Gratitude and Negative Affects During the Covid-19 Pandemic: The Role of Comparative Thinking as Moderating Variables

Muh. Daud
Department of Psychology, Faculty of Psychology,
Universitas Negeri Makassar, Indonesia
m.daud@unm.ac.id
(Corresponding author)

Dwi Yan Nugraha
Master of Psychology, Faculty of Psychology,
Universitas Gadjah Mada, Indonesia
dwiyannugraha20@gmail.com

Dian Novita Siswanti
Department of Psychology, Faculty of Psychology,
Universitas Negeri Makassar, Indonesia
dian.novita@unm.ac.id

Muhammad Shafwan Zhalifunnas
Department of Psychology, Faculty of Psychology,
Universitas Negeri Makassar, Indonesia
shafwanmuhammadd@gmail.com

Abstract

College students have been shown to be more susceptible to mental health problems and psychological distress than the general population their age. The purpose of this study is to examine the moderating effect of comparative thinking on the relationship between gratitude and negative affect during the COVID-19 outbreak. A total of 370 students were recruited through an online questionnaire to obtain responses from a representative sample. Respondents filled out a questionnaire in the form of the gratitude questionnaire – six item form (GQ-6) and 20 items positive affect negative affect schedule (PANAS), as well as a question used to measure comparative thinking. The main result obtained in this study is that there is a significant moderating effect of comparative thinking in predicting gratitude towards negative affect. This finding, of course, can be used as a reference as the determination of training programs at the applied level and theoretical development of the gratitude model.

Keywords: comparative thinking; gratitude; negative affect.

Introduction

Society is currently facing various kinds of problems caused by the Covid-19 pandemic. These problems arose, both during the pandemic and the transition to the recovery process. The transition that occurs is felt collectively so that it changes various patterns of community life. Changes in lifestyle during the Covid-19 pandemic caused various problems such as the economy, education, employment to mental health (Fitzpatrick, 2020; Heanoy, 2021; Tennant, 2002). Problems that occur in the mental health of each individual can have a negative impact such as

increasing depression, loneliness to suicidal behavior (Anglim & Horwood, 2021; Brooks, et al., 2020). Based on a study conducted by Smith, et al. (2020) that during the Covid-19 pandemic, 36% (N=932) of individuals in the United Kingdom experienced self-isolation and experienced poor mental health. In addition, based on a study conducted by Karuniawati, et al. (2022) that 35.6% of individuals in Indonesia feel they do not have enough energy to go about their daily lives during the Covid-19 pandemic. In addition, more than 30% feel insecure, the environment is unhealthy, they are economically disadvantaged and they don't have time for recreation. This encourages individuals to have good mental health. One form of maintaining mental health when experiencing various problems is gratitude. Specifically explained in the research results of Daulay et al., (2022) that gratitude can provide mental well-being for students during the Covid-19 pandemic.

Gratitude is an individual's positive attitude towards the results of the achievement of a business that is not necessarily feasible. Gratitude can also be explained as an individual's positive acceptance of the results of the effort that is obtained and is generally difficult to accept (Geier & Morris, 2022). Interpersonally, gratitude is a form of recognition and individual response that is appreciative to other individuals who have given them alturistic assistance (Nguyen & Gordon, 2022). In addition, based on the opinion of Wood, Froh, and Geraghty (2010) argued that interpersonally, gratitude is a form of positive individual appreciation of the world in general and does not expect reciprocity from the kindness of other individuals. Gratitude during a pandemic can provide positive emotions and satisfaction in life. Collaboration between low feelings of mental illness and high psychological well-being can provide individuals with sustainable mental health. So that it can increase positive affect within and reduce negative affect (Kloos, et al., 2022). In another study, it was explained that gratitude is a complex emotion that can be explained based on a cognitive-affection context. The cognitive aspect of gratitude can be explained as a positive assessment of benefits, while the affective aspect can be explained as a feeling that leads to generosity or giving benefits (Zhang, et al., 2022). In addition, it was explained that gratitude involves several components such as cognition, emotion to behavior (Liang, et al., 2022).

Another discussion that has a close relationship with gratitude and affect, during a pandemic, is comparative thinking. The results of the study report that comparative thinking has an effect on the relationship between

gratitude and negative affect (Bernabe-Valero, 2021). Individuals who think that they are in a worse condition than before due to the pandemic situation, the protective effect of gratitude on negative affect will decrease. However, if they have better conditions or there is no change from their previous conditions due to the pandemic situation, the protective effect of gratitude on negative affect will increase. Markman and McMullen (2003) suggest that comparative thinking is a form of individual reflection and evaluation of reality and individual expectations either before it happens or after it happens. Comparative thinking has a close relationship with various other psychological variables such as social comparison, temporal comparison and counterfactual thinking. Roose (1997) explains further that counterfactual thinking is also one of the types that has the closest definition to comparative thinking and can be defined as a mental process that produces alternatives to a situation. Based on the results of Bertolotti and Catellani's research (2022) it was explained that during the Covid-19 pandemic period counterfactual thinking could reduce misinformation and fake news so as to improve individual mental health. Counterfactual thinking can actually help students specifically to hone critical thinking processes for any information received. Although gratitude, comparative thinking, and negative affect are known to be interrelated, the mechanisms underlying this relationship remain insufficiently explained. Therefore, this study aims to examine the role of comparative thinking as a moderator in the relationship between gratitude and negative affect.

Method

Participant

Three hundred and seventy (370) student respondents were involved in this study which were obtained using cluster random sampling technique. Respondents consisted of 119 (32.2%) male and 250 (67.8%) female (M_{age} = 22 years), which were divided into 20 years (10.5%), 21 years (32.2%), 22 years (38.4%), and 23 years (18.9%). This study uses a cross-sectional design, involving students from nine faculties at Makassar State University, with a majority (62.7%) consisting of students admitted in 2018.

Procedures

The researcher adapted the scales to align with Indonesian cultural context. The adaptation process adhered to the ITC Guidelines for Translating and Adapting Tests (2017) to maintain cultural and linguistic accuracy. The process began with a forward translation of the original scale into Indonesian, conducted by

bilingual professionals familiar with the construct. This was followed by a back-translation into the original language by independent translators to ensure the meaning remained consistent. The translations were then reviewed by experts to evaluate their cultural relevance and appropriateness. A pilot test was conducted to refine the items and ensure clarity before finalizing the scale for use in the study.

