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Positive reframing: the underlying mechanism between gratitude and depressive symptoms, perceived stress and mental wellbeing

- Master Thesis PCPT (10 EC)-

by

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Abstract

Background: Some gratitude interventions seem to have beneficial effects regarding reduced depressive symptoms, perceived stress, and increased mental wellbeing, while other studies find only small effects of gratitude. Therefore, it remains unclear which underlying mechanism is creating such desirable results in some interventions. Consequently, it needs to be investigated which underlying mechanism can support the effect of gratitude interventions. **Aim:** This study tested if positive reframing (partially) mediates the direct relationships between gratitude (IV) and depressive symptoms, perceived stress, and mental wellbeing (DV). Besides, it was tested whether if one aspect of the proposed mediation model is improved (gratitude), the indirect effect of positive reframing is strengthened, possibly leading to improved mental wellbeing, depressive symptoms, and perceived stress. **Methods:** A randomized controlled trial was conducted with 847 adults. The proposed mediation model was tested in three steps. First, a potential mediation of positive reframing between gratitude, positive reframing, depressive symptoms, perceived stress, and mental wellbeing was measured cross-sectionally. Secondly, the mediation model was tested longitudinally to check whether this model is independent of the time point of assessment. Lastly, the proposed model was tested by using a gratitude application that manipulates participants' gratitude levels to test the association of gratitude with the improvement of the mediator and the dependent variables. **Results:** Three mediation analyses showed that positive reframing did partially mediate the relationship between gratitude, depressive symptoms, perceived stress, and mental wellbeing cross-sectionally. This partial mediation remained significant between gratitude and depressive symptoms as well as between gratitude and mental wellbeing and evolved into a complete significant mediation between gratitude and perceived stress over time. Lastly, the increase of gratitude could be indeed related to significantly improved positive reframing, mental wellbeing, depressive symptoms, and perceived stress, providing final support for the proposed model. **Conclusion:** Positive reframing has promising results as a (partial) mediator between gratitude, depressive symptoms, perceived stress, and mental wellbeing. This was shown with different time dimensions. The proposed mediation model was further supported by showing that increased gratitude influenced positive reframing and thus also depressive symptoms, perceived stress as well as mental wellbeing effectively.

Introduction

Dispositional Gratitude

Dispositional gratitude can be defined as the "generalized tendency to recognize and respond with grateful emotion to the roles of other people's benevolence in the positive experience and outcomes that one obtains" (McCullough et al., 2002). This gratitude definition refers to an individual's trait rather than to an individual's grateful mood (McCullough et al., 2002). People high in dispositional gratitude have a much more positive perspective towards their life (Wood et al., 2008). This means that gratitude does not only concern appreciating worthy actions of others but also being grateful for other aspects of life, regardless of their origin (Furlong et al., 2013; Wood et al., 2010). Recent studies have found that gratitude seems to be a strong predictor of mental wellbeing (Davis et al., 2016; Emmons & Mccullough, 2003; Wood et al., 2010). Therefore, several gratitude interventions have been created. As a result, it has been found that some of those gratitude interventions also seem to decrease depression (Seligman et al., 2005). Thus, there is a growing interest in fostering such potential benefits by investigating underlying mechanisms that create this desirable relationship between gratitude interventions and mental health-related benefits. This is especially relevant considering that the mental health of many has been negatively affected due to the Covid-19 pandemic (Pan et al., 2021 Cheng et al., 2015; Lee et al., 2018; Limcaoco et al., 2020).

Potential Benefits of Dispositional Gratitude

According to recent literature, gratitude interventions seem to have multiple benefits; however, relevant benefits can only be found in few gratitude interventions (Cregg & Cheavens, 2021). One of these potential benefits that seem worth investigating more thoroughly is the decrease in depressive symptoms. The World Health Organisation (n.d.) has defined depression as "persistent sadness and a lack of interest or pleasure in previously rewarding or enjoyable activities. It can also disturb sleep and appetite; tiredness and poor concentration are common". Several studies have found that some gratitude (interventions) seem to reduce depressive symptoms effectively (Cheng et al., 2015; Harbaugh & Vasey, 2014; Kim-Godwin, 2020; Sherman et al., 2020). However, it is also true that other studies could only find mild to moderate

effect sizes of gratitude interventions on depressive symptoms and doubt the effectiveness (Cregg & Cheavens, 2021; Dickens, 2017). However, if only some gratitude interventions are effective, it should be investigated which underlying mechanism strengthens the relationship between gratitude and reduced depressive symptoms, considering that depression is a leading cause of disability and a major contributor to the overall global burden of disease with an increased risk of suicide according to the WHO (n.d). This mental illness is often untreated due to stigma or lacking treatments (Smith, 2014). Especially during the recent Covid-19 pandemic, depressive symptoms increased for those who had no or few depressive symptoms before the pandemic (Pan et al., 2021).

Another factor that seems to be positively influenced by gratitude interventions and represents an increasingly worrisome problem due to the current Covid-19 pandemic is perceived stress (Cheng et al., 2015; Lee et al., 2018; Limcaoco et al., 2020). Cohen et al. (1995) defined perceived stress as the perception that external demands exceed one's ability to cope. This increase in perceived stress is relevant since it has been found to cause and support the onset of many psychiatric disorders negatively (Lee & Ham, 2013). A successful reduction of perceived stress initiated by gratitude interventions might be due to the increased probability to convert a stressful experience into an enhanced appreciation of life for more grateful individuals, meaning that gratitude serves as a protective factor (Vieselmeyer et al., 2017).

Although reducing depressive symptoms and perceived stress would be valuable, gratitude interventions could also prevent future pathological symptoms by increasing mental wellbeing (Davis et al., 2016; Emmons & Mccullough, 2003; Wood et al., 2010). Lamers et al. (2011) defined mental wellbeing as "not merely the absence of mental illness but also the presence of positive emotions (emotional wellbeing) and positive functioning in individual life (psychological wellbeing) and community (social wellbeing)" . However, the potentially protective function of mental wellbeing against future pathological symptoms is relevant considering that the relationship between gratitude and mental health can persist in the presence of negative life events, which might have increased due to the Corona crises (Gautam & Hens, 2020; Sirois and Wood 2017; Wood et al. 2010).

Underlying Mechanism Positive Reframing

Even though various studies can support the effect of gratitude on mental wellbeing, perceived stress, and depressive symptoms (Harbaugh & Vasey, 2014; Lee et al., 2018; Wood et al., 2008; Wood et al., 2010), it is still not clear which underlying mechanism creates these relationships. Coping styles have been suggested as a potential mediator between gratitude and perceived stress and between gratitude and mental wellbeing (Wood et al., 2007). The most promising adaptive coping strategy seems to be positive reframing, being defined as "thinking of seemingly negative experiences as an opportunity, a chance to learn something new, a chance to learn a new skill or deepen a relationship" (Lambert et al., 2009; Wood et al., 2007). Thus, it seems logical that positive reframing could help to recognize specific things in life one is grateful for, which have not been noticed as much beforehand.

