Lamers et al., 2011). The scale measures how often the participant experienced specific feelings, divided over three subscales: emotional well-being (3 items, e.g., "...feel happy?"), social well-being (5 items, e.g., "...people are basically good"), and psychological well-being (6 items, e.g., "...feel confident to think or express your own ideas and opinions?"). Each item is scored on a scale from 0 (never) to 5 (every day). Average subscale scores range between 0 and 3, with higher scores indicating higher levels of well-being. The internal consistency was acceptable to good in the current sample, ranging from  $\alpha = 0.71$ – $0.82$  for the different subscales on T0, and  $\alpha = 0.76$ – $0.85$  on T1.

### 2.3.3 | Ability to adapt

The recently developed 10-item Generic Sense of Ability to Adapt Scale (Franken et al., 2023) was used to measure the ability to readjust after a personally challenging event (e.g., "I can handle setbacks well"). Items are scored on a scale from 1 (not at all) to 5 (completely). A total mean score is computed, with high scores indicating better ability to adapt. The scale showed excellent reliability in the current sample (T0  $\alpha = 0.93$ ; T1  $\alpha = 0.92$ ).

### 2.3.4 | Barrier for adaptation

#### *Repetitive negative thinking*

The specific barrier of adaptation that was assessed was repetitive negative thinking, measured with the 15-item Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2012, 2011). The PTQ asks participants to indicate to what extent they typically engage in repetitive negative thoughts when recalling experiences and problems (e.g., "Thoughts come to my mind without me wanting them to") on a response scale from 0 (never) to 4 (almost always). Total sum scores range from 0 to 60, with higher scores indicating a higher degree of repetitive negative thinking. The scale demonstrated excellent reliability in the current sample (T0  $\alpha = 0.95$ ; T1  $\alpha = 0.96$ ).

### 2.3.5 | Source for adaptation

#### *Positive reframing*

Positive reframing was assessed as a source for adaptation. The 4-item Positive Reinterpretation and Growth subscale of the Coping Orientations and Problems Experienced inventory (COPE; Carver et al., 1989; Kleijn et al., 2000) was used to measure positive reframing. The COPE measures what participants generally did and felt when they experienced stress in the recent past (e.g., "I've been looking for something good in what is happening"), on a response scale from 1 (I haven't been doing this at all) to 4 (I've been doing this a lot). Higher total sum scores

indicate more positive reframing. The subscale showed good reliability in the current sample (TO  $\alpha = 0.85$ ; T1  $\alpha = 0.85$ ).

### Analyses

An alpha level of 0.05 was used as cut-off for significance for all analyses. Bivariate Pearson correlations between all model components at baseline were analyzed, with  $r \leq 0.29$  indicating a weak,  $0.29 < r \leq 0.49$  a moderate, and  $r \geq 0.50$  a strong correlation (Cohen, 1988).

For the primary analyses, SEM with maximum likelihood estimation was conducted, using the “lavaan” package (Rosseel, 2012) in R (R Core Team, 2020). A model was fitted that includes all paths of the model of SMH. Mental illness and mental well-being were defined as latent variables in the model. The latent mental illness factor was indicated by observed scores of depression (PHQ-9) and anxiety (GAD-7), while the MHC-SF subscale scores of emotional, social, and psychological well-being were set as indicators of mental well-being. Before fitting the full SMH model, we examined fit indices of a measurement model that only included the latent variables mental illness and mental well-being, as well as their factor loadings and relationships.

In line with the primary aim of the study, the validity of the model of SMH was evaluated. This was done by examining the goodness of fit of the model with the fit indices root mean square error of approximation (RMSEA), standardized root mean squared residual (SRMR), comparative fit index (CFI), and Tucker–Lewis index (TLI). For RMSEA and SRMR, values of  $\leq 0.80$  and  $\leq 0.50$  were considered as acceptable and good model fit, respectively, and for CFI and TLI, values of  $\geq 0.90$  were seen as acceptable and values  $\geq 0.95$  as good model fit (Browne & Cudeck, 1992; Hu & Bentler, 1999).

To examine the role of the ability to adapt (second aim), we determined whether ability to adapt serves as mediator of the direct effect from the barrier (repetitive negative thinking) to mental illness and from the resource (positive reframing) to mental well-being. For this, we assessed the effects from repetitive negative thinking and positive reframing to ability to adapt (a-paths), from ability to adapt to mental illness and mental well-being (b-paths), and direct effects from repetitive negative thinking to mental illness and from positive reframing to mental well-being (c-paths). The two indirect effects were specified for the barrier and the resource as the product of the corresponding a-path and b-path. Bootstrapped 95% confidence intervals (CIs) (5000 bootstraps) were calculated, and the indirect effect was considered significant if the bootstrapped CI did not contain zero. Total effects for the barrier and the resource on mental illness and well-being were calculated as the sum of the direct and indirect effects.