Participation in this study is voluntary and uses an anonymity system completely. The survey web address was sent to each student who was selected to take part in this research according to the considerations and criteria that had been determined. The number of respondents was determined with the help of the Raosoft® program (http://www.raosoft.com/samplesize.html). By referring to the active student population at Makassar State University as many as 2,542 students using a margin of error of 5%, confidence level of 95%, and response distribution of 50%, so that the number of samples used as research targets was 370 students. For this reason, a cluster random sampling technique was used to determine the respondents who would be involved in this study.

The selection of research respondents was carried out in two stages. First, the researchers selected departments for nine faculties at Makassar State University, with the help of the UNPAD SAS random generator program (https://m.unpad-sas.id/) to conduct cluster random sampling. Second, determining the minimum number of samples for each selected department by proportioning the sample. To obtain the proportion of the number of samples, the researcher uses the proportional allocation formula by Nazir (2005), which is explained as follows:

$$ni = \frac{Ni}{N} \; x \; n \qquad\qquad (1)$$

With:
ni   = Proportion of samples to be selected in each selected department;
Ni   = Number of students in each selected department;
N   = Total student population at Makassar State University;
n   = Number of predetermined sample sizes;

After the number of samples is determined and selected, the respondents are given an online survey. On the first page of the web-based survey, information related to informed consent was

provided and all respondents gave their consent to participate in this study. Questionnaires were distributed from July to September 2020. After completing the questionnaire, participants received a token of appreciation from the researcher as a gesture of gratitude for their contribution to the study.

Instruments

The researcher gave several sociodemographic questions, such as gender, age, faculty, and class before giving the research questionnaire.

Comparative thinking

Comparative thinking in the context of COVID-19 is measured using a single item from Bernabe-Valero (2021), namely: *"Currently we are in a world health crisis situation due to COVID-19. Has this situation significantly affected your mood and emotions?",* which was assessed with two answer choices (1 = I feel worse, and 2 = I feel better). This question measures the respondent's perception of their current emotions and conditions by comparing their experience (during the pandemic) and the situation before the pandemic. So from that the researcher can assess comparative thinking (CT). The researcher assumes that this choice can be the result of upward (when the respondent imagines a better situation) and downward (when the respondent imagines a worse situation) counterfactual thinking process.

Gratitude

Gratitude is measured using The Gratitude Questionnaire – Six Item Form (GQ-6; McCullough, et al., (2002), which is used to assess individual gratitude. This scale consists of 6 items (e.g., "I have so much in life to be grateful for") assessed using the 5-point Likert model (1 = strongly disagree, to 5 = strongly agree). Higher scores reflect high gratitude. This scale has good internal consistency ($\alpha = 0.82$, McCullough et al., 2002; $\alpha = 0.87$, Gouveia, et al., 2021).

Negative affect

Negative affect is measured using the Positive Affect Negative Affect Schedule (PANAS) scale, which consists of 20 items (10 items measure positive affect and 10 items measure negative affect) based on the development of Watson, et al. (1988). In this study, we only focused on using the Negative Affect subscale (Akhtar, 2019), which consists of 10 items (e.g., "I am very depressed,"), using a 5-point Likert model assessment (1 = Almost never, 2 = Rarely, 3 = Sometimes, 4 = Often, and 5 = Almost always). This scale has a good level of reliability (α = 0.853, Akhtar, 2019).

Data Analysis

The researcher conducted an analysis with a descriptive approach, then continued with the normality and homogeneity assumption test, before further analysis was carried out. In addition, comparative and correlation analyzes were evaluated. Second, hierarchical multiple linear regression was conducted to predict the dependent variable, with predictors entered in sequential steps to examine their incremental contributions. In addition, descriptive analyses, assumption checks, correlations, comparisons, and multiple hierarchical regressions were conducted using the Jamovi software, version 2.6.13. Finally, the moderation analysis was carried out using a statistical approach to the Warp-PLS method with a bootstrap procedure using 10.000 samples (Moret-Tatay et al., 2018).

Meanwhile, plotting was done using the R programming language (v4.4.0, R Core Team, 2024) combined with RStudio (v2024.04.1-748, RStudio Team, 2024). Several R packages were used in this process, such as *readxl* (Wickham et al., 2023a) to import Excel files and *tidyverse* (Wickham, 2023d) to calculate standard deviation values and mean differences. In addition, *dplyr* (Wickham et al., 2023c) and *moments* (Komsta & Novomestky, 2022) were used to prepare descriptive statistics, perform plotting, and rename columns. For plotting, *ggplot2* (Wickham et al., 2023b) and *tidyr* (Wickham et al., 2024) were used to organize the plot structure, while *ggstatsplot* (Patil & Powell, 2024) was used for plot themes and correlation plots. The *ggpmisc* (Aphalo et al., 2024) and *interactions* (Long, 2024) packages were used to organize the interaction plots, while *ggforce* (Pedersen, 2024a) was used to create plots with transparency, and *patchwork* (Pedersen, 2024b) was used to display the graphs in a single

layout. Furthermore, hierarchical regression analysis was performed using the *lmtest* package (Hothorn et al., 2022). Prior to running the analysis, the *rstatix* (Kassambara, 2023a) and *ggpubr* (Kassambara, 2023b) packages were used to prepare the statistical analysis. In addition, researchers also conducted power analysis to test the interaction effect using the main package *InteractionPoweR* (Baranger dkk., 2024). This analysis is supported by several other complementary packages, such as *reprex* (Bryan dkk., 2024) to generate accountable code, *webshot* (Chang dkk., 2023) to capture screenshots, *magick* (Ooms, 2024) for image manipulation, and *gridExtra* (Auguie & Antonov, 2017) for data visualization. In addition, the *cowplot* (Wilke, 2024) package is used to compose non-numeric plot titles, while *grid* (R Development Core Team, 2024) supports the arrangement of graphic elements. To provide sound notification after analysis, *beepr* (Bååth & Dobbyn, 2024) is used, and *ggrepel* (Slowikowski dkk., 2024) helps in avoiding overlapping labels on the plot.

