

**The Ability to Adapt: Our Hidden Potential**

Ability to Adapt as a Mediator Between Gratitude and Well-being, Depressive Symptoms, and Anxiety

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## Abstract

**Background:** Although gratitude has proven to benefit not only well-being but also ill-being, the working mechanisms are still unclear. The ability to adapt has been proposed to fill this role; it refers to the way we readjust to challenging situations to maintain life satisfaction.

**Aim:** The current study aimed to test the model of ability to adapt as a mediator between gratitude and well-being, anxiety, and depressive symptoms. **Methods:** A six-week gratitude study with an intervention and control group was analysed. All participants completed baseline assessments on gratitude, ability to adapt, well-being, depressive symptoms, and anxiety and a post-test six weeks later. The data set was tested on four levels 1) the correlation between the study variables at pre-test 2) a cross-sectional mediation model at pre-test with ability to adapt as a mediator ( $n=847$ ) 3) a longitudinal mediation model of the control group ( $n=392$ ) with ability to adapt as a mediator 4) the intervention was evaluated for its effectiveness in improving the ability to adapt, well-being and depressive symptoms, and anxiety comparing the intervention group ( $n=224$ ) with the control group ( $n=392$ ). **Results:** The findings indicate that ability to adapt mediates the relationship between gratitude and well-being, depressive symptoms, and anxiety not only cross-sectional but also longitudinal. Additionally, the gratitude intervention effectively improved ability to adapt, well-being and reduced depressive symptoms and anxiety. **Discussion:** The findings indicate that gratitude has a more direct positive influence on well-being but indirectly affect anxiety and depressive symptoms. Ability to adapt has been suggested to mediate this relationship between gratitude and well-being and ill-being. **Conclusion:** The present study indicates the ability to adapt to be a working mechanism of gratitude which has a beneficial impact on central positive and negative aspects of mental health.

## Introduction

The traditional focus of mental health care on diminishing mental illness has long disregarded the importance of mental well-being (Westerhof & Keyes, 2010). Considering the high number of individuals who can be categorised as free from any mental disorder yet do not feel healthy and functioning in their lives, this unilateral approach has been claimed to be problematic (Regier et al., 1993; Keyes, 2002). With the introduction of positive psychology, there has been a revolution in the understanding of mental health. The World Health Organization (2014) captures this development in defining mental health as a :“*a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community*”. Gratitude as a basis for positive psychological interventions proved great success by improving parts essential to mental health and well-being alongside ill-being (Duckworth, Steen & Seligman, 2005; Davis et al., 2016; Bohlmeijer et al., 2020). It can be defined as both positive feelings of appreciation followed by receiving a benefit from another person (McCullough, Emmons & Tsang, 2002) and a trait which is characterized by appreciating the simple pleasures in life, having a sense of abundance, and expressing gratitude to others (Watkins et al., 2003; Wood et al., 2008). The current study aimed to shed light on the unknown working mechanism of gratitude.

Gratitude interventions commonly consist of brief exercises of reflection, for example, asking people to simply list five things for which they were grateful several times per week (Emmons & McCullough, 2003) or writing letters expressing one’s gratitude to another person. While some individuals might prefer writing and sharing gratitude letters, others benefit more from sharing and reflecting on what they were grateful for with their partners. Therefore,

interventions tailored to the individual yield better success to positive intrapersonal change than generic interventions (Lyubomirsky, 2007). Research has found these gratitude interventions to benefit both well-being moreover ill-being by reducing symptoms of depression and anxiety (Duckworth, Steen & Seligman, 2005; Bohlmeijer et al., 2020). However, the underlying working mechanisms of gratitude are still unknown. The sustainable mental health model, a new model by Bohlmeijer and Westerhof (in press), proposes the ability to adapt to be an essential factor in regulating the balance between well-being and ill-being. Ability to adapt refers to changing one's attitude or behaviour as a form of down-regulating negative affect and maintaining life satisfaction (Taylor, 1983). The lack of research about this construct might be due to the absence of an existing measurement tool for the concept of ability to adapt. The current study was the first to implement a recent development of a scale to assess one's ability to adapt (Schuffelen et al., 2021).

While a higher ability to adapt has been associated with actively practising gratitude (Algoe & Zhaoyang, 2016), it is still unclear how both concepts are linked together. Consistent with the broaden-and-build theory (Fredrickson, 2001), which proposes positive emotions to broaden the range of our thoughts and ideas and thereby build resources, prior research has found gratitude to be associated with the construction of personal and social resources that help to cope better with anxiety and depression (Wood et al., 2008). Thus, the more we focus on what we are grateful for, the more self-aware we seem to become about positive aspects of our lives (Wood et al., 2010). Consequently, being grateful builds durable personal psychological, social, and physical resources, which were shown to last even after the initial feelings of gratitude have passed (Wood et al., 2008). By reflecting on what we are grateful for and what helped us overcome challenges in our past, we become more creative and flexible in using helpful coping

methods (Aspinwall, 1998; Fredrickson, 2001). As a result, we are more likely to have a higher ability to adapt to adverse circumstances.

Actively practising gratitude has led to higher mental well-being and lower ill-being (Lambert et al., 2010; Wood et al., 2008). In the present study, well-being refers to the presence of positive feelings (e.g. happiness) and the perception of one's overall life (e.g. life satisfaction) (Diener et al., 1999; Magyar & Keyes, 2019)). In contrast, ill-being refers to symptoms of depression and anxiety. Generally, depression is commonly accompanied by a depressed mood or loss of interest or pleasure in activities (Tolentino & Schmidt, 2018). Additionally, depressive symptoms can relate to experiencing appetite changes, sleep difficulties, fatigue or loss of energy, concentration problems, feeling worthless or guilty, and suicidality (Uher, Payne, Pavlova & Perlis, 2014). Anxiety, in contrast, is often accompanied by the presence of excessive anxiety and worry about a variety of topics, particular events, or activities (American Psychiatric Association, 2013). Like depression, people suffering from anxiety may experience concentration problems, fatigue, and sleep problems. Despite various treatment options, high relapse rates remain a problem for depression and anxiety (Ali et al., 2017).