Hughes et al. (2011) found support for positive reframing as an effective coping strategy to reduce perceived stress. This relationship is possibly created since negative thoughts were challenged, situations viewed from many (more positive) perspectives, and direct coping was enabled (Hughes et al., 2011). However, Hughes et al. (2011) did not examine positive reframing as a mediator between gratitude and perceived stress, leaving a gap in literature. Also, Lin (2016) found only theoretical support for a model indicating that active coping should partially mediate the relationship between gratitude and perceived stress. This support was based on the broaden and build theory by Fredrickson (2001). This theory states that positive emotion, like gratitude, is an adaptive mechanism that broadens the thought-action repertoire and builds cognitive ability and flexibility (Fredrickson, 2001; Lin 2016). This repertoire, flexibility, and ability can be used to cope with new situations more effectively (Lin, 2016). However, active coping is not the same as positive reframing, even though positive reframing represents an example of active coping. Therefore, it is clear that literature regarding positive reframing as a mediator between gratitude and perceived stress is still lacking. For this reason, it should be examined whether positive reframing represents a mediator and, if so, whether positive reframing continues to mediate this relationship also over time to further support the missing evidence. To make sure that positive reframing and perceived stress are indeed changing due to an increase in gratitude, a manipulation check of gratitude should be conducted as well.

Moreover, gratitude seems to be indirectly related to reduced depressive feelings (Lambert et al., 2012). This relationship is probably created because grateful individuals have a greater tendency to reframe negative or neutral situations more positively, possibly strengthening their gratefulness further. In addition, positive reframing seems to be related to fewer depressive feelings because negative experiences are seen as potentially positive experiences, for instance, as challenges, reducing their harmful effect (Lambert et al., 2012). However, Lambert et al. (2012) have also found support for positive emotion as a potential mediator between gratitude and depressive symptoms, indicating that positive reframing might act as a partial instead of a complete mediator. In contrast, other research has found that gratitude accounts for reduced depressive symptoms without the effect of positive reframing (Sherman et al., 2020). In conclusion, positive reframing seems to represent a potential mediator between gratitude and depressive symptoms. Lambert et al. (2012) were the only researchers who investigated this mediation relationship over time. Furthermore, literature examining a potential mediation of positive reframing between gratitude and depressive symptoms have not included a manipulation check of gratitude up until now; thus, there is a need for further evidence examining whether an increase in gratitude is actually causing an increase in positive reframing and improvement of depressive symptoms.

Lastly, previous literature indicates that positive reframing has a positive relationship with psychological wellbeing and resilience in the long term (Folkman, 1997; Tugade & Fredrickson, 2004). Thus, there seems to be support for a relationship between positive reframing and wellbeing and between gratitude and wellbeing (Davis et al., 2016; Emmons & Mccullough, 2003; Wood et al., 2010); however, literature examining positive reframing as a potential mediator between gratitude and mental wellbeing is still missing up until now.

Taking all of this literature into account, a model has been proposed (Figure 1), showing a potential mediation effect of positive reframing.

The Effect of a Gratitude Application

To test the proposed mediation model (Figure 1), gratitude is increased via a gratitude intervention, possibly leading to an increase of other aspects of the model as well. The gratitude application “Zo erg nog niet (ZENN)” was chosen as a method to test the proposed model. This

application represents the gratitude exercises of the intervention by Bohlmeijer et al. (2020), being adapted to the fit of an application by formulating the content of the intervention more clearly to the user. The gratitude intervention by Bohlmeijer et al. (2020) seems promising because all exercises involved are evidence-based, combined instead of used on their own, and achieved an increase in gratitude and mental wellbeing in participants with low to moderate mental wellbeing. The application seemed more practical to increase gratitude because the gratitude exercises can be performed anonymously (Yaphe & Speyer, 2011). In case the ZENN application could increase gratitude and therefore influence the mediator, depressive symptoms, perceived stress as well as mental wellbeing, the proposed model (Figure 1) could also be supported for participants being exposed to challenging life circumstances such as the Covid-19 pandemic.

The Current Study

The aim of this study was to test if positive reframing does mediate the relationship between gratitude, depressive symptoms, perceived stress, and mental wellbeing (Figure 1) cross-sectionally and over time. In addition, it was investigated whether, if one aspect of the mediation model is increased (gratitude), other parts of the model (positive reframing, mental wellbeing, depressive symptoms, and perceived stress) increase as well to add support for the proposed model.

In order to investigate these aims, a randomized controlled trial was carried out. Since to date, the research regarding positive reframing as a mediator between gratitude, perceived stress, depressive symptoms, and mental wellbeing has been shown to be lacking. Literature up until now is missing either cross-sectional support, longitudinal support, or a manipulation check of gratitude. However, all of these steps are needed to be able to find out whether positive reframing does represent a mediator (baseline data model testing) and if this model hold true, independent of the time point of assessment (longitudinal). Besides, a manipulation is necessary to measure whether an increase in the variable gratitude is actually responsible for an improvement in positive reframing and perceived stress, depressive symptoms, and mental wellbeing.

Based on the literature reviewed, the following research questions and hypotheses have been formulated:

RQ1**:** To what extent is gratitude correlated with positive reframing and depressive symptoms, perceived stress and mental wellbeing?
H_1: Gratitude has a significant and positive correlation with positive reframing and mental wellbeing and a negative and significant correlation with depressive symptoms and perceived stress.