Results

We found that in this study there were 26.8% of respondents reporting an upward process of counterfactual comparative thinking (reporting that they were worse off), while 73.2% reported a downward process of counterfactual comparative thinking (feel better). Descriptive analysis and Pearson correlation (Table 1) have passed the Kolmogorov Smirnov normality assumption test ($p > 0.05$). In addition, the results of independent sample t test analysis were carried out (upward vs. downward) after checking homogeneity with the Levene's test method ($p > 0.05$). The results obtained show that respondents in the upward group describe a lower average value ($M_{upward} = 27.0$; SD = 7.16) when compared to the downward group ($M_{downward} = 33.3$; SD = 7.13) on the negative affect score ($t = 7.54$; $p < 0.01$; $d = 0.89$). This difference is also illustrated in Figure IA.
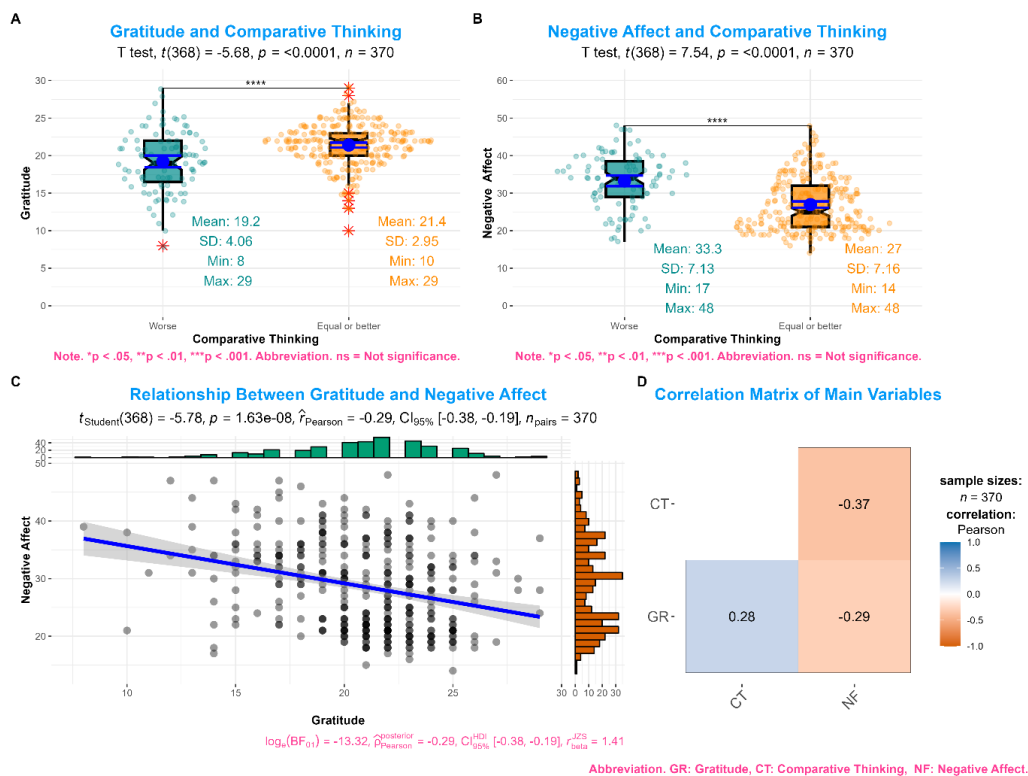
Figure 1. Comparison and correlation plots of main variables

However, respondents who were in the upward group had a higher average value (M_{upward} = 21.4; SD = 2.95), when compared to the downward respondent group ($M_{downward}$ = 19.2; SD = 4.06) in terms of gratitude (t = - 5.68; p < 0.01; d = -0.67). Meanwhile, the results have been visualized in Figure 1B. Then, the results of the correlation analysis showed that gratitude was negatively correlated with negative affect (r = -0.29; p < 0.01). The estimated correlation results have also been illustrated in Figures 1C and 1D.

Table 1

Descriptive Statistics and Correlations on The Variables Studied

Variable	Group	M	SD	t	p	1	2
1. Gratitude	Worse	19.2	4.06	-5.68	< 0.01 (d = -0.67)	-	
	Better	21.4	2.95				
2. Negative affect	Worse	33.3	7.13	7.54	< 0.01 (d = 0.89)	-0.29 (< 0.01)	-
	Better	27.0	7.16				

Note: N = 370 (99 for worse and 271 better).

Hierarchical multiple regression analysis was performed to predict the negative affect score. However, before conducting hierarchical regression analysis, the best model was selected to explain the empirical data through fitting the model to the data. Table 2 presents a comparison of various measurement models using indicators such as Adjusted R-square (Adj.R^2), Akaike Information Criterion (AIC), and overall model testing to determine the most appropriate model. In Model I, the Adj.R^2 value of 0.13 indicates that this model explains about 13% of the data variability. The AIC of 250 indicates a good fit of the model, and the model testing shows significant results ($F_{(4, 364)} = 15.2$, $p < 0.01$). However, although significant, this model has room for improvement, especially in terms of its ability to explain data variability.

Table 2
Comparison of hypothetical model fit

Model	R^2	Adj. R^2	AIC	Overall Model Test				Model Comparison				
				F	df1	df2	p	ΔR^2	ΔF	df1	df2	p
Model I	0.14	0.13	250	15.2	4	364	< 0.01	–	–	–	–	–
Model II	0.19	0.18	248	17.0	5	363	< 0.01	0.05	21.1	1	363	< 0.01
Model III	0.26	0.24	245	20.7	6	362	< 0.01	0.07	31.9	1	362	< 0.01

Note: Adj.R^2: Adjusted R^2, AIC: Akaike information criterion. ΔR^2 & ΔF: Model II (Model II – Model I), Model III (Model III – Model II).

In Model II, there is an improvement in model fit, with Adj.R^2 of 0.18, indicating a 5% increase in explaining data variability compared to Model I ($\Delta R^2 = 0.05$, $F_{(1, 363)} = 21.1$, $p < 0.01$). In addition, the AIC value decreased to 248, indicating an improvement in model fit. These results indicate that Model II is better than Model I, although the increase is still moderate. Finally, in Model III, the analysis results show a significant increase with an Adj.R^2 value of 0.24, meaning that this model is able to explain 24% of data variability. The decrease in the AIC value to 245 indicates a better model fit compared to the previous model.

Table 3

Hierarchical Multiple Regression Coefficients for Predicting Negative Affect Scores

Variable	Step I B	Step I SE	Step I β	Step II B	Step II SE	Step II β	Step III B	Step III SE	Step III β	VIF
Intercept	19.73	1.34	–	31.08	2.79	–	31.90	2.68	–	
Age										
20 – 21	5.77	1.32	0.75*	5.13	1.29	0.67*	4.84	1.24	0.63*	
20 – 22	5.49	1.30	0.71*	5.08	1.27	0.66*	4.58	1.22	0.60*	1.01
20 – 23	7.39	1.45	0.96*	6.72	1.42	0.88*	6.28	1.36	0.82*	
Gender										
[a]Male – Female	5.23	0.81	0.68*	4.53	0.80	0.59*	4.01	0.78	0.52*	1.05
Gratitude				-0.50	0.11	-0.22*	-0.39	0.11	-0.15*	1.06
Comparative Thinking										
[a]Worse –Better							-4.68	0.83	-0.61*	1.05

Note: *p <0.05, **p < 0.01. Gender and comparative thinking are considered dummy variables, while age is a categorical variable in the research model. a: Reference group. Each step represents a corresponding model (e.g., Model I corresponds to Step I, Model II corresponds to Step II, and Model III corresponds to Step III).