A possible explanation could be that existing treatments are not suitable for every patient (Sin et al., 2011). Even though cognitive behavioural therapy (CBT) is argued to be one of the most effective evidence-based treatments, only less than half of the patients fully recover from their depressive symptoms (e.g., Burcusa & Iacono, 2007), and between one-third and two-thirds of anxiety disorder patients relapse after eight years (Yonkers et al., 2003). Hence, new positive psychological interventions such as relapse prevention tailored to the individual focusing on promoting durable resources could be the solution (Lyubomirsky, 2008; Bolier et., 2013). A

promising pathway may be treatments aiming at increasing the ability to adapt based on practising gratitude.

A meta-analysis reviewing gratitude interventions focusing on enhancing well-being and alleviating depressive symptoms confirmed the effectiveness of improving both concepts simultaneously (Sin & Lyubomirsky, 2009). Gratitude is associated with interpreting life events positively (Wood et al., 2010) and adopting a more compassionate and less critical stand towards ourselves (Petrocchi & Couyoumdjian, 2016). Through gratitude, we value helpful resources from the past, which leads to a more functional adaptation to life stressors. Ultimately reducing negative symptoms and leading to a higher appreciation of the positive aspects of life and higher well-being. The benefits highlight the importance to effectively adapting to life stressors to remain balanced in the experience of well-being and ill-being.

The present study aims to test a model with ability being a mediator in the relationship between gratitude as the independent variable and the outcome variables well-being, anxiety, and depressive symptoms. Hereby the research gap about the working mechanism of gratitude is addressed. For this matter, an existing data set of a six-week gratitude intervention with a waitlist control group has been analysed on four levels 1) the association between gratitude and ability to adapt, well-being as well as depressive symptoms and anxiety at pre-test 2) the mediating role of ability to adapt at pre-test 3) longitudinal at post-test 4) the effectiveness of the gratitude intervention on ability to adapt and the effect on well-being, depressive symptoms, and anxiety.

The following hypotheses were tested:

H1: Gratitude is negatively associated with depressive symptoms and anxiety

H2: Gratitude is positively associated with well-being and ability to adapt

H3: The relationship between gratitude and anxiety is mediated by ability to adapt

H4: The relationship between gratitude and depressive symptoms is mediated by ability to adapt

H5: The relationship between gratitude and well-being is mediated by ability to adapt

H6: The gratitude intervention improves not ability to adapt, but also well-being and ill-being

## **Methods**

### **Study Design**

A randomised controlled trial in the form of a six-week-long app-based intervention with a gratitude intervention group and a waitlist control group was conducted. Participants were randomly assigned to two groups, performing various modules of gratitude exercises (intervention group) or waiting for performing well-being exercises (waitlist control group). All participants completed an online baseline questionnaire (T0) and a post-test (T1) after completing the study period of six weeks. Different parts of the data set were used to test the hypothesis allowing to gather evidence of the mediating role of ability to adapt on several levels. First, at baseline, a correlation analysis was conducted to gather initial support for the mediation model by assessing the strengths and direction of the relationship between the study variables.

Second, a cross-sectional mediation model with gratitude and ability to adapt as a mediator as well as the three outcome variables well-being, depressive symptoms, and anxiety separately. Third, based on the assumption that mediation consists of causal processes that unfold over time (Maxwell & Cole, 2007), a longitudinal mediation testing with the control group has been tested. Fourth, the effects of manipulating gratitude levels of the intervention group and its impact on ability to adapt and the outcome measures was tested. The study was approved by the Ethics Committee of the University of Twente (file number: 201071).

## Participants and Procedure

Participants were recruited via different platforms; advertisements were placed on social media along with a newspaper press release and radio interviews. Everyone was invited to participate who experienced lower well-being due to the corona crisis and were motivated to improve their well-being by participating in a free study from the University of Twente. After giving their online consent to participate in the study, the participants completed the baseline assessment, which screened for the eligibility criteria and outcome measures. Due to the special circumstances during the corona pandemic the participants were asked to indicate the extent to which they feel corona has negatively impacted their well-being. After that, all participants were randomly assigned via randomizer.org to either the intervention or the control group. After the intervention group received instructions to download the free application “ZENN” (Zo erg nog niet) they started with the first modules. Meanwhile, the control group was informed that the gratitude app would begin in six weeks. Both groups completed a baseline assessment (of gratitude, ability to adapt, well-being, depressive symptoms and anxiety) and a six-week follow-up test.

Of the 850 participants, three participants had to be excluded from the baseline assessment because they either did not possess a smartphone, disagreed with the informed consent, or showed severe anxiety (<15 on the Generalized Anxiety Disorder-7 (GAD-7) questionnaire (Donker et al., 2009; Spitzer et al., 2006) or depression (<20 on the Patient Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer & Williams, 2001)) symptoms. For the intervention analysis, additional inclusion criteria were the completion of the post-test as well as at least three modules of the intervention to ensure the participants engaged with minimum of half of the exercises. Consequently, the sample size for the baseline was 857 and 616 for post-test with an

allocation of 224 participants in the intervention group and 392 in the control group. There were no notable differences in characteristics between the groups (see Table 1). The mean age of the total group was 53 years ( $SD=14.1$ ;  $Min = 18$ ,  $Max = 83$ ), and the majority was female (79.8%), higher educated (76.9%), in paid employment (62.7%), living in the Netherlands (78.5%), with their partner but without any children (38.5%) and was married (56.9%).