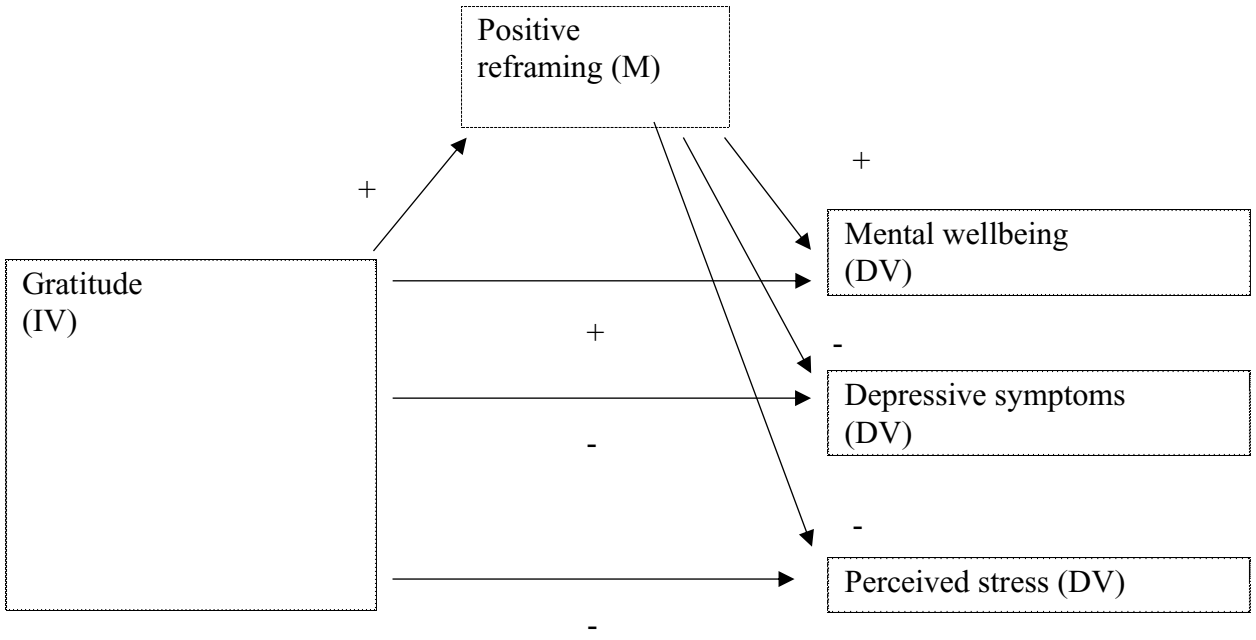
RQ2: To what extent does positive reframing mediate the relationship between gratitude and depressive symptoms/perceived stress as well as mental wellbeing at baseline (T0)?
*H_2**:*** The relationship between gratitude and mental wellbeing is partially mediated by positive reframing at T0
H_3: The relationship between gratitude and perceived stress is partially mediated by positive reframing at T0
H_4: The relationship between gratitude and depressive symptoms is partially mediated by positive reframing at T0

RQ3: To what extent does positive reframing mediate the relationship between gratitude and depressive symptoms/perceived stress and mental wellbeing across time?
H_5: The relationship between gratitude and mental wellbeing is partially mediated by positive reframing across time
H_6: The relationship between gratitude and perceived stress is partially mediated by positive reframing across time
H_7: The relationship between gratitude and depressive symptoms is partially mediated by positive reframing across time

RQ4: To what extent does the gratitude application “Zo erg nog niet (ZENN)” increase gratitude and thereby also improve positive reframing, depressive symptoms, perceived stress as well as mental wellbeing?
H_8: The intervention group shows increased gratitude and, as a result, also improved positive reframing, mental wellbeing, depressive symptoms and perceived stress.

Figure 1

Three Proposed Mediation Relationships with Positive Reframing



Note. Minus and plus characters are directional indicators, displaying either a positive or a negative relationship.

Methods

Design

The current study discusses the results of a randomized controlled trial (RCT), taking place in the Netherlands and Belgium. The independent variable in this study was gratitude,

positive reframing the (partial) mediator, and depressive symptoms, perceived stress, and mental wellbeing were dependent variables.

Firstly, to answer RQ2, a cross-sectional within-group design for the total group was used at baseline (T0) to examine whether positive reframing could potentially mediate the relationship between gratitude (IV) and depressive symptoms, perceived stress, and mental wellbeing. Secondly, a longitudinal within-group subject design was used to answer RQ3 to show whether a potential mediation of positive reframing does actually last over time to further strengthen the quality of evidence. Here only the control group was taken into account.

These different time dimensions build upon each other because common method variance bias is avoided (Rindfleisch et al., 2008). This bias relates to the error that occurs if only one source or method of evidence is used to answer a research question. This single source or method is seen as a bias because one probability to infer a causal relation of one variable to another is decreasing if it is not clear whether circumstances or the time point have been influential (Rindfleisch et al., 2008).

Intervention

To answer RQ4 “To what extent does the gratitude application “Zo erg nog niet (ZENN)” increase gratitude and thereby also improve positive reframing, depressive symptoms, perceived stress as well as mental wellbeing?” a method that provides causal efficacy needed to be used (Ejelöv & Luke, 2020). Therefore, a manipulation check of gratitude was conducted via a 2 (time) *2 (condition) between-group subject design. The two conditions were the intervention group that used that gratitude application and the control group that did not receive access to the application until all data for this study had been collected.

The intervention group took part in various gratitude exercises consisting of a “Gratitude diary,” the exercise “Take another perspective,” “Expressing gratitude,” “Appreciating the good things in life: Grateful memories,” “Gratitude and misfortune,” and “Using a gratitude attitude in life” (Bohlmeijer et al., 2020). These tasks were writing exercises, elements of psychoeducation, and tasks that motivate to reflect on gratitude.

Participants knew that they were in two different groups; however, they did not know in which group they were. The instruction for the control group was to fill out the same

questionnaires as the intervention group; however, they had to wait for eight weeks until they received access to the ZENN application.

Participants

The inclusion criteria were being 18 years or older, having access to a smartphone, and mastering the Dutch language to be able to fill out all questionnaires and follow the intervention instructions. Participants who did not agree to the informed consent were excluded. Table 1 shows all relevant demographic characteristics of the intervention, control, and total group. The total group consisted of a sample with a mean age of 52.85, representing mainly female adults (79.8%) who were married (56.9%) and in a paid employment (62.7%). Furthermore, the majority of the total sample lived either with their partner and/or a child (65.9%), enjoyed a higher education (76.9%), and were Dutch inhabitants (78.5%). Table 1 also indicates that there are no noteworthy differences regarding the demographic characteristics between the intervention and control group. Furthermore, Table 1 also shows the influence of Corona on mental wellbeing for the intervention, control, and total group. This Covid-19 influence was measured with the questions “To what extent has the corona crisis currently a negative impact on your mental wellbeing?”. Answers did not differ particularly between the intervention and control group.

Table 1

Demographic Characteristics of the Intervention, Control and Total Group (T0)

Characteristic	Intervention Group (*n=423*)	Control group (*n=424*)	Total group (*n= 847*)
Age, *M* (*SD*)	53.26 (14.67)	52.45 (14.33)	52.86 (14.5)
Female gender, *n* (%)	78.3	81.4	79.8

Marital status (%)			
Married	59.9	53.9	56.9
Divorced/ Widow/Widower	17.2	20.8	19
Never married	22.9	25.3	24.1
Employment (%)			
Paid Employment	62.7	62.8	62.7
Retired	22.5	19.8	21.1
Other	37.4	37.2	16.2
Living situation (%)			
With partner and child	26	28.8	27.4
With partner without a child	39.7	37.3	38.5
Other	34.3	34	34.1
Education (%)			
Low	4.2	5.6	5.0
Intermediate	13.5	14.4	14.3
High	79.2	74.8	76.9
Other			
Dutch nationality	82.5	74.5	78.5
Influence of corona on wellbeing			
(%)	1.7	1.7	1.7
Not at all	42.6	40.1	41.3
Somewhat	40.2	35.4	37.8
Tolerable	13.2	20	16.6
A lot	2.1	2.8	2.5
Very much			

Note. N=847

Procedure

Firstly, participants were recruited via social media and the newspaper press release of the University of Twente. To advertise the gratitude application, the message was: "Can your wellbeing use a boost? Join this study on the effects of happiness exercises from the University of Twente for free" and "Do you experience less well-being due to the corona crisis? Could you use some positivity and resilience? Are you motivated to start working with an app for a few weeks to increase your mental resilience?" (Bohlmeijer et al., 2020). To randomly assign the participants to the intervention or the control group, randomizer.org was used. The intervention

group used the application for six weeks. The control group had to wait to use the intervention, meaning that they did not receive the intervention before T1.