In addition, the increase in ΔR² by 0.07 compared to Model II ($F_{(1, 362)}$ = 31.9, p < 0.01) indicates that Model III has better predictive ability. In addition, the AIC value for Model III is the lowest among all models, which means that this model is the most appropriate to explain the relationship between variables. Meanwhile, based on the evaluation of model suitability indicators (Kline, 2023) and its predictive power (Chin, 1988), it can be concluded that Model III is the best model to use in explaining the empirical data in this study and is a reference for describing the results of the research hypothesis estimation described in step III in Table 3. In addition, the partial regression also showed significant results for each predictor variable (see Table 3 and Figure 2). The results of the analysis also show that there is no measurement bias in the research model, with a maximum VIF value obtained of 1.06 and not exceeding 3.3 which is a threshold criterion (Kock & Lynn, 2012; Kock, 2015).
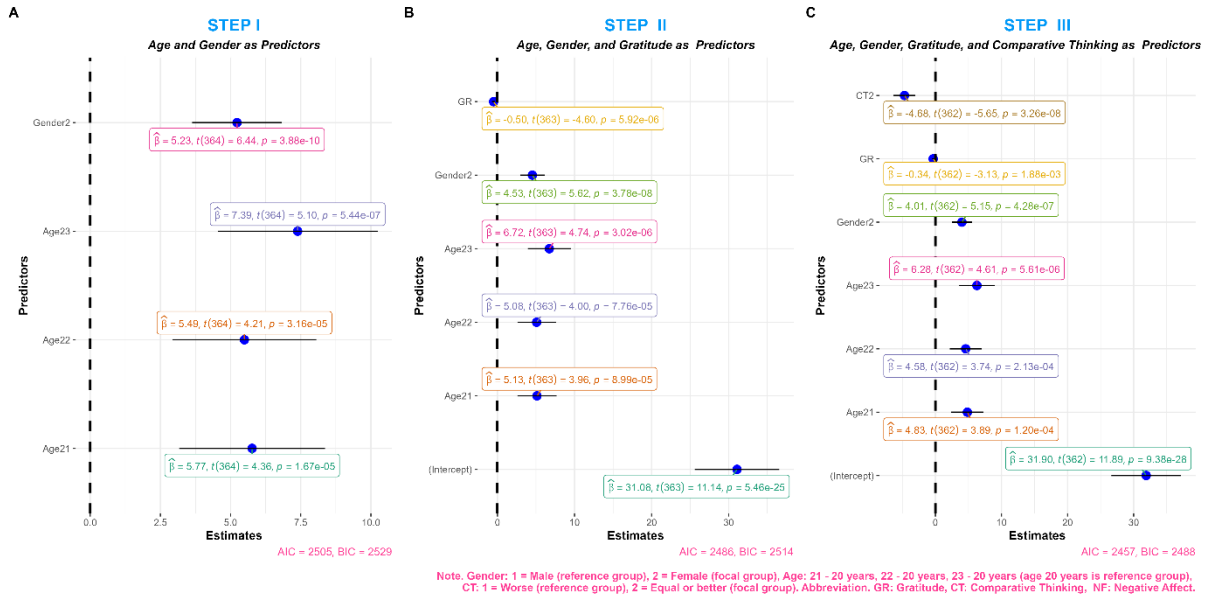
Figure 2. Plot of Stepwise Sequential Hierarchical Regression Analysis

Finally, the moderation model analysis is tested to see the role of comparative thinking (upward vs downward) as a moderator variable for the relationship between gratitude and negative affect. The moderation test uses the Warp-PLS approach which produces an evaluation of the measurement model and structural model to prove the research objectives. Based on the proposed moderation model, it was found that the model fit index parameter has produced a fit model such as (APC = 0.23, $p < 0.01$; ARS = 0.14, $p < 0.01$; AARS = 0.14, $p < 0.01$; AVIF = 1.15 < 5; AFVIF = 1.25 < 5; GoF = 0.37 > 0.36; SPR = 1.00 > 0.7; RSCR = 1.00 > 0.9; SSR = 1.00 > 0.7; and NLBCDR = 1.00 > 0.7). So that the moderation model proposed (Figure 3) as a whole is feasible or has supported the theoretical model based on empirical research data.
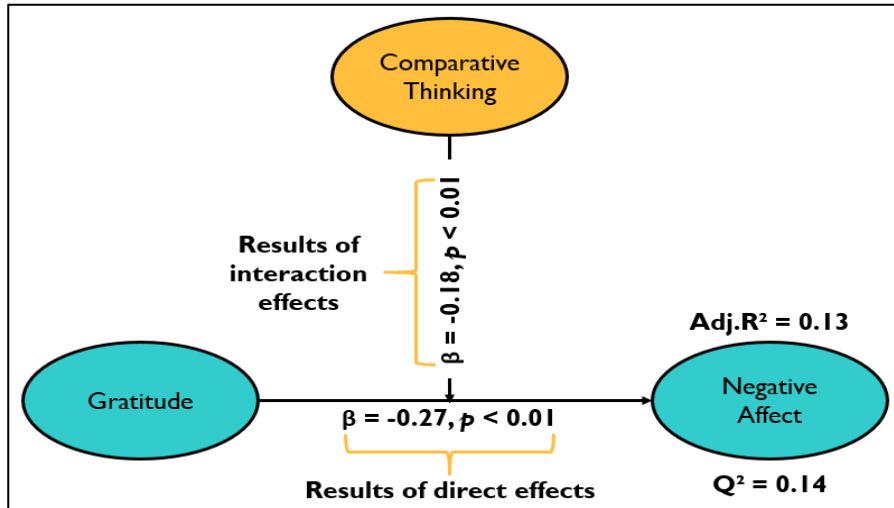
Figure 3. Moderation Model of Gratitude and Comparative Thinking on Negative Affect

In addition, the structural model analysis shows that there is a negative and significant influence between attitude and negative affect ($\beta = -0.27$, $p < 0.01$), with a given effect of 9% ($f^2 = 0.09$). Then, the results of the analysis also reported the interaction effect of gratitude and comparative thinking on negative affect of 5% ($f^2 = 0.05$) with a significant interaction ($\beta = -0.18$, $p < 0.01$). The results of the moderation model analysis indicate that the proposed research model has an Adjusted R-square value of 0.13 and a Q-square value of 0.14, both exceeding the threshold value of 0 (Hair et al., 2017). This suggests that our research model effectively predicts negative affect.