**Table 1**

*Baseline Characteristics of the total sample, Intervention Group, and the Waitlist Control Group*

	Total sample ( $n=847$ )	Intervention group ( $n=224$ )	Control group ( $n=392$ )
<b>Age, <math>M</math> (SD)</b>	52.86 (14.5)	54.7 (13.6)	52.8 (14.3)
<b>Gender, <math>n</math> (%)</b>			
Female	676 (79.8)	182 (81.3)	324 (82.7)
Male	168 (19.8)	42 (18.8)	65 (16.6)
Other	3 (0.4)	0 (0)	3 (0.8)
<b>Education, <math>n</math> (%)</b>			
Low	42 (5.0)	8 (3.5)	21 (5.4)
Intermediate	118 (13.9)	31 (13.8)	56 (14.2)
High	652 (76.9)	182 (81.2)	294 (75.0)
<b>Marital status, <math>n</math> (%)</b>			
Married	482 (56.9)	123 (56.3)	229 (58.3)
Divorced	126 (14.9)	33 (14.7)	56 (14.2)
Widowed	35 (4.1)	12 (5.4)	17 (4.3)
Never been married	204 (24.1)	33 (14.7)	56 (14.2)
<b>Country of residence, <math>n</math> (%)</b>			
Netherlands	665 (78.5)	192 (85.7)	295 (75.3)
Belgium	171 (20.2)	28 (12.5)	96 (24.5)
Other	11 (1.3)	4 (1.8)	1 (0.3)
<b>Living situation, <math>n</math> (%)</b>			
Living alone	188 (22.2)	56 (25.0)	88 (22.4)
Living with children	232 (27.4)	50 (22.3)	105 (26.8)
Living with partner	326 (38.5)	96 (42.9)	149 (38.0)
<b>Employment, <math>n</math> (%)</b>			
Paid employment	531 (62.7)	135 (60.3)	244 (62.1)
Pension	179 (21.1)	53 (23.7)	79 (20.2)
Unemployed	45 (5.3)	8 (3.6)	23 (5.3)
Other	92 (10.9)	28 (12.4)	46 (12.2)

### Negative influences of corona, *n* (%)

Small	364 (43.0)	95 (43.5)	163 (41.6)
Medium	320 (37.8)	94 (42.2)	139 (35.5)
High	162 (19.1)	32 (14.3)	90 (23.9)

### Gratitude Intervention

Over the course of six weeks, the intervention group was asked to complete six modules in the application with evidence-based gratitude exercises (Emmons & McCullough 2003; Emmons & Stern 2013). Each module prompted the participants to reflect on positive experiences in their lives and encouraged them to write their thoughts and feelings in a diary. For example, the modules instructed the participants to write about three good things daily from 5 to 7 days a week. The intervention group was encouraged to take 10 to 15 minutes to answer several questions stimulating their reflection (e.g. *What are you grateful for? Why do you feel grateful for that? What does that mean to you?*). Furthermore, psychoeducation was included in the form of short videos. Lastly, there was the option to upload pictures related to what they feel grateful for and save inspirational quotes on the homepage of the app. On average, it was expected that the participants would spend around 75 minutes over five days on the exercises. Following this, daily push notifications to complete the outstanding assignments were sent as a reminder. However, it was an option to turn them off in the settings.

### Outcome Measures

As the current study was part of a more extensive research study, the participants had to fill out the following questionnaires, the PSS to measure stress (Cohen, Kamarck & Mermelstein, 1983), PTQ to measure the level of rumination (Ehring et al., 2011) and COPE, a coping inventory for measuring how individuals respond to stress (Carver, Scheier & Weintraub, 1989).

Lastly, two additional gratitude measurements were included the GRAT to assess disposition gratitude (Watkins et al., 2003) and the grateful mood questionnaire (McCullough, Tsang & Emmons, 2004). In the following, only the outcome measures that were important for this study were in detail reported.

### ***Generic Dispositional Gratitude***

The level of grateful disposition was assessed by the Gratitude Questionnaire-Six-Item Form (GQ-6) (Jans-Beken et al., 2015; Emmons et al., 2003). Six items evaluated the frequency and intensity of experiencing the grateful affect, for example, “*I have so much in life to be thankful for*”. All items were rated on a scale from 1 (=strongly disagree) to 7 (=strongly agree) with a higher sum score indicating higher dispositional gratitude. Overall, the scale has shown to have a robust one-factor structure, convergent validity with peer reports (McCullough, Emmons & Tsang, 2002) and high re-retest reliability (Wood et al., 2008). In the present study, the scale was shown to have good reliability at the pre-test ( $\alpha = .73$ ) and post-test ( $\alpha = .72$ ).

### ***Ability to Adapt***

The generic sense of ability to adapt scale (GSAAS) is a 10-item scale that measures the degree to which the participants can readjust and actively deal with adversity while maintaining life satisfaction (e.g. “*I can cope well with adverse circumstances*”) (Schuffelen et al., under review)). Items are scored on a 5-point Likert scale ranging from 0 (= not at all) to 5 (= always) with a higher sum score indicating a higher generic sense of the ability to adapt. The scale of the present study had an excellent reliability score at pre-test ( $\alpha = .90$ ) and post-test ( $\alpha = .91$ ).

### ***Depressive Symptoms***

The level of depressive symptoms was assessed by the Patient Health questionnaire-9 (PHQ-9) (Kroenke, Spitzer & Williams, 2001)). The scale consists of nine questions (e.g. “*Over the last two weeks, how often have you been bothered by any of the following problems? - Little interest or pleasure in doing things*”) with each item rated on a scale from 0 (= *not at all*) to 3 (= *nearly every day*) with a higher sum score indicating a higher level of depressive symptoms. In the present study, the scale was shown to have good reliability at pre-test ( $\alpha = .73$ ) and post-test ( $\alpha = .81$ ).