Then, participants agreed with the informed consent and filled out a questionnaire assessing their demographic data (gender, living situation, marital status, country of residence, work situation, education) as well as the potentially negative impact of Covid-19 on their mental wellbeing. Next, a pre-test (T0) of all outcome measures needed to be answered. These outcome measures were the Gratitude questionnaire (GQ-6) to assess the gratitude level of the participants, the Brief COPE questionnaire was chosen to assess how much positive reframing was used. Also, the perceived stress scale (PSS) was utilized to measure the level of perceived stress the participants were experiencing at that time. To check for depressive symptoms, the Patient Health questionnaire (PHQ-9) was used. Lastly, to assess participants' mental wellbeing, the MHC-SF had to be filled in. Shortly after participants filled in all necessary questionnaires, access to the ZENN application was provided to the intervention group. The instruction for the control group was to fill out the same questionnaires as the intervention group; however, they were asked to wait until T1.

The participants of the intervention group received automatic reminders in the form of a gratitude citation in the morning, in the form of a request to add a photo of something the user is grateful for in the afternoon, and in the form of a recommendation to do a gratitude exercise in the evening. However, participants were able to turn such reminders off in case they did not like to receive them. The application included various journaling exercises, which were explained in the application but carried out on a private smartphone/laptop or paper notebook instead of in the application itself. Furthermore, it was possible to finish the tasks before the six-week period (planned duration of the intervention) ended. After the intervention had been completed by the participants, outcomes measurement questionnaires had to be completed again (post-test). The participants did not receive any compensation for their participation.This RCT was approved by the Ethics Committee of the University of Twente (file number 201071).

Outcome Measures

Mental Wellbeing

The mental health continuum short form (MHC-SF) was used to measure the mental wellbeing of participants at baseline and at the post-test measurement (T1). This questionnaire consists of 14 items measuring three kinds of wellbeing: emotional, social, and psychological wellbeing (Lamers et al., 2011). An example of an item measuring emotional wellbeing would be "During the past month, how often did you feel…happy?" (Item 1). The answer possibilities range from "never" = 0 to "every day" = 5. A higher mean score indicates higher mental wellbeing (Lamers et al., 2011). Furthermore, this questionnaire had good reliability considering the Cronbach's alpha (.88) in this study.

Positive Reframing

Positive reframing was measured at baseline and at the post-test measurement (T1) with the questionnaire "Brief COPE" consisting of 28 items; however, only items measuring the construct positive reframing were included (Yusoff et al., 2010). The questionnaire has a 4-point Likert scale ranging from "I haven't been doing this at all"= 1 to "I have been doing this a lot" = 4. A higher mean score on subscales indicates increased coping of the participant. The questionnaire contains 14 dimensions: self-distraction, active coping, denial of substance use, use of emotional support, use of instrumental support, behavioural disengagement, venting, positive reframing, planning, humour, acceptance, religion, and self-blame (Yusoff et al., 2010). However, only positive reframing was measured with the following items: "I've been trying to see it in a different light, to make it seem more positive" and "I've been looking for something good in what is happening " (Carver, C. S. (n.d.)). Moreover, positive reframing shows an acceptable Cronbach's alpha of .79 in this study.

Gratitude

To measure grateful disposition, the Gratitude Questionnaire (GQ-6) was used (Jans-Beken et al., 2015). Answer options range from "strongly disagree" =1 to "strongly agree" = 7. A higher sum score (ranging from 6 to 42) indicates greater dispositional gratitude if the two negative items 3 "When I look at the world, I don't see much to be grateful for" And 6 "Long amounts of time can go by before I feel grateful to something or someone" are reverse coded

(Jans-Beken et al., 2015). In addition, the GQ-6 shows an acceptable Cronbach's alpha of .75 in this study.

Perceived Stress

The perceived stress scale (PSS) consists of 10 items which were supposed to measure how "uncontrollable, unpredictable and overloaded respondents find their lives" (Cohen et al., 1994). Items 4 to 8 need to be recoded since they are formulated positively. Respondents can use a 4-point Likert scale with answers ranging from 0= "Never" to 4= "Very often." An example of an item would be, "In the last month, how often have you been upset because of something that happened unexpectedly?" (Item 1). The higher the sum score, the higher the perceived stress (Cohen et al., 1994). The Cronbach's alpha of the scale was questionable (.67) in this study.

Depression

Depressive symptoms were measured with the Patient Health Questionnaire- 9 (PHQ-9), which includes nine items; one of which is "Over the last two weeks, have you been bothered by any of the following problems…Little interest or pleasure in doing things" (Item 1) (Kroenke et al., 2001). The higher the sum score, the more depressive symptoms seem to be present. A score of 5 symbolizes a mild depression, 10 a moderate depression, 15 a moderately severe depression and 20 a severe depression. The Cronbach's alpha of the PHQ-9 is acceptable (.71) in this study. The questionnaire has a 4-point Likert scale with answers ranging from "not at all" =0 to "nearly every day" = 3 (Kroenke et al., 2001).

Data Analysis

The data were analysed using the computer program SPSS version 24. (IBM Corp., 2017) in combination with the tool Hayes PROCESS macro version 3.4 (Hayes, 2020), with an alpha level set to 0.05. Considering that a Cronbach's alpha scores below .70 are common in psychological constructs, a cut-off score of $\alpha = .60$ was chosen for this study (Field, 2013).

Moreover, 714 participants (84%) completed all outcome measurement questionnaires for the post-test; therefore, 133 participants had to be excluded from the manipulation data model testing (RQ4). In addition, only 223 of 322 (69%) participants of the intervention group

completed at least half (3 out of 6) of the gratitude application modules. For this reason, further 99 participants of the intervention group were excluded from the manipulation data model testing. Thus, 615 participants were included to answer RQ4.

Baseline Data Model Testing

Firstly, to compare mean scores and standard deviation of the sample with mean scores and standard deviations of a (Dutch) norm group, descriptive statistics were analyzed. To test H_1, a Pearson correlation was conducted. Then, it was aimed to investigate the proposed model (Figure 1) at baseline (T0), thus, cross-sectional PROCESS Hayes (Hayes, 2017) macro regression mediation analyses with bootstrapping have been performed. Also, the bias-corrected and accelerated 95% confidence interval was taken into account. For these analyses, the intervention and control group were included. For each mediation relationship, the analyses were conducted individually. Furthermore, the direct effect (relationship between gratitude and dependent variable when the indirect effect of positive reframing is controlled for) should be lower than the total effect in case of a significant indirect mediation effect of positive reframing (Hayes, 2017).