To explain the results of the interaction, the researcher refers to Dawson's theory (2014), namely by plotting a comparative thinking regression line in the worse versus the same or better groups (+1 and -1 SD from the mean). This interaction shows that when individuals imagine a better situation, the higher the gratitude score, the lower the negative affect felt (Figure 4) with a significant effect ($\beta = -0.792$, p <0.001, 95%CI: 0.05, 0.18) and a contribution to a decrease in negative affect by 11%. Conversely, when individuals imagine a worse situation, even though they are happy to be grateful, the negative affect felt relatively increases.
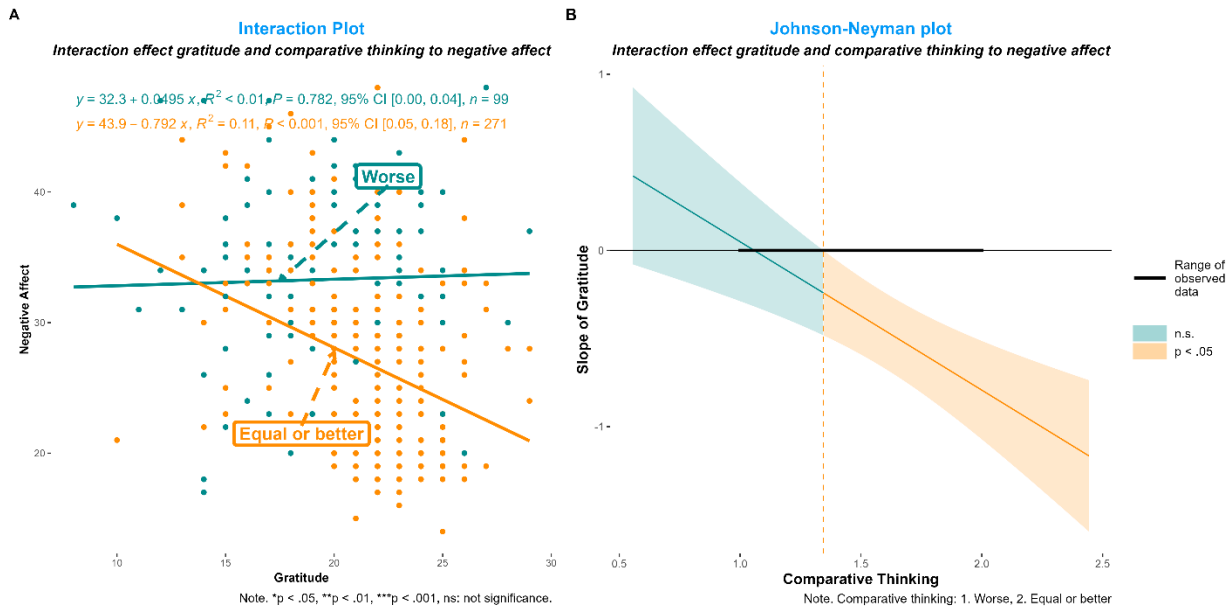
Figure 4. Plot of The Interaction of Gratitude and Comparative Thinking on Negative Affect

Power analysis checks for interaction effects aim to ensure that the study has sufficient power to detect significant interaction effects. Previous research (Bernabe-Valero, 2021) showed that the strength of the relationship between negative affect (outcome) and gratitude (main effect) varies based on comparative thinking as a moderator. This study attempts to evaluate whether the effect remains significant when applied to different samples and how strong the analysis power is. To conduct this analysis, several parameters are needed, namely the correlation between gratitude and negative affect (X1 and Y; $r = -0.29$), the correlation between comparative thinking and negative affect (X2 and Y; $r = -0.37$), the correlation between gratitude and comparative thinking (X1 and X2; $r = 0.28$), and the sample size (N = 370 for the current study). In addition, the hypothesized interaction effect (gratitude × comparative thinking; $r = -0.43$) is also needed to show how much the relationship between gratitude and negative affect changes for every 1 SD change in comparative thinking (see Figure 5). All variables are standardized (M = 0 and SD = 1) to facilitate the calculation through path analysis.
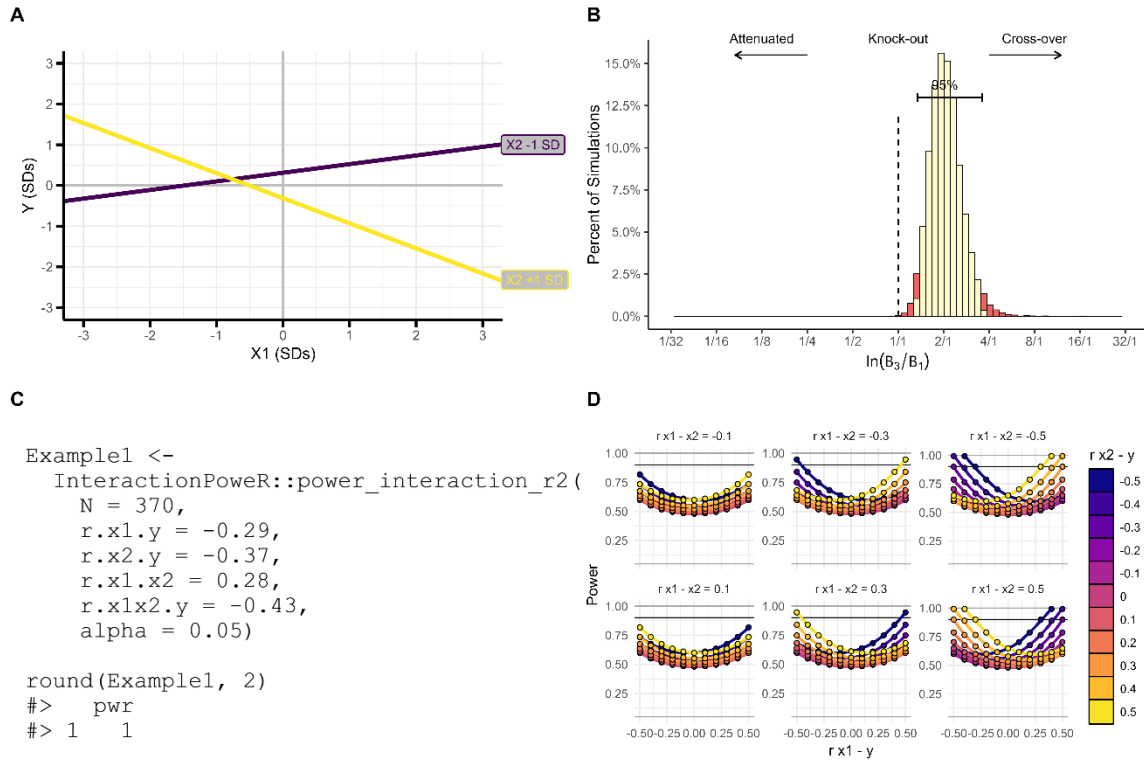
Figure 5. Plot of Power Analysis for Interaction Effect