### ***Anxiety Symptoms***

The 7-item generalised anxiety disorder (GAD-7) questionnaire was administered to assess participants’ anxiety symptoms during the previous two weeks (e.g., “*Over the last two weeks, how often have you been bothered by the following problem - feeling nervous, anxious or on the edge?*”) (Spitzer et al., 2006). Items are rated on a scale from 0 (= *not at all*) to 3 (= *nearly every day*) with higher sum scores indicating higher levels of anxiety. The scale was shown to have good reliability in the present study assessed at pre-test ( $\alpha = .78$ ) and post-test ( $\alpha = .87$ ).

### ***Well-being***

The level of well-being was assessed with the 14-item Mental Health Continuum Short Form (MHC-SF) (Keyes et al. 2008; Lammers et al., 2011). The questionnaire is divided into three subscales: Emotional well-being (e.g., “*During the past month how often did you feel happy?*”), social well-being (“*During the past months how often did you feel that you had*

*something important to contribute to society*”), and psychological well-being (“*During the past months how often did you feel like you liked most parts of your personality*”). Items are rated on a scale of 0 (= *never*) to 5 (= *every day*) with a higher mean score indicating a higher level of well-being. In the present study, the scale was shown to have good reliability at the pre-test ( $\alpha = .88$ ) and excellent post-test ( $\alpha = .90$ ).

### **Statistical Analysis**

All analyses were performed using SPSS version 25 and the PROCESS macro 3.0 for SPSS statistics using two-tailed tests (alpha level  $p < .05$ ). The hypotheses were tested on four different levels to investigate the overarching research question about the mediating role of ability to adapt. Firstly, hypotheses 1 and 2 were tested, which proposed that gratitude is negatively associated with depressive symptoms and anxiety but positively associated with well-being and ability to adapt. For this purpose, the total sample ( $n=847$ ) was investigated at the baseline level. More specifically, the mean, standard deviation, and Pearson correlation between gratitude, ability to adapt, anxiety, depressive symptoms, and well-being were analysed and compared to a norm group.

Secondly, hypotheses 3 to 5 were investigated that state ability to adapt mediates the relationship between gratitude and anxiety, depressive symptoms, and well-being. A mediation model with ability to adapt as a mediator was tested at baseline with the total sample. Thirdly, the mediation model was tested longitudinally with the control group ( $n=392$ ), considering the post-test data. More specifically, a bootstrap mediation analysis by Preacher and Hayes (2008) has been conducted, with gratitude as the independent variable, ability to adapt as the mediator, and the three dependent variables, well-being, anxiety, and depressive symptoms, were tested

individually. The estimate of the indirect effect was derived from the mean of 5,000 bootstrap samples. A mediation effect was established when the confidence interval of 95% of the indirect effect did not include zero (Preacher & Hayes, 2008). To account for a complete mediation of ability to adapt, the 95% confidence interval for the indirect effect had to be excluding a zero. If the direct effect remained significant, a partial mediation was indicated.

Lastly, the fourth level tested hypothesis 6, the gratitude intervention improves well-being and ill-being and ability to adapt an independent sample t-test was conducted. This is a common method to investigate mean group differences of an intervention (e.g., Gabana et al., 2019). Prior analysis, 234 participants had to be excluded because they either did not complete the post-test or completed less than three intervention modules. For analysing if the intervention group ( $n=224$ ) had significant changes compared to the waitlist control group ( $n=392$ ), the mean of the change score (T1-T0) on all study variables was analysed. To accept the hypothesis, the change scores of ability to adapt, anxiety, depressive symptoms and well-being of the intervention group needed to be significantly higher than the control group.

## Results

### **First Level: Baseline Associations between the Study Variables**

The first two hypotheses proposed that gratitude is negatively associated with depressive symptoms and anxiety but positively associated with well-being and ability to adapt. The Pearson correlation analysis confirmed gratitude had a strong negative correlation with depressive symptoms and anxiety and a strong positive correlation with well-being and the ability to adapt (see Table 2). Concluding, both hypotheses were accepted. In addition, the descriptive analysis (see table 2) was evaluated in regard to several norm groups. To begin with,

the sample had a lower average mean score of gratitude at the baseline testing than a comparable norm group ( $M = 36.9$ ) (McCullough, Emmons & Tsang, 2002). Additionally, the mean score indicated a moderate level of well-being and ability to adapt (Keyes et al., 2008; Schuffelen et al., under review). Furthermore, the participants' mean score reflected mild anxiety and depressive symptoms (Kroenke, Spitzer & Williams, 2001; Spitzer et al., 2006).

**Table 2**

*Mean (SD) and Pearson Correlation of the Total Sample among the Study Variables at Baseline test (n=847)*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Gratitude	32.15	5.30	-				
2. Ability to Adapt	2.23	0.68	.49**	-			
3. Anxiety	6.60	3.20	-.24**	-.36**	-		
4. Depressive symptoms	6.05	3.35	-.31**	-.39**	.61**	-	
5. Well-being	2.71	0.80	.54**	-.61**	-.29**	-.39**	-

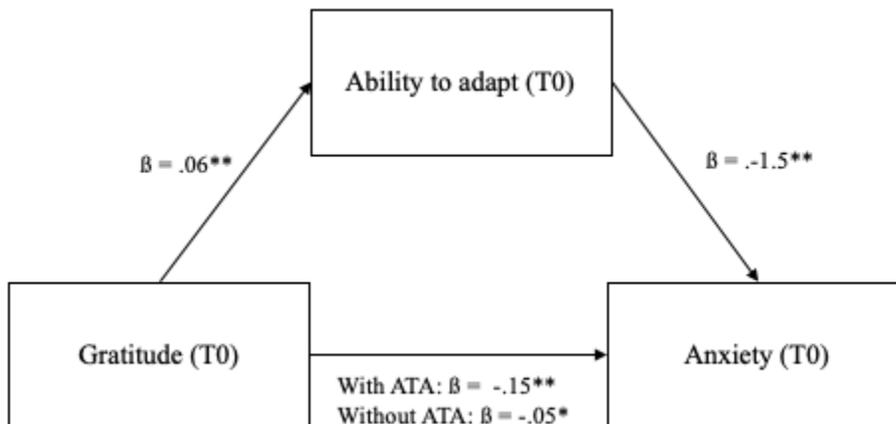
Note. *M* and *SD* are used to present mean and standard deviation.