Longitudinal Mediation Analysis

To test hypotheses 2 to 7, simple mediation regression analyses were conducted using the PROCESS Hayes (Hayes, 2017) macro tool. For these analyses, baseline gratitude and T1 measures of the mediator and dependent variables were used, focusing on the control group only this time. Mediation analyses were conducted for all three dependent variables individually.

Manipulation check

To test H_8, change score variables (T1-T0) allowed to conduct an independent-samples t-test to check whether a significant difference between the control and intervention group appeared in regard to all outcome variables (Gabana et al., 2019). Moreover, the application needed to be used enough to associate an effect to the questionnaire results; thus, participants in the intervention group who completed at least 3 out of the 6 of the gratitude application modules

were defined as adherent and included in the analysis, non-adherent participants of the intervention group were excluded.

Results

Descriptive Statistics

Descriptive statistics of the mean scores and standard deviations of the sample are shown in Table 1. Firstly, the means of the gratitude level was normal in comparison to a younger norm group consisting of undergraduate students. Such norm scores are not ideal for comparison; however, there is a lack of norm scores focusing on a more diverse adult population (M=35.62, SD=5.25) (Breen et al., 2010). Similarly, positive reframing levels were lower than norm scores of a population consisting of a sample with mainly college students (M=5.37, SD=1.46) being approximately one standard deviation below the mean. (Doron et al., 2014). Moreover, the mean score of perceived stress was still within the normal range in comparison to norm scores collected with U.S. adult respondents (M=12.8, SD=6.2) (Cohen et al., 1994). However, the majority of the sample shows lower mental wellbeing than the norm (Lamers et al., 2011), being approximately one standard deviation below a comparable Dutch sample which was somewhat younger with a mean age score of 47.6 in comparison to this sample with a mean age score of 52.8 (M=3.98, SD= 0.85). Lastly, most of the participants were indicating mild depression (Kroenke et al., 2001).

Correlations

H_1: gratitude has a significant and positive correlation with positive reframing and mental wellbeing and a negative and significant correlation with depressive symptoms and perceived stress.

The relationships between gratitude and the mediator positive reframing as well as the dependent variables depressive symptoms, perceived stress and mental wellbeing were also examined by measuring the Pearson correlations among the total sample at T0 (Table 1). The correlations indicated that there was a positive significant ($p < 0.001$) association between gratitude and positive reframing as well as between gratitude and mental wellbeing. Additionally, the association between gratitude and perceived stress as well as between gratitude and depressive

symptoms is negative and significant ($p < 0.001$). Also, positive reframing had a positive and significant correlation with mental wellbeing ($p< 0.001$). The correlation between positive reframing and perceived stress as well as between positive reframing and depressive symptoms is also significant and negative ($p<0.001$). In conclusion, these Pearson correlations give a first indication of a mediation of positive reframing between gratitude and all three dependent variables (Figure 1) and show that H_1 can be accepted.

Table 1

Descriptive statistics and Pearson Correlations of all Outcome Measures at T0

Variable	*M*	*SD*	1.	2.	3.	4.	5.
1. Gratitude	32.14	5.29	-				
2. Positive reframing	2.83	0.80	.42**	-			
3. Perceived stress	17.88	4.56	-.35**	-.35**	-		
4. Mental wellbeing	2.71	0.80	.53**	.43**	-.45**	-	
5. Depressive symptoms	6.04	3.34	-.30**	-.20**	.45**	-.38**	-

Note. M and SD are utilised to stand for means and standard deviations.
**. Correlation is significant at the 0.01 level (2-tailed). *N*=847

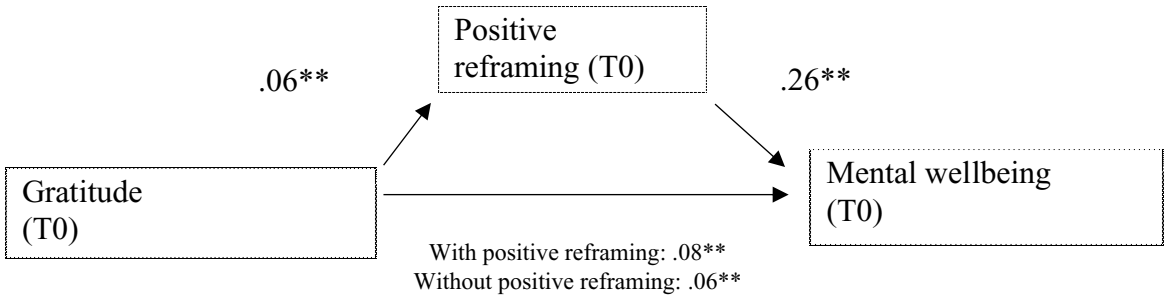
Baseline Data Model Testing

H_2: The relationship between gratitude and mental wellbeing is partially mediated by positive reframing at T0

The simple mediation analysis has revealed that positive reframing partially mediated the relationship between gratitude and mental wellbeing (Figure 2). The direct effect between gratitude and depressive symptoms seems to be significant (Direct effect: ß = .06 $t(847) = 13.75$ p =.00). The partial mediation can be noticed because this relationship remains significant and increases in consideration of the indirect effect of positive reframing (Total effect: ß = 0.80 $t(847) = 18.34$, p = .00). The 95% confidence interval [0.01,0.02] of the indirect effect did not include zero. Therefore, H_2 can be accepted.

Figure 2

Direct Mediation Effect with the Outcome Variable Mental Wellbeing



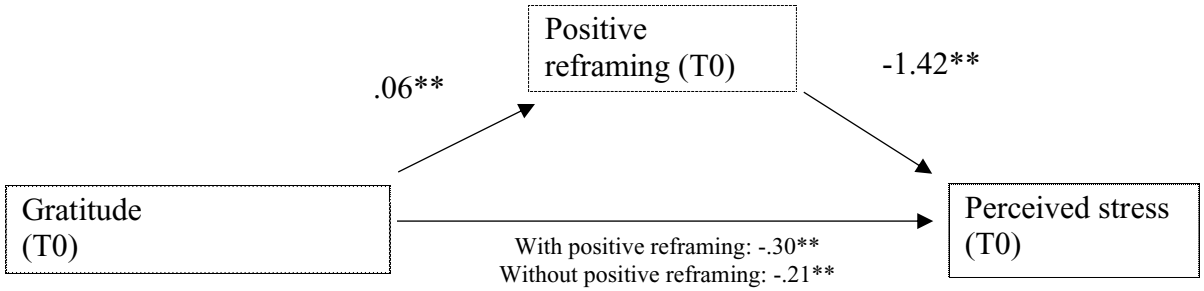
Note. **Correlation is significant at the 0.01 level (2-tailed)

H_3: The relationship between gratitude and perceived stress is partially mediated by positive reframing at T0

A simple mediation regression analysis revealed that positive reframing also partially mediates the relationship between gratitude and perceived stress (Figure 3). The relationship between gratitude and perceived stress seems to be significant when controlling for the mediator (Direct effect: ß = -.21 $t(847) = -7.17$ $p = .00$). However, this relationship becomes stronger when taking the mediator into account (Total effect: ß = -.30 $t(847) = -10.98$ $p = .00$), indicating a partial mediation.The indirect effect of positive reframing is also statistically significant because the 95% confidence interval [-0.12, -0.06] did not include zero. Therefore, H_3 can be accepted.