Finally, as sensitivity test for the robustness of the findings, the final model was also fitted in the posttest data. Before running this additional analysis, longitudinal measurement invariance of the measurement model was examined to check how time and the intervention might have affect the structural model. This was done by conducting configural, metric, and scalar models and comparing their fit by chi-square difference tests. The configural model indicates if the overall factor structure is invariant, the metric model if the slopes (paths) are invariant, and the scalar model if the intercepts (means) are invariant (Cheung & Lau, 2012).

## 3 | RESULTS

Table 2 summarizes the distribution and intercorrelations of baseline measurements. The indicators of mental illness (depression and anxiety) were strongly intercorrelated, and both had a moderate negative correlation with mental well-being. Ability to adapt had a moderate negative correlation with mental illness indicators, and a strong positive correlation with mental well-being. The barrier repetitive negative thinking and the resource positive reframing were both related to ability to adapt, with strong negative and positive correlations, respectively. It should also be noted that repetitive negative thinking had a moderate correlation with mental illness, and mental



**TABLE 2** Means, standard deviations, and correlations of baseline model components (n = 849).

	Scale	M	SD	1	2	3	4	5	6	7	8	9
Mental illness												
1. Depression	0-14	6.05	3.35	-								
2. Anxiety	0-14	6.59	3.20	0.61**	-							
3. Mental well-being	0-5	2.71	0.80	-0.39**	-0.30**	-						
4. Emotional well-being	0-5	3.09	0.92	-0.41**	-0.33**	0.78**	-					
5. Social well-being	0-5	2.25	0.92	-0.25**	-0.19**	0.86**	0.53	-				
6. Psychological well-being	0-5	2.91	0.92	-0.37**	-0.28**	0.92**	0.64**	0.65**	-			
7. Ability to adapt	0-4	2.24	0.68	-0.39**	-0.36**	0.61**	0.54**	0.45**	0.59**	-		
8. Repetitive negative thinking	0-60	30.77	9.90	0.42**	0.49**	-0.42**	-0.55**	-0.33**	-0.38**	-0.55**	-	
9. Positive reframing	1-16	11.81	2.78	-0.22**	-0.20**	0.49**	0.59**	-0.36**	0.48**	0.58**	-0.36**	-

\*\*p < 0.01 (two-tailed).

well-being, while positive reframing had a moderate correlation with well-being, and a weak correlation with mental illness.