\*\* Correlation is significant at the 0.01 level (2-tailed).

### Second Level: Baseline Mediation Analysis

To test hypotheses 3 to 5, a mediation analysis was conducted based on the total group ( $n=847$ ) at pre-test. The three outcome variables, anxiety, depressive symptoms, and well-being, were separately assessed (see Table 3). Firstly, for the third hypothesis, the relationship between gratitude and anxiety is mediated by ability to adapt; anxiety was included as the dependent variable (see Figure 1). The results indicated gratitude was significantly associated with anxiety (Total effect:  $\beta = -.15$ ,  $t(847) = -9.44$   $p < .001$ ). The mediation analysis indicated gratitude had a direct effect on anxiety (Direct effect:  $\beta = -.05$   $t(847) = -2.26$   $p = .024$ ). Additionally, the 95% bias-corrected interval size for the indirect effect of ability to adapt did not include zero [-0.12, -

.07], indicating the ability to adapt to be a partial mediator in the relationship between gratitude and anxiety. Concluding, the fourth hypothesis was accepted.



Note.  $\beta$  = represents the effect from one variable to another

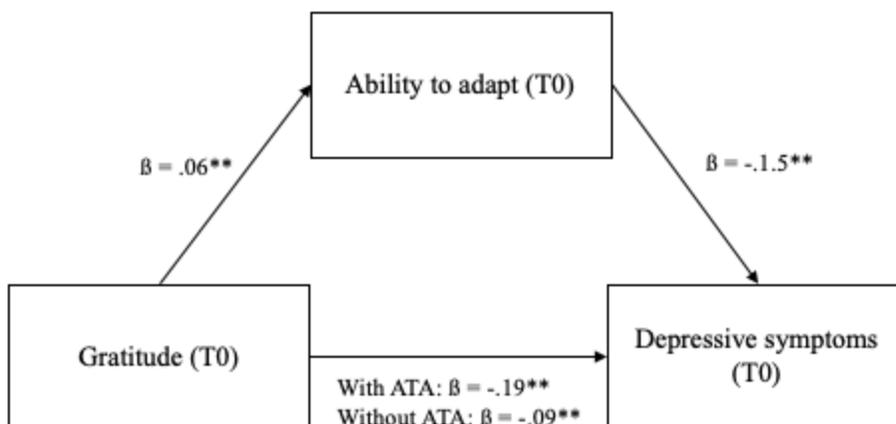
\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at 0.05 level (2-tailed).

### Figure 1

#### *Mediation Effect of Ability to Adapt on Anxiety (n=847)*

Secondly, the fourth hypothesis, the relationship between gratitude and depressive symptoms is mediated by the ability to adapt, was tested with depressive symptoms as the dependent variable (see Figure 2). The analysis revealed, gratitude was significantly associated with depressive symptoms (Total effect:  $\beta = -.19$ ,  $t(847) = -9.44$   $p < .001$ ). Additionally, gratitude had a significant direct effect on depressive symptoms even when controlling for the indirect effect of ability to adapt (Direct effect:  $\beta = -.09$ ,  $t(847) = -4.22$   $p < .001$ ). Nevertheless, the 95% bias-corrected interval size for the indirect effect of ability to adapt did not include zero [-.12, -.07], which means the ability to adapt is a partial mediator between gratitude and depressive symptoms. In conclusion, the fifth hypothesis was accepted.



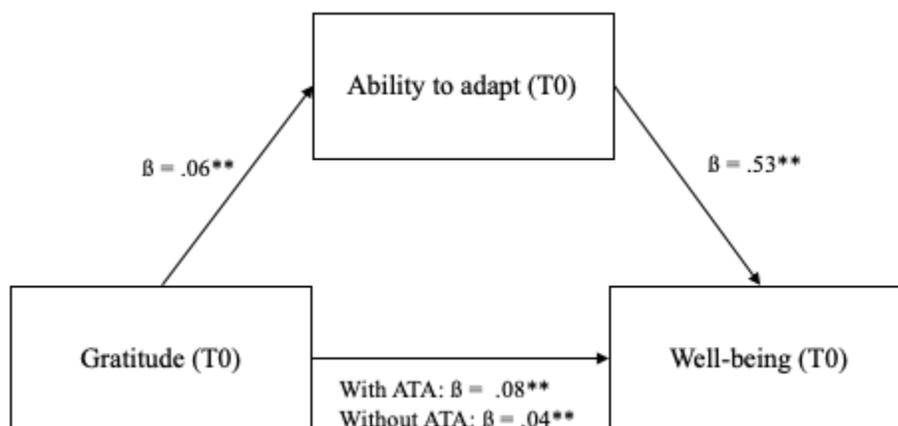
Note.  $\beta$  = represents the effect from one variable to another

\*\* Correlation is significant at the 0.01 level (2-tailed).

## Figure 2

*Mediation Effect of Ability to Adapt on Depressive Symptoms (n=847)*

Lastly, the fifth hypothesis proposed that the relationship between gratitude and well-being is mediated by the ability to adapt. The mediation analysis (see Figure 3) indicated that gratitude and well-being were significantly associated (Total effect:  $\beta = 0.08$ ,  $t(847) = 18.35$   $p < .001$ ), gratitude had a direct effect on depressive symptoms (Direct effect:  $\beta = 0.04$ ,  $t(847) = 10.39$   $p < .001$ ). The 95% bias-corrected interval size for the indirect effect of ability to adapt did not include zero [.40, .57], which means the ability to adapt is a partial mediator between gratitude and well-being. Therefore, the sixth hypothesis was accepted.