Figure 3

Direct Mediation Effect with the Outcome Variable Perceived Stress



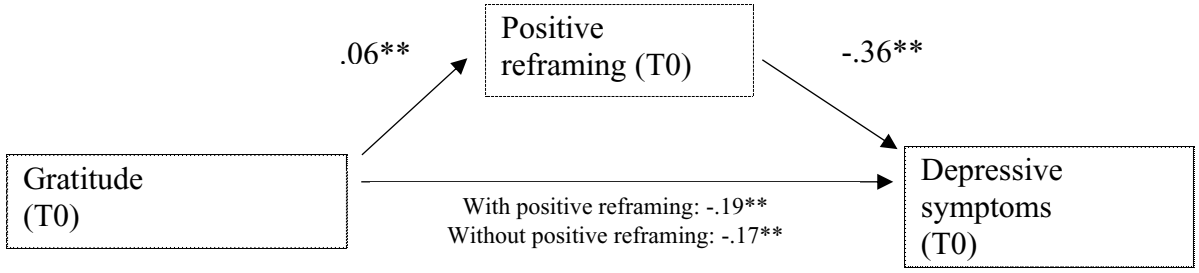
Note. **Correlation is significant at the 0.01 level (2-tailed)

H_4: The relationship between gratitude and depressive symptoms is partially mediated by positive reframing at T0

Lastly, the relationship between gratitude and depressive symptoms (Figure 4) seems significant in itself (Direct effect: ß = -.17 $t(847) = -7.55$ $p = .00$), however, this relationship becomes stronger when considering the indirect effect of positive reframing as well (Total effect: ß = -.19, $t(847) = -9.44$, $p = .00$), indicating a partial mediation. The 95% confidence interval [-0.04, -0,00] of the indirect effect did not include zero. Thus, H_4 can be accepted.

Figure 4

Direct Mediation Effect with the Outcome Variable Depressive Symptoms



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

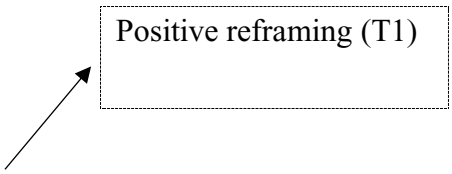
Longitudinal Data Model Testing

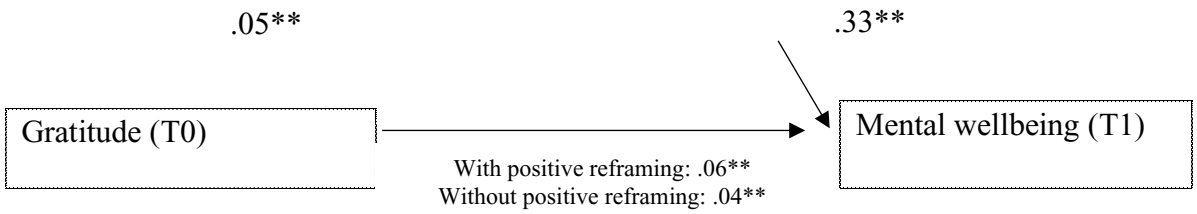
H_5: The relationship between gratitude and mental wellbeing is partially mediated by positive reframing across time.

The results of the longitudinal analysis (Figure 5) show that the relationship between gratitude at T0 and mental wellbeing (T1) is still significant for the control group (n=392) over time (Direct effect: ß = 0.04 $t(392) = 5.65$ $p = .00$). Besides, the relationship between gratitude and mental wellbeing is still significant when controlling for the indirect effect (Total effect: ß =0.06, $t(392) = 8.79$, $p = .00$). The indirect effect of positive reframing (T1) did not include zero in its 95% confidence interval [0.01, 0.03]. Therefore, H_5 can also be accepted.

Figure 5

Direct Mediation Effect with the Outcome Variable Mental Wellbeing





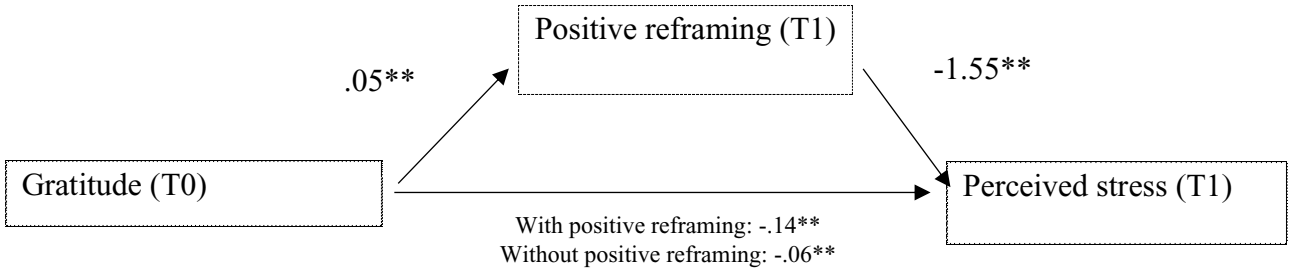
Note. **Correlation is significant at the 0.01 level (2-tailed)

H6: The relationship between gratitude and perceived stress is partially mediated by positive reframing across time.

The results of the longitudinal analysis (Figure 6) show that the relationship between gratitude and perceived stress is significant over time if the mediator is considered (Total effect: ß =-0.14, *t(*392) = -3.17, *p* = .00). However, the direct relationship between gratitude and perceived stress is not significant anymore if the mediator has been controlled for (Direct effect: ß = -0.05 *t*(392) = -1.09 *p* =.27). In addition, the indirect effect of positive reframing did not include zero in its 95% confidence interval [-0.13, -0,04], meaning positive reframing does mediate the relationship between gratitude and perceived stress completely. For this reason, *H6* can be rejected.