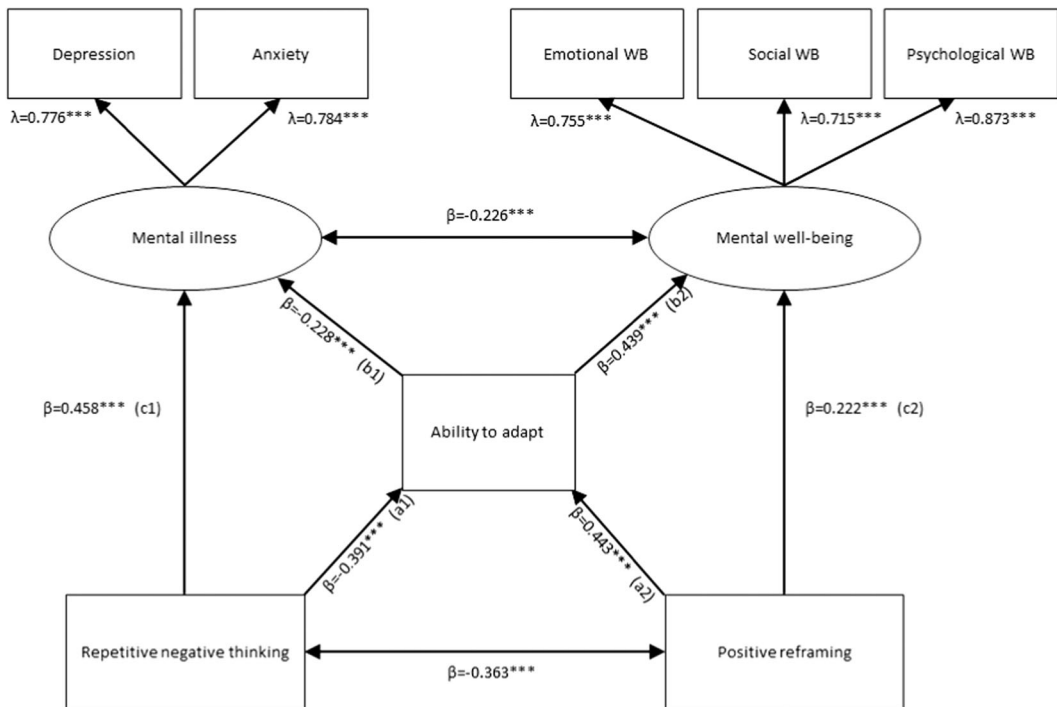
### 3.1 | Goodness of fit of the model

Before fitting the full SMH model, a CFA model of mental health (i.e., the upper part of the model or Key's two-continua model) was conducted that only includes the latent variables mental illness and mental well-being, their relationship, and factor loadings of individual indicators. This model showed acceptable to good fit for most fit indices ( $\chi^2(4) = 32.11$ , CFI = 0.981, TLI = 0.954, SRMR = 0.037, RMSEA = 0.091). Only the RMSEA was slightly above the threshold for acceptable fit. The latent factors sufficiently loaded on their corresponding indicators ( $\lambda > 0.60$ ).

Afterwards, the full model of SMH was estimated. For the full model, most fit indices suggested a good fit of the SMH model, while the RMSE indicated acceptable model fit ( $\chi^2(15) = 68.47$ , CFI = 0.981, TLI = 0.965, SRMR = 0.033, RMSEA = 0.065). Both latent factors (mental illness and mental well-being) sufficiently loaded on the corresponding indicators ( $\lambda > 0.70$ ). A diagram showing each individual path of the full model of SMH can be found in Figure 2.

### 3.2 | The role of ability to adapt

Table 3 provides an overview of all regression coefficients in the model presented in Figure 2. All paths between the proposed elements of the model of SMH were significant ( $ps < 0.001$ ) and in the expected direction. In accordance with assumptions of the model of SMH, both indirect effects were significant.



**FIGURE 2** Overview of regression paths in the model of sustainable mental health (SMH) (standardized).  $***p < 0.001$ .

**TABLE 3** Summary of model results for the model of SMH.

	STD. Estimate	Estimate	SE	Boot 95% CI	
				Lower	Upper
<b>Latent factors</b>					
Mental illness → Depression	0.776	2.052	0.108	1.795	2.164
Mental illness → Anxiety	0.784	1.982	0.094	1.837	2.271
Mental well-being → Emotional well-being	0.755	0.476	0.020	0.435	0.512
Mental well-being → Social well-being	0.715	0.448	0.024	0.402	0.492
Mental well-being → Psychological well-being	0.873	0.553	0.024	0.504	0.596
<b>Paths</b>					
Repetitive negative thinking → Ability to adapt (a1)	-0.391	-0.027	0.002	-0.031	-0.023
Ability to adapt → Mental illness (b1)	-0.228	-0.422	0.078	-0.575	-0.273
Repetitive negative thinking → Mental illness (c1)	0.458	0.059	0.006	0.046	0.071
Positive reframing → Ability to adapt (a2)	0.443	0.109	0.007	0.095	0.123
Ability to adapt → Well-being (b2)	0.439	0.937	0.093	0.765	1.129
Positive reframing → Well-being (c2)	0.222	0.116	0.018	0.081	0.153
<b>Indirect effects</b>					
Repetitive negative thinking → Mental illness via ATA (ind1 = a1 × b1)	0.089	0.011	0.002	0.007	0.016
Positive reframing → Well-being via ATA (ind2 = a2 × b2)	0.194	0.102	0.012	0.079	0.128
<b>Total effects</b>					
Repetitive negative thinking → Mental illness (c1 + ind1)	0.547	0.070	0.006	0.059	0.082
Positive reframing → Well-being (c2 + ind2)	0.416	0.218	0.019	0.184	0.257

Abbreviations: ATA, ability to adapt; CI, confidence interval; SE, standard error; SMH, sustainable mental health; STD Estimate, standardized estimate.