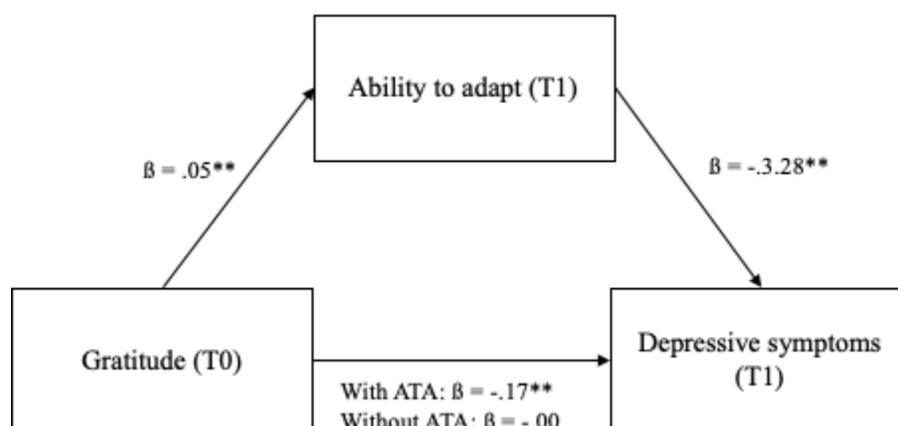
Note.  $\beta$  = represents the effect from one variable to another  
 \*\* Correlation is significant at the 0.01 level (2-tailed)

### Figure 3

*Mediation Effect of Ability to Adapt on Well-being (n=847)*

#### Third Level: Control Group Longitudinal Mediation Testing

Firstly, the third hypothesis was tested, that ability to adapt mediates the relationship between gratitude and depressive symptoms. The total effect of the model indicated that gratitude and depressive symptoms were significantly associated (Total effect:  $\beta = .17$   $t(392) = -4.33$   $p < .001$ ) While there was no evidence, that gratitude directly affected depressive symptoms (Direct effect:  $\beta = 0.00$ ,  $t(392) = -.11$   $p = .91$ ), the bootstrapped 95% confidence interval for the indirect effect of ability to adapt was entirely below zero  $[-.23, -.11]$ . Therefore, the mediation model (see Figure 4) indicates that the ability to adapt fully mediates the relationship between gratitude at baseline and depressive symptoms at the post-test. In conclusion, the hypothesis was confirmed.

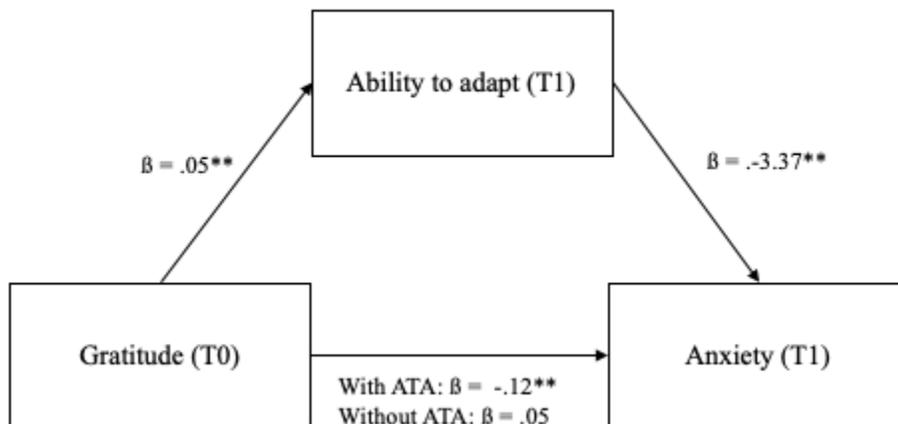


Note.  $\beta$  = represents the effect from one variable to another  
 \*\* Correlation is significant at the 0.01 level (2-tailed).

### Figure 4

*Longitudinal mediation model with Depressive symptoms as an outcome variable for the control group (n=392)*

Secondly, the fourth hypothesis was tested, ability to adapt mediates the relationship between gratitude and anxiety. The analysis revealed that gratitude and anxiety were significantly associated (Total effect:  $-.12$ ,  $t(392) = -3.03$   $p < .001$ ) While there was no evidence that gratitude directly affected anxiety (Direct effect:  $\beta = 0.04$ ,  $t(392) = -1.30$   $p = .19$ ), the bootstrapped 95% confidence interval for the indirect effect of ability to adapt was entirely below zero  $[-.23, -.12]$ . Therefore, the mediation model (see Figure 5) indicates that ability to adapt fully mediates the relationship between gratitude at baseline and anxiety at the post-test. Consequently, the hypothesis was confirmed.



Note.  $\beta$  = represents the effect from one variable to another

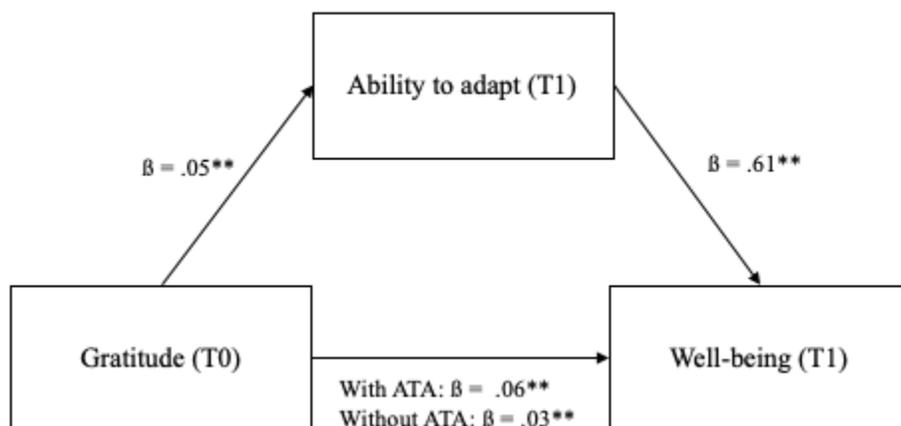
\*\* Correlation is significant at the 0.01 level (2-tailed).