Figure 6

Direct Mediation Effect with the Outcome Variable Perceived Stress



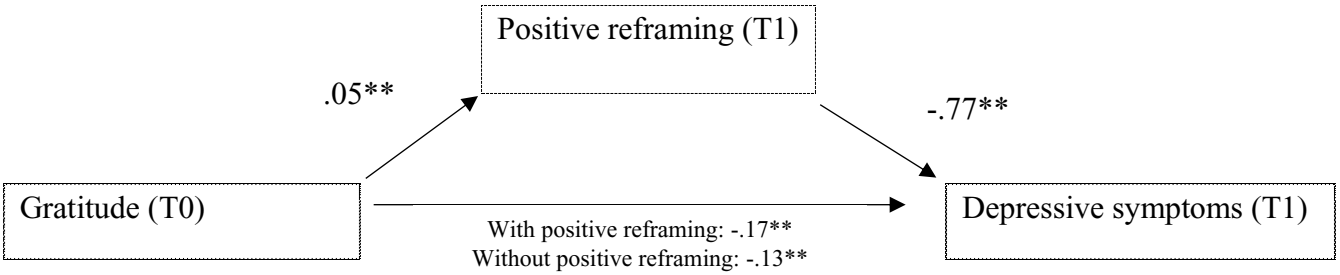
Note. **Correlation is significant at the 0.01 level (2-tailed)

H7: The relationship between gratitude and depressive symptoms is partially mediated by positive reframing at across time.

Lastly, the relationship between gratitude and depressive symptoms is still significant over time (Direct effect: ß = -0,12, $t(392) = -2.88$ $p = .00$) (Figure 7). This significant relationship remained and increased after the indirect effect of positive reframing has been considered (Total effect: ß = -0.17, $t(392) = -4,32$, $p = .00$). The direct relationship between gratitude and depressive symptoms was still partially mediated by positive reframing over time (Figure 7) taking into account that the indirect effect of positive reframing did not include zero in its 95% confidence interval [-0.88, -0.17]; thus, H_7 can be accepted.

Figure 7

Direct Mediation Effect with the Outcome Variable Depressive Symptoms



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

Manipulation Data Testing

H_8: The intervention group shows increased gratitude and, as a result, also improved positive reframing, mental wellbeing, depressive symptoms, and perceived stress.
Results of the independent t-test are shown in Table 2. As Levene's Test for Equality of Variances is not significant, Equal Variances assumed needs to be considered. As predicted, results indicated that the participants of the intervention group (n=223) had a significantly higher

gratitude level, used significantly more positive reframing, had significantly better mental wellbeing than the control group (n=392). Moreover, the intervention group could show a significant reduction in perceived stress as well as in depressive symptoms, compared to the control group at T1. Results of the descriptive statistics that show the means and standard deviations of the intervention and control group before and after the manipulation can illustrate the impact of increased gratitude further (Table 3). In conclusion, H_8 can be accepted.

Table 2

Descriptive Statistics and Independent t-test for the Change Scores (T1-T0) of the Intervention (n=223) and Control group (n=392)

	Intervention group		Control group			
	ΔM	SD	ΔM	SD	t	p
Gratitude	2.37	4.44	0.62	4.19	-4,85	> 0.05
Positive reframing	0.25	0.69	0.02	0.72	-3.82	> 0.05
Perceived stress	-2,39	3.97	-0.31	3.93	6.26	> 0.05
Depressive symptoms	-1.58	3.47	-0.07	3.64	5.01	> 0.05
Mental wellbeing	0.49	0.59	0.07	0.59	-8.44	> 0.05

Table 3

Descriptive of the Intervention (n=223) and Control group (n=392)

	Intervention group (T0)		Control group (T0)		Intervention group (T1)		Control group (T1)	
	M	SD	M	SD	M	SD	M	SD
Gratitude	31.42	5.20	32.68	5.08	33.79	5.05	33.31	4.98

Positive reframing	2.77	0.83	2.88	0.80	3.02	0.73	2.90	0.81
Perceived stress	17.94	4.41	17.80	4.61	15.55	4.67	17.49	4.58
Depressive symptoms	6.06	3.37	6.14	3.43	4.47	3.66	6.07	4.16
Mental wellbeing	2.61	0.78	2.76	0.80	3.10	0.81	2.83	0.78

Discussion

The aim of this study was to test whether positive reframing does mediate the relationship between gratitude (IV) and mental wellbeing, perceived stress, and depressive symptoms (DV) cross-sectionally and longitudinally. This study focus was chosen because previous literature showed that gratitude interventions seem to have a positive effect on various aspects of mental health, being depressive symptoms, perceived stress, and mental wellbeing. However, only some interventions seem to work effectively (Cregg & Cheavens, 2021). For this reason, this study focused on finding support for a potential mediator that seemed promising, namely positive reframing, that could influence the relationship between gratitude and such mental health-related variables effectively. Research regarding this particular mediation is lacking, demonstrating missing steps in evidence, being various time dimensions; thus, it was aimed to find cross-sectional as well as longitudinal support for the proposed mediation model. In addition to that, the current study aimed to find out whether an increase in gratitude can actually be associated with an increase in positive reframing, depressive symptoms, perceived stress, and mental wellbeing by conducting a manipulation check of gratitude.

Positive reframing as a mediator

One of the main findings of this study was that gratitude and positive reframing, as well as gratitude and mental wellbeing, have a positive and significant correlation. On the other hand,

gratitude a significant and negative correlation with depressive symptoms and with perceived stress. This result already gave an indication for the mediation and was in accordance with previous literature (Cheng et al., 2015; Davis et al., 2016; Emmons & Mccullough, 2003; Harbaugh & Vasey, 2014; Kim-Godwin, 2020; Lambert et al., 2012; Sherman et al., 2020; Vieselmeyer et al., 2017; Wood et al., 2010). Another main finding was that positive reframing seems to (partially) mediate the relationships between gratitude and depressive symptoms, perceived stress, and mental wellbeing, providing support for the proposed mediation model (Figure 1). This could be especially demonstrated by the analyses with different time dimensions, meaning that this (partial) mediation has been shown cross-sectionally as well as longitudinally. Additionally, this study could show that an increase in dispositional gratitude has led to an increase in the mediator positive reframing as well as in all three dependent variables depressive symptoms, perceived stress, and mental wellbeing.

Firstly, findings indicated that positive reframing does partially mediate the relationship between gratitude and depressive symptoms cross-sectionally as well as longitudinally. This result was expected because it was in line with previous findings by Lambert et al. (2012), who also found this direct mediation relationship, even over time. In contrast, the findings of this study are not in line with the results of Sherman et al. (2020), who have found that the direct relationship between gratitude and depressive symptoms is already significant without the indirect effect of positive reframing. This discrepancy might have occurred because the sample size of the study by Sherman et al. (2020) was relatively modest. However, it might also have occurred because most participants in this study indicated a mild depression at baseline, while the sample of Sherman et al. (2020) was a population suffering from cystic fibrosis, possibly less willing or able to engage in positive reframing due to the tendency of having more physical and psychosocial sequelae. Lastly, compared to existing evidence about positive reframing as a mechanism behind the positive effects of gratitude on depressive symptoms, this study also integrated a manipulation check. The manipulation of gratitude has shown that an increase in dispositional gratitude could improve positive reframing and depressive symptoms for the intervention group. In contrast, many studies doubted the effect on depressive symptoms (Cregg & Cheavens, 2021; Dickens, 2017).