Based on the parameters used, the analysis shows that the power to detect the interaction effect is greater than 0.90, which is 1.0 (Figure 5C). This indicates that the interaction model used in this study has 100% power to detect the interaction effect with a significance level of α = 0.05. Furthermore, Figure 5B illustrates the distribution of the interaction effect shape (B3 / B1) resulting from 10,000 simulations using the *interaction_power* function. In this study, the hypothesized interaction shape is around 1:5, which means that the interaction effect is one-fifth of the main effect. However, the simulation results show that the effect shape ranging from 1:3 to 1:14 is more likely to be observed in new samples. As many as 95% of the simulation distributions are within this range, indicating the consistency of the results despite variations in the form of the interaction effect. In addition, the correlation between gratitude (X1) and comparative thinking (X2) also varies (Figure 5D), producing either a suppression effect or an enhancement effect, depending on the direction and magnitude of the correlation. This variation provides important insights into the dynamics of the interaction involving the two predictor variables.

Discussion

The purpose of this study is to investigate the moderating role of comparative thinking in influencing the strength of the relationship between gratitude and negative affect. In addition, the literature shows that there are differences in psychopathological conditions based on gender and age during the pandemic (Pérez et al., 2020; Terry et al., 2020), so this demographic variable is also included in the analysis. The main results obtained in this study are: (i) there is a difference between the comparative thinking groups on gratitude and negative affect scores; (ii) the regression model that includes the variables gender, age, gratitude, and comparative thinking is able to predict negative affect significantly; (iii) the moderation model of comparative thinking significantly interacts with gratitude predicting negative affect. The comparative thinking variable has divided the sample into two different groups to overcome differences in terms of negative affect. In addition, this measure allows us to differentiate upward and downward counterfactual processes. This has been found in previous literature, namely the upward counterfactual process seems to lead to greater negative symptomatology (Broomhall et al., 2017) and the downward counterfactual process is useful for increasing greater well-being (Nicuta & Constantine, 2021).

In addition, we also found that there are differences in negative affect and gratitude based on the comparative thinking group. In other words, high or low levels of gratitude are strongly related to comparative thinking (where participants show that they are worse off or vice versa). Previous research reported that comparative thinking has implications for individual gratitude categorization (Bernabe-Valero et al., 2021). On the other hand, gratitude was found to be negatively correlated with negative affect, and is in line with previous literature, especially during a pandemic (Jiang, 2020) and other historical moments, such as death events (Frias et al., 2011). This indicates that grateful individuals may experience better emotional well-being through lower levels of negative affect. Furthermore, gender, age, gratitude, and comparative thinking were found to be able to predict negative affect through the regression model. With respect to age, older individuals show lower negative affect and greater feelings of well-being (Ebert et al., 2020). In contrast to our findings that the older the individual is, the greater the negative affect they experience, especially during the COVID-19 pandemic. The inconsistency of our results reminds

us of the need to dig deeper into the processes underlying differences in individual affective regulation for each age level in order to infer their influence in the current crisis.

On the other hand, gender was also found to be able to predict negative affect. In the previous literature it was found that gender had an effect on feelings of negative affect (Rogowska et al., 2020), and it was also reinforced that there were differences between men and women in the COVID-19 pandemic situation (Zhang & Ma, 2020). In addition, the expected results such as the predictive relationship of gratitude and negative affect have been confirmed. Interestingly, the moderating effect occurred for negative effects exclusively. That is, gratitude is inversely related to the negative affect experienced during the pandemic, and furthermore this association is moderated by comparative thinking, which also shows that this effect is different for individuals who use the downward counterfactual process compared to those who use the upward counterfactual process. Therefore, for individuals who show that they are worse off, the protective effect of gratitude on reducing negative affect decreases due to a moderating effect. One mechanism that can explain the predictive relationship of gratitude in reducing negative affect is by referring to broaden-and-build theory (Fredrickson, 2001), which argues that positive emotional experiences expand the repertoire of thoughts and momentary actions for individuals. In this way, individuals can make different choices of thought and action in threatening situations. Therefore, emotional management can be improved and negative emotions can be reduced (e.g., emotions of fear and nervousness). This mechanism can act in a variety of situations and daily routines, leading to a reduction in negative affect.

In addition, comparative thinking is the result of objective conditions stemming from a pandemic situation (for example, people may suffer losses in the frequency and quality of social relations, economic losses, deaths from COVID-19), which in turn give rise to subjective judgments. Then, individuals who are involved in comparative thinking also play the counterfactual thinking process that has been discussed previously. We assume that individuals in the comparative thinking group who show that they are "worse" reflect an unpleasant feeling about the events that occurred during the pandemic. This discomfort will moderate the beneficial effects of gratitude on negative affect. Thus, the emotion of gratitude will compete with other negative emotions that are included

in their feelings of discomfort (for example, losses during a pandemic). Therefore, the mechanism for strengthening positive emotions resulting from gratitude can reduce negative affect (Portocarrero et al., 2020). Then, we consider that comparative thinking can act as an affective scheme by integrating experiences and influencing affect. In addition, it has been suggested that the psychological dynamics of gratitude involve a flexible and integrated view of the negative affect of an experience (Moyano, 2011). In this way, individuals who believe that their conditions can improve may experience a moderating effect that reduces negative affect. Conversely, those who perceive their conditions as worsening may experience an increase in negative affect. In line with previous findings that comparative thinking acts as a moderator in the relationship between gratitude and negative affect (Fredrickson & Joiner, 2002; Bernabe-Valero et al., 2021). Thus, it is very clear that this model not only helps clarify the relationship between dispositional traits and influence, but also provides empirical evidence based on field data (Wood et al., 2008), and reinforces that the comparative thinking variable which is a cognitive domain can modify linkages between gratitude and negative affect. Therefore, the relevance of multivariate models that include different affective, cognitive, and dispositional dimensions is emphasized.