### Figure 5

*Longitudinal mediation model with Anxiety as an outcome variable for the control group (n=392)*

Lastly, the fifth hypothesis, ability to adapt mediates the relationship between gratitude and well-being was tested. The mediation analysis indicated that gratitude and well-being were positively associated (Total effect:  $\beta = 0.06$ ,  $t(392) = 8.79$   $p < .001$ ) even when controlling for

the indirect effect (Direct effect:  $\beta = 0.03$ ,  $t(392) = 4.77$   $p < .001$ ). Furthermore, the bootstrapped 95% confidence interval for the indirect effect did not contain zero [.02, .04]. Consequently, both ability to adapt and gratitude have a significant effect on well-being. The mediation model (see Figure 6) indicates that ability to adapt partially mediates the relationship between gratitude at baseline and well-being at the post-test. Concluding, the hypothesis was confirmed.



Note.  $\beta$  = represents the effect from one variable to another  
 \*\* Correlation is significant at the 0.01 level (2-tailed).

### Figure 6

*Longitudinal mediation model with well-being as an outcome variable for the control group (n=392)*

### Fourth Level: Gratitude Manipulation Data Testing

The sixth hypothesis, the gratitude intervention improves not ability to adapt, but also well-being and ill-being was tested with an independent t-test. The results indicated (see table 4) that the intervention group ( $n=224$ ) had a significantly higher increase in well-being and ability to adapt compared to the control group ( $n=392$ ). Furthermore, the intervention group had

significant reductions in symptoms of depression and anxiety compared to the control group. In conclusion, the last hypothesis was accepted.

**Table 3**

*Descriptive statistics T0 and T1 of the Intervention (n=224) and Control Group (n=392)*

M(SD)	Intervention group		Control group	
	T0	T1	T0	T1
Gratitude	31.43 (5.19)	33.79 (5.08)	32.68 (5.08)	33.31 (4.98)
Ability to Adapt	2.18 (0.70)	2.48 (0.70)	2.27 (0.66)	2.31 (0.69)
Anxiety	6.56 (3.20)	5.67 (3.86)	6.61 (3.17)	6.69 (4.21)
Depressive symptoms	6.06 (3.39)	4.50 (3.65)	6.14 (3.43)	6.07 (4.16)
Well-being	2.61 (0.78)	3.10 (0.81)	2.76 (0.80)	2.83 (0.78)

Note. M and SD are used to present mean and standard deviation.

**Table 4**

*Results of t-test and Descriptive Statistics for the Change Scores (T1-T0=  $\Delta$ ) of the Intervention (n=224) and Control group (n=392)*

	Intervention group		Control group		t	p
	$\Delta$ M	$\Delta$ SD	$\Delta$ M	$\Delta$ SD		
Gratitude	2.35	4.44	0.68	4.12	-4.81	> 0.05
Ability to Adapt	0.30	0.49	0.05	0.45	-6.49	> 0.05
Anxiety	-0.92	3.48	-0.35	3.62	-4.25	> 0.05
Depressive symptoms	-1.58	3.47	-0.07	3.64	-4.99	> 0.05
Well-being	0.49	0.59	0.07	0.59	-8.40	> 0.05

Note. M and SD are used to present mean and standard deviation.

## Discussion

The present study aimed to get a deeper insight into the working mechanisms of gratitude by examining whether the ability to adapt functions as a mediator in the relationship between gratitude and anxiety as well as depressive symptoms and well-being. For this purpose, an existing data set of a six-week gratitude intervention study with a waitlist control group was

analysed, and the proposed model tested on four consecutive levels. First, the associations between gratitude, ability to adapt, well-being, anxiety and depressive symptoms were examined. Second, ability to adapt was tested as a mediator based on the total sample at pre-test. Third, to see if the mediating effect of ability to adapt exists longitudinal, the mediation was tested at post-test with the control group. Lastly, the effects of a gratitude intervention on two groups at pre-test post-test was evaluated.

Overall, the results of the present study indicated ability to adapt functions as a working mechanism of gratitude in relation to central positive and negative aspects of mental health. A higher level of gratitude was associated with a higher ability to adapt and well-being but fewer depressive symptoms and less anxiety. The research question investigated the mediating role of ability to adapt in relation to gratitude. For this purpose, the model was analysed on four levels. The aim of the first level was to get insight into the associations between gratitude and well-being and ill-being. As proposed in hypotheses 1 and 2 gratitude had a positive association with ability to adapt and well-being but a negative association with depressive symptoms and anxiety. The findings reflected similar to what previous research reported, gratitude had a strong link to higher well-being but is linked to less depressive symptoms and anxiety (e.g. Bolier et al., 2013; Seligman et al., 2006). Practising gratitude has been associated with interpreting life in a more positive light (Wood et al., 2010) and adopting a more compassionate and less critical stand to themselves (Petrocchi & Couyoumdjian, 2016), which enables better coping with symptoms of depression and anxiety (Wood et al., 2008).