### 3.3 | Sensitivity analyses

Before running the model on the posttest data, longitudinal measurement invariance of the measurement model was examined by checking for configural, metric, and scalar invariance. We found that the configural ( $\chi^2(8) = 77.02$ , RMSEA = 0.105, SRMR = 0.033, CFI = 0.979, TLI = 0.948) and metric ( $\chi^2(11) = 79.07$ , RMSEA = 0.089, SRMR = 0.033, CFI = 0.979, TLI = 0.963) invariance models had a satisfactory fit for most fit indices, except for the RMSEA. The chi-square difference between the configural and metric model was not significant ( $\Delta\chi^2(3) = 2.04$ ,  $p = 0.56$ ), suggesting that factor loadings were invariant over time. The scalar invariant model also had acceptable fit for most fit indices ( $\chi^2(14) = 91.12$ , RMSEA = 0.084, SRMR = 0.036, CFI = 0.977, TLI = 0.967). The chi-square difference compared with the configural model was significant ( $\Delta\chi^2(6) = 14.10$ ,  $p = 0.03$ ), indicating that slopes were time variant.

The summary of model results for the sensitivity analysis can be found in Table S1. Again, model fit was acceptable to good when then model was fitted in the posttest data ( $\chi^2(10) = 62.93$ , RMSEA = 0.079, SRMR = 0.036, CFI = 0.975, TLI = 0.948). Overall, model results were comparable with the model in the baseline data. All paths, indirect and total effects were significant ( $p < 0.001$ ).

## 4 | DISCUSSION

This is the first study to empirically examine a recently developed model of mental health. The aims of the current study were to examine the overall fit of the model of SMH and the indirect role of ability to adapt, using an existing dataset of a sample of the general population with reduced well-being due to the corona crisis.

The acceptable to good model fit indices showed that the model of SMH explained the data well. The findings underscore that repetitive negative thinking, positive reframing, ability to adapt, depression and anxiety, and mental well-being are (inter)related constructs. Though significant associations between components of the model have been demonstrated in earlier studies, for example, repetitive negative thinking and mental illness (e.g., Moulds et al., 2020; Watkins & Roberts, 2020), positive reframing and well-being (e.g., Hu et al., 2014) and mental illness and mental well-being (e.g., Grant et al., 2013; Westerhof & Keyes, 2010), this is the first corroboration of a single comprehensive model integrating these constructs.

The results of SEM and mediation analyses also underscored the central position of the ability to adapt. In addition to a direct relation between repetitive negative thinking and mental illness, an indirect pathway via ability to adapt was found. In a similar vein a significant indirect effect for positive reframing to mental well-being via ability to adapt was found. These findings suggest that the ability to adapt is a central process of maintaining both lower levels of distress and higher levels of mental well-being. This is consistent with the recent definition of health in general as the ability to self-manage and to adapt (Huber et al., 2011), but also with earlier conceptualization of "salutogenesis," the origins of health, and the vital role of a sense of coherence in developing and maintaining health (Antonovsky, 1996; Dodge et al., 2012). A generic sense of ability to adapt expresses the trust that one is able to successfully cope with minor and major life-events (Franken et al., 2023), by using specific effective coping skills and emotion-regulation strategies such as positive reframing. Where low mental illness and high well-being can be seen as optimal end states of mental health, it is realistic to expect that these two dimensions of mental health will fluctuate in the presence of stressors and (chronic) life events. Indeed, psychosocial adaptation can be seen as a process by which a person interacts with the psychosocial consequences of challenges in his or her life (e.g., daily hassles, chronic and/or severe physical and mental diseases, life-events such divorce, accidents, and unemployment). The presence of a sense of ability to adapt can therefore be considered a key component in a balanced model of SMH (Bohlmeijer & Westerhof, 2021). In this study, a new scale measuring a generic sense of ability to adapt was used (Franken et al., 2023). However, we propose that other generic scales such as the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995), scales measuring psychological flexibility (McCracken et al., 2015) and sense of coherence (Antonovsky, 1993) could be used as well.

The findings of the current study explain how treatments primarily focusing on dysfunctional cognitions, behavior and emotion regulation may have a positive impact on mental well-being in addition to mental illness. For instance, based on a large meta-analysis, van Agteren et al. (2021) found that cognitive behavioral therapy (CBT) has a positive impact on mental well-being. The model of SMH and the current findings suggest several potential pathways. First, CBT will decrease of dysfunctional processes and thereby diminish distress and mental illness, which in turn will have a positive impact on mental well-being. Second, a decrease of dysfunctional processes has a positive impact on ability to adapt, which will directly promote mental well-being. And a third potential pathway is that a decrease of dysfunctional processes may increase resources such as positive reframing with a direct and indirect positive impact on mental well-being. One important implication is that in some cases, specific interventions targeting resources of ability to adapt are not always warranted in clinical treatment. After symptom-oriented treatments, levels of ability to adapt and mental well-being may be sufficiently high and implementing further treatment would not be cost-effective. Routine assessment of mental well-being in addition to mental illness symptomatology is required to make informed decisions about sequential treatments specifically focusing on mental well-being (Fava & Guidi, 2020; Franken et al., 2018).