Limitation

This research is certainly inseparable from several limitations, such as the absence of information related to data on knowledge or exposure to COVID-19. Then, research data were collected by means of self-reports by each respondent, so that the range was biased. So we tested the measurement bias of the research model.

Conclusion

Based on the results of the study, it can be concluded that there is a significant interaction effect between gratitude and comparative thinking on negative affect. Thus, comparative thinking functions as a moderator variable in explaining the relationship between gratitude and negative affect. This finding highlights the importance of considering individual cognitive tendencies, such as comparative thinking, in interventions aimed at reducing negative affect. Practically, interventions designed to enhance gratitude should also address how individuals evaluate their

circumstances, potentially helping to mitigate negative emotions more effectively. Theoretically, this research contributes to the understanding of the complex interplay between emotional and cognitive processes. Future research should explore these dynamics further, particularly in the context of crises like COVID-19, to gain deeper insights into their impact.

Conflict of Interest
There is no conflict of interest. This research project was carried out by a research team involving students in several cities in Indonesia. Students have been told that their data will be part of research published in a scientific journal. Students also realize that their data will not be used for anything that could harm them or their families.

Author Contribution Statement
Muh. Daud: Conceptualization; Project Administration; Data Curation; Methodology; Writing Original Draft. *Dwi Yan Nugraha*: Conceptualization; Formal Analysis; Writing, Review & Editing. *Dian Novita Siswanti*: Validation; Supervision. *Muhammad Shafwan Zhalifunnas*: Investigation; Writing, Review & Editing.

Data Availability
The research data and analysis code are available upon reasonable request from the authors.

Informed Consent Statement
All participants signed an informed consent form and agreed to participate in this study.

References

Akhtar, H. (2019). Evaluasi properti psikometris dan perbandingan model pengukuran konstruk subjective well-being. *Jurnal Psikologi, 18*(1), 29-40. doi: 10.14710/jp.18.1.29-40

Anglim, J., & Horwood, S. (2021). Effect of the COVID-19 pandemic and big five personality on subjective and psychological well-being. *Social Psychological and Personality Science, 12*(8), 1527–1537. doi: 10.1177/1948550620983047

Aphalo, P. J., Slowikowski, K., & Mouksassi, S. (2024). *ggpmisc: Miscellaneous extensions to 'ggplot2'*. Retrieved from https://CRAN.R-project.org/package=ggpmisc.

Auguie, B., & Antonov, A. (2017). *gridExtra: Miscellaneous functions for "grid" graphics*. Retrieved from https://CRAN.R-project.org/package=gridExtra

Bååth, R., & Dobbyn, A. (2024). *beepr: Easily play notification sounds on any platform* (Version 2.0). Retrieved from https://CRAN.R-project.org/package=beepr

Baranger, D., Goldstein, B., Finsaas, M., Olino, T., Vize, C., & Lynam, D. (2024). *InteractionPoweR: Power analyses for interaction effects in cross-sectional regressions*. Retrieved from https://CRAN.R-project.org/package=InteractionPoweR

Bernabe-Valero, G., Blasco-Magraner, J. S., Aguilar-Moya, R., & Moret-Tatay, C. (2021). The moderation effects of comparative thinking between gratitude and negative affect during the covid-19 outbreak. *Frontiers in Psychology*, *12*, 1-9. doi: 10.3389/fpsyg.2021.644323

Bertolotti, M., & Catellani, P. (2022). Counterfactual thinking as a prebunking strategy to contrast misinformation on COVID-19. *Journal of Experimental Social Psychology*, *104*, 1–10. doi: 10.1016/j.jesp.2022.104404

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The lancet*, *395*(10227), 912-920. doi: 10.1016/S0140-6736(20)30460-8

Broomhall, A. G., Phillips, W. J., Hine, D. W., & Loi, N. M. (2017). Upward counterfactual thinking and depression: a meta-analysis. *Clin. Psychol. Rev.*, *55*, 56–73. doi: 10.1016/j.cpr.2017.04.010.

Bryan, J., Hester, J., Robinson, D., Wickham, H., Dervieux, C., & Posit Software, PBC. (2024). *reprex: Prepare reproducible example code via the clipboard*. Retrieved from https://CRAN.R-project.org/package=reprex

Chang, W., Xie, Y., Guillem, F., Schloerke, B., & Perriault, N. (2023). *webshot: Take screenshots of web pages*. Retrieved from https://CRAN.R-project.org/package=webshot

Chin, W. W. (1998). The partial least squares approach to structural equation modelling (1st Ed.), In: G. A. Marcoulides (Ed.), *Modern Metods for Business Research*. New Jersey: Lawrence Erlbaum Associates, Inc.

Daulay, N., Assingkily, M. S., & Munthe, A. K. (2022). The relationship between gratitude and well-being: The moderating effect of religiosity on university freshmen during the COVID-19 pandemic. *Psikohumaniora*, *7*(1), 51–64. doi: 10.21580/pjpp.v7i1.11055

Dawson, J. F. (2014). Moderation in management research: What, why, when, and how. *Journal of Business and Psychology, 29*(1), 1–19. doi: 10.1007/s10869-013-9308-7

Ebert, A. R., Bernstein, L. E., Carney, A. K., & Patrick, J. H. (2020). Emotional well-being during the first four months of COVID-19 in the United States. *Journal Adult Development, 27*, 241–248. doi: 10.1007/s10804-020-09365-x

Fitzpatrick, K. M., Harris, C., & Drawve, G. (2020). Fear of COVID-19 and the mental health consequences in America. *Psychological Trauma: Theory, Research, Practice, and Policy, 12*, 1–5. doi: 10.1037/tra0000924

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: the broaden-and-build theory of positive emotions. *American Psychologist., 56*(3), 218–226. doi: 10.1037/0003-066X.56.3.218

Fredrickson, B. L., & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *Psychological Sciences., 13*(2), 172–175. doi: 10.1111/1467-9280.00431

Frias, A., Watkins, P. C., Webber, A. C., & Froh, J. J. (2011). Death and gratitude: death reflection enhances gratitude. *The Journal Positivie Psychology., 6*(2), 154–162. doi: 10.1080/17439760.2011.558848

Geier, M. T., & Morris, J. (2022). The impact of a gratitude intervention on mental well-being during covid-19: A quasi-experimental study of university students. *Applied Psychology: Health and Well-Being*, *14*(3), 937–948. doi: 10.1111/aphw.12359

Gouveia, V. V., Ribeiro, M. G. C., de Aquino, T. A. A., Loureto, G. D. L., Nascimento, B. S., & Rezende, A. T. (2021). Gratitude questionnarie (gq-6): Evidence of construct validity in Brazil. *Current Psychology*, *40*(5), 2481-2489. doi: 10.1007/s12144-019-00197-x

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd Ed.). Thousand Oaks, CA: SAGE.