The second level tested hypotheses 3 to 5 based on a mediation model at pre-test. Depressive symptoms, anxiety and well-being were separately tested in a model with ability to adapt as a mediator. Hereby gratitude was shown to directly affect well-being and ill-being,

which is consistent with existing literature (Bolier et al., 2013; Dickens, 2017; Seligman et al., 2006). However, the mediating effect of the ability to adapt to anxiety was more impactful compared to the effect of gratitude alone. Hence the effect of ability to adapt was larger than the impact gratitude had on reducing anxiety, emphasising the mediating role ability to adapt plays in the relationship. The third level tested hypothesis 3 to 5 longitudinal, taking into account the post-test data based on the control group. In contrast to the cross-sectional findings, over time the direct effect of gratitude no longer existed when the individual had the ability to adapt. Hence, indicating individuals high in gratitude seemed to experience fewer depressive symptoms and anxiety because they had the ability to adapt to their experiences. This partly confirms the sustainable mental health model, which emphasized ability to adapt to be essential in regulating well-being and ill-being (Bohlmeijer & Westerhof, in press). The finding implies that gratitude positively affects well-being even in the absence of the effect of ability to adapt. Therefore, the current study found ability to adapt to be necessary in regulating ill-being but playing only a minor role in maintaining well-being. In conclusion, the findings suggest that gratitude has a direct effect on well-being but a more indirect effect on ill-being. Previous literature emphasized that gratitude could have a direct as well as indirect effect on well-being and coping styles (Lin & Yeh, 2014). Possibly ability to adapt plays a more indirect role as a mechanism of gratitude, decreasing symptoms of depression and anxiety.

The fourth level aimed to test the sixth hypothesis. It confirmed that the gratitude intervention led to an increased ability to adapt and fewer symptoms of depression and anxiety but higher well-being. This was evident in the intervention but not in the control group. The findings are consistent with previous evaluations of gratitude intervention, where practising gratitude was associated with higher well-being and lower negative affect (Emmons &

McCullough, 2003; Wood et al., 2008; Bohlmeijer et al., 2020). The added finding of the current research was the indication that ability to adapt plays a mediating role in this relationship. Wood and colleagues emphasised (2010) that practising gratitude when feeling depressed or anxious can guide the way out of a negative thinking cycle by reflecting on the positive aspects in any challenging situation. As a result, individuals remember valuable resources and coping skills which strengthen their ability to adapt (Lambert et al., 2010; Wood et al., 2008). In conclusion, the findings confirmed consistent with previous research (Algoe & Zhaoyang, 2016) the positive effects of actively practising gratitude were linked to a higher ability to adapt.

Several limitations apply to the present study requiring interpreting the findings with caution. Firstly, the findings have to be interpreted with respect to the ongoing corona pandemic. The government posed strict restrictions on the population (e.g., working from home, isolation, quarantine (González-Sanguino et al., 2020). These drastic changes to their daily life possibly had a meaningful impact on the ability to adapt to upcoming challenges. Therefore, the assessed level of ability to adapt might not be generalisable outside the influences of the pandemic. Despite this, most participants reported only a small to moderate negative influence on their mental well-being at their baseline assessment. Only 20 per cent of the total sample subjectively experienced a highly negative influence related to corona. Therefore, replicating the study post corona would be valuable to see if similar findings resembled. Secondly, higher educated women were over-represented in the sample, limiting the generalisation to the general population. Therefore, future research needs to be more inclusive of men to enrich the understanding of ability to adapt to various populations. Lastly, although most of the scales used were reliable measures widely employed in literature, the GSAAS questionnaire (Schuffelen et al., 2021) to assess the ability to adapt was recently introduced and is still subject to further validation and

reassessment. Primarily evidence confirmed that it is a reliable and valid measurement tool to measure individuals' generic sense of ability to adapt (Schuffelen et al., 2021). However, future studies are recommended to establish more robust evidence for its psychometric properties. Despite limitations, the study was the first to investigate the mediating effect of ability to adapt. Notably, the research stood out with a strong design by testing the model on four different levels. While cross-sectional mediation is a common practice to investigate the relationship between three or more variables, it is also known to be prone to bias due to causal processes that unfold over time (Maxwell & Cole, 2007). Therefore, the present study added an extra level analysing the mediating role of ability longitudinal. Additionally, previously many gratitude studies included an active control group that was instructed to list their daily hassles. This was questioned as it might have a harmful effect on the control group, who would focus more on the adverse events in their life than they might normally do, thus resulting in increased symptoms of distress (Cregg & Cheavens, 2020). Therefore, another strong point of the current study was including a neutral wait-list control group to prevent negatively influencing the control group.

The current study further advances the knowledge on the link between gratitude and ability to adapt. A higher ability to adapt was found to be associated with fewer symptoms of depression and anxiety but a higher subject level of well-being. The findings represent an excellent initial step towards inventing more efficient and powerful interventions focusing on the mediating role ability to adapt. Future research can extend the findings by testing the model with different outcome measurements. For example, research has shown that gratitude was associated with prosocial behaviour (McCullough et al., 2001) and lower stress levels (Krejtz et al., 2016). Future research could investigate if the mediating effect of ability to adapt is apparent for similar benefits associated with gratitude. Another path of research could be to examine the concept of

adaptation further. Previous studies found individuals' ability to adapt to vary across different events and circumstances (Diener, Lucas & Scollon, 2009). For example, Lucas and colleagues (2003) found great variability in adaptation to marriage. The differences of positive reactions and its development over years were counterbalanced to experiencing a decline in satisfaction over time. Mixed-methods research would enrich the understanding by shining light on the specific adaptation processes and individual differences. The inclusion of open questions, identifying the particular ways and motives of a person successfully adapting to stress would reveal more details about how individuals adapt to life stressors. Ultimately the relationship to gratitude will become more evident.

In conclusion, the present study confirmed previous findings regarding the benefits of gratitude on well-being and ill-being (e.g., Emmons & McCullough, 2003; Wood et al., 2008) and deepened the understanding of the relationship with ability to adapt. The findings provided initial evidence for the ability to adapt to be a working mechanism of gratitude as it was found to mediate the relationship between gratitude and anxiety, depressive symptoms, and well-being. These insights provide the opportunity to better understand the underlying processes of gratitude and build a knowledge base to design more effective intervention models. Future research is needed to investigate the relevant adaptation processes and how they can be a part of sustainable intervention programs.

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