Still, the model of SMH and this first validation of the model of SMH underscore the importance of a balanced treatment approach, systematically integrating complaint- and strength-oriented interventions in clinical

psychology (Bohlmeijer & Westerhof, 2020, 2021; Jeste & Palmer, 2015; Wood & Johnston, 2016). Strength-oriented interventions such as well-being therapy (Fava et al., 1998) and positive psychotherapy (Rashid, 2015) could be implemented as sequential treatments. This is based on the a priori assumption that one treatment will often not be adequate in realizing complete mental health (Guidi et al., 2016). A treatment primarily targeting barriers for adaptation could be followed by a treatment primarily focusing on increasing resources for adaptation. Radstaak et al. (2020) evaluated the impact of an intervention combining well-being therapy and positive psychology as a rehabilitation intervention for people who had been treated for posttraumatic stress disorder. For patients with lower levels of well-being, indicating the absence of complete recovery, the positive intervention was more effective than treatment as usual for mental well-being and posttraumatic growth. Resource- and strength-oriented interventions could also be offered to people with more chronic severe mental illnesses, that is, disorders where the constraints are consequential and not temporary (Delespaul, 2013). Earlier studies have shown that people with mental illnesses are able to have high levels of positive functioning (de Vos et al., 2018; Westerhof & Keyes, 2010). Specific resource- and strength-oriented interventions have been developed to enable people to live a joyful, engaged and meaningful life, also in the presence of ongoing mental health issues (e.g., Kraiss et al., 2018; Schrank et al., 2016).

#### 4.1 | Strengths and limitations

This was the first study to empirically examine the SMH model. However, we used an existing dataset, which led to a few limitations. First, we included a sample of the general population with reduced well-being, consisting mainly of women who were highly educated. Given that the model was specifically developed for use in the mental healthcare setting (Bohlmeijer & Westerhof, 2021), future studies should examine this model in clinical samples. Second, we included only a single barrier and a single resource in our examination of the model, and did not examine the influence of social, historical, and cultural contextual factors (e.g., relationships, communities) the SMH model describes on a person's attempt to maintain and achieve mental health (Bohlmeijer & Westerhof, 2021). Future studies should include contextual factors and additional barriers, such as suppression of emotions (Gross & John, 2003), and additional resources, such as optimism and hope (Schiavon et al., 2017) to fully examine the model. The goal of the current study was to provide a first validation of this model. In addition, future studies might want to compare the SMH model with alternative mental health models or with other indicators for barriers, resources or contextual factors.

Finally, we performed cross-sectional analyses on baseline, and T1 data, which means we can only assume the temporal or causal nature of the associations based on previous literature. As a related limitation, we did not examine the effect of a psychological intervention targeting barriers and/or resources to adaptation on mental illness and mental well-being. To truly examine the temporal precedence of the model, future studies should include intervention effects and gather data at more timepoints and analyze this using a cross-lagged panel model (Humphreys, 1991).

## 5 | CONCLUSIONS

The current study provides the first empirical support of the model of SMH in a sample of the general population with reduced well-being. Our findings suggests that both the absence of mental illness and presence of mental well-being are essential aspects of SMH, supporting the need to systematically monitor mental well-being and ability to adapt in addition to mental illness. They also underscore the need for a balanced treatment approach to improve SMH, by targeting barriers and resources of adaptation to life stressors, improving the ability to adapt and thereby reducing mental illness and improving mental well-being (Bohlmeijer & Westerhof, 2020, 2021). Clinical

psychologists are especially recommended to consider strengths-oriented interventions when assessments show that levels of well-being and ability to adapt are still relatively low after a primary treatment focusing on dysfunctional processes and mental illness.

### AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. Data analyses were performed and described by Noortje Kloos and Jannis Kraiss, assisted by Peter ten Klooster. The first draft of the manuscript was written by Noortje Kloos and Ernst Bohlmeijer, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### ETHICS STATEMENT

The RCT from which data was used for this study was approved by the Ethics Committee of the faculty of Behavioural, Management and Social Sciences of the University of Twente (no. 201071). The explanation of the research, informed consent and the application procedure could be read in full on the study website, after which participants provided active online consent before participation. The RCT from which data was used was registered at the Netherlands Trial Register (trial NL8856).

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### PEER REVIEW

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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