In addition, results demonstrated that positive reframing does partially mediate the

relationship between gratitude and perceived stress cross-sectionally. This mediation transferred into a complete mediation over time. These findings were not expected, considering that there was no other study that could find this direct mediation relationship up until now, neither cross-sectionally nor longitudinally. Hughes et al. (2011) only found support for a relationship between viewing situations from more positive perspectives, which is similar to the definition of positive reframing and reduced perceived stress. Also, Lin's (2016) theoretical findings do not correspond because he hypothesized that active coping, as well as social support, would mediate the relationship between gratitude and perceived stress instead of positive reframing. Lastly, this study was able to show that participants with increased gratitude (intervention group) have less perceived stress in comparison to the control group. Such findings were in line with Lee et al. (2018), who have found that grateful individuals reframe negative memories experiences, which in turn facilitate coping with perceived stress. Having said that, it is also true that results were not in line with Cheng et al. (2015), who found that gratitude interventions possibly reduce perceived stress because things/people that one feels grateful for that would have normally forgotten or ignored can now be appreciated more, considering that they were actively written in a gratitude diary.

Lastly, findings showed that positive reframing does indeed partially mediate the relationship between gratitude and mental wellbeing cross-sectionally and over time. These results were to some extent expected, considering that Folkman (1997) and Tugade and Fredrickson (2004) suggested that positive reframing does mediate the relationship between gratitude and psychological wellbeing, representing a part of mental wellbeing. Moreover, a partial instead of a complete mediation was also expected because Wood et al. (2007) have found various underlying mechanisms relating gratitude to different aspects of mental wellbeing; thus, a partial mediation of positive reframing seems more probable. Finally, results have indicated that participants in the intervention group had higher mental wellbeing, which disagrees with findings by Davis et al. (2016), who have raised serious doubt whether engaging in gratitude exercises for a couple of minutes will have a noteworthy effect on mental wellbeing. Such different results might have been caused by the samples being investigated in the recent gratitude studies, consisting of mainly college students who might have had less room for improvement in mental wellbeing than the sample in this study that seemed to have lower mental wellbeing than the

Dutch population. Furthermore, participants of this study stated that Corona had affected their mental wellbeing negatively to some extent (Davis et al., 2016).

The "ZENN" Gratitude Application as a Method for Testing the Proposed Mediation

The findings of this study showed that participants of the intervention group felt much more grateful due to the 6-week gratitude online intervention "Zo erg nog niet (ZENN)" compared to the control group at T1. This result was expected because this online gratitude intervention was based on the study by Bohlmeijer et al. (2020), being one of the first interventions to find a greater effect on dispositional gratitude. Furthermore, the meta-analysis by Davis et al. (2016) argued that many gratitude interventions do not find similarly promising results because dispositional gratitude refers to a trait instead of gratitude as a mood, meaning this might be harder to change. However, this ZENN application was able to achieve an increase in dispositional gratitude. This increase might have been caused by the longer duration of this gratitude intervention and by the reminders to use the application regularly.

Strengths and Limitations

Up to date, this is the first study that could show support for a proposed model suggesting positive reframing as a (partial) mediator between gratitude and depressive symptoms, perceived stress, and mental wellbeing cross-sectionally, longitudinally, and with a manipulation check. However, there are some limitations that should be taken into account when looking at the results of this study. Firstly, the chosen sampling method, "opportunity sampling," was a limitation of this study. This method means to contact people who are willing to participate in the study. However, this should be avoided if the aim is to generalize the findings of the study (Fogelman & Comber, 2002). This can be seen when looking at the sample of this study in which highly educated women in paid employment were overrepresented. However, this overrepresentation might have also been caused by the way the advertisement was placed because participants were recruited via social media and the newspaper press release of the University of Twente. These platforms might have been more interesting/ relevant for individuals who are in contact with (this) University; thus, higher education might have been more likely. The overrepresentation of

women might be due to the tendency of women to be more interested in psychology than men, according to Harton and Lyons (2003).

Implications

The findings of this study have shown that positive reframing represents an important mediator between gratitude and mental health-related aspects, even over time. This finding adds support to the "broaden and build theory" by Fredrickson (2001), who found that positive emotion, such as gratitude, is an adaptive mechanism that broadens the thought-action repertoire and builds cognitive ability and flexibility. This, in turn, can enable successful coping, for example, by stepping back and approach a seemingly negative perspective from a big picture perspective and increase wellbeing (Fredrickson, 2001). This bigger picture perspective was tried to achieve through positive reframing and has worked successfully.

The "Zo erg nog niet (ZENN)" application, as well as other future gratitude interventions, could focus on (re)designing their interventions in a way that focuses more on improving positive reframing as well. Thus, exercises that would ask the user to rewrite and/or reinterpret seemingly negative experiences in a way that also highlights also resulting opportunities, for instance, are recommended. This way, depressive symptoms, perceived stress, and mental wellbeing might be affected more effectively.

Future research

Future studies should focus on the inclusion of a diverse population to test the proposed model again, aiming for the generalizability of the results. Additionally, researchers ought to investigate if gratitude (interventions) can improve gratitude and therefore also positive reframing, mental wellbeing, depressive symptoms, and perceived stress over a long time that has passed (several months) to investigate whether this proposed model hold true in the long-term, this way future interventions could use this theoretical support to treat patients with mental health-related issues in a sustainable way.

Furthermore, it needs to be investigated if the findings of this study can be replicated with a sample showing clinical levels of depressive symptoms. For example, if even severe depressive symptoms could be reduced via an increase in gratitude, possible future treatments could be

enabled. Thus, one could use scientific evidence as a foundation for a recommendation for health insurance companies and doctors who could use this application to treat their patients effectively.

Lastly, future research could focus on the comparison of positive reframing as a mediator in comparison to other potential mediators, such as the ability to adapt, social support, or resilience; thus, a clearer picture of the most important mediators would be available (Gupta & Kumar, 2015; Kong et al., 2021).

Conclusion

This study was able to collect evidence for the proposed mediation model (Figure 1), meaning that positive reframing does partially mediate the relationship between gratitude (IV) and mental wellbeing, perceived stress and depressive symptoms cross-sectionally. Also, it was found that the relationships between gratitude and mental wellbeing as well as between gratitude and depressive symptoms were partially mediated by positive reframing across time. Moreover, this study indicated that positive reframing mediates the relationship between gratitude and perceived stress completely across time. Finally, it was found that if gratitude is increased by means of a gratitude application, positive reframing, as well as depressive symptoms, perceived stress and mental wellbeing improve as well.

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