Heanoy, E. Z., Shi, L., & Brown, N. R. (2021). Assessing the transitional impact and mental health consequences of the covid-19 pandemic onset. *Frontiers in Psychology*, *11*, 1–10. doi: 10.3389/fpsyg.2020.607976

Hothorn, T., Zeileis, A., Farebrother, R. W., Cummins, C., Millo, G., & Mitchell, D. (2022). *lmtest: Testing linear regression models*. Retrieved from https://CRAN.R-project.org/package=lmtest

ITC Guidelines for Translating and Adapting Tests (Second Edition). (2017). *International Journal of Testing, 18*(2), 101–134. doi: 10.1080/15305058.2017.1398166

Jiang, D. (2022). Feeling gratitude is associated with better well-being across the life span: A daily diary study during the COVID-19 outbreak. *The Journals of Gerontology: Series B*, 77(4), e36–e45. doi: 10.1093/geronb/gbaa220

Karuniawati, H., Sari, N., Hossain, S., Ismail, W. I., Haq, A. H. B., Yulianti, T., Taufik, T., & Sudarsono, G. R. (2022). Assessment of mental health and quality of life status of undergraduate students in indonesia during COVID-19 outbreak: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *19*(19), 1–14. doi: 10.3390/ijerph191912011

Kassambara, A. (2023a). *rstatix: Pipe-friendly framework for basic statistical tests*. Retrieved from https://CRAN.R-project.org/package=rstatix

Kassambara, A. (2023b). *ggpubr: 'ggplot2' based publication ready plots*. Retrieved from https://CRAN.R-project.org/package=ggpubr

Kline, R. B. (2023). *Principles and practice of structural equation modeling* (5th Ed). The Guilford Press.

Kloos, N., Austin, J., van't Klooster, J. W., Drossaert, C., & Bohlmeijer, E. (2022). Appreciating the good things in life during the covid-19 pandemic: A randomized controlled trial and evaluation of a gratitude app. *Journal of Happiness Studies*, 23(8), 1-25. doi: 10.1007/s10902-022-00586-3

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (IJeC)*, *11*(4), 1–10. doi: 10.4018/ijec.2015100101

Kock, N., & Lynn, G. S. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for Information Systems*, *13*(7), 1-40. doi: 10.17705/1jais.00302

Komsta, L., & Novomestky, F. (2022). *moments: Moments, cumulants, skewness, kurtosis and related tests. Functions to calculate moments, pearson's kurtosis, geary's kurtosis, and skewness; tests related to these statistics*. Retrieved from https://CRAN.R-project.org/package=moments

Liang, Y., Tudge, J. R. H., Cao, H., Freitas, L. B. L., Chen, Y., & Zhou, N. (2022). Gratitude as a moral virtue: a psychometric evaluation of the Gratitude Assessment Questionnaire in Chinese children. *Applied Developmental Science*, *26*(3), 578–591. doi: 10.1080/10888691.2021.1941964

Long, J. A. (2024). *interactions: Comprehensive, user-friendly toolkit for probing interactions*. Retrieved from https://CRAN.R-project.org/package=interactions

Markman, K. D., & McMullen, M. N. (2003). A reflection and evaluation model of comparative thinking. *Personality and Social Psychology Review*, 7(3), 244–267. doi: 10.1207/S15327957PSPR0703_04

McCullough, M. E., Emmons, R. A., & Tsang, J. A. (2002). The grateful disposition: A conceptual and empirical topography. *Journal of Personality and Social Psychology, 82*(1), 112–127. doi: 10.1037//0022-3514.82.1.112

Moret-Tatay, C., Lami, A., Oliveira, C. R., & Beneyto-Arrojo, M. J. (2018). The mediational role of distracting stimuli in emotional word recognition. *Psicologia: Reflexão e Crítica*, *31*(1), 1-5. doi: 10.1186/s41155-017-0082-8

Moyano, N. C. (2011). Gratitud en la Psicoterapia Cognitiva: Elementos para su inclusión. *Psicodebate, 11,* 9–26. doi: 10.18682/pd.v11i0.373

Nazir, M. (2005). *Metode penelitian.* Ghalia Indonesia.

Nguyen, S. P., & Gordon, C. L. (2022). Gratitude for categories of needs before and during the covid-19 pandemic. *Journal of Happiness Studies, 23*(6), 2881–2901. doi: 10.1007/s10902-022-00531-4

Nicuță, E. G., & Constantin, T. (2021). Take nothing for granted: downward social comparison and counterfactual thinking increase adolescents' state gratitude for the little things in life. *Journal of Happiness Studies, 22*(8), 3543–3570. doi: 10.1007/s10902-021-00382-5.

Ooms, J. (2024). *magick: Advanced graphics and image-processing in R.* Retrieved from https://CRAN.R-project.org/package=magick

Patil, I., & Powell, C. (2024). *ggstatsplot: 'ggplot2' based plots with statistical details.* Retrieved from https://cran.r-project.org/web/packages/ggstatsplot/index.html

Pedersen, T. L. (2024a). *ggforce: Accelerating 'ggplot2'.* Retrieved from https://CRAN.R-project.org/package=ggforce

Pedersen, T. L. (2024b). *patchwork: The composer of plots.* Retrieved from https://CRAN.R-project.org/package=patchwork

Pérez, S., Masegoso, A., & Hernández-Espeso, N. (2020). Levels and variables associated with psychological distress during confinement due to the coronavirus pandemic in a community sample of Spanish adults. *Clinical. Psychology & Psychotherapy., 28*(3), 606–614. doi: 10.1002/cpp.2523

Portocarrero, F. F., Gonzalez, K., & Ekema-Agbaw, M. (2020). A meta-analytic review of the relationship between dispositional gratitude and well-being. *Personality Individual Differences., 164,* 1-14. doi: 10.1016/j.paid.2020.110101

R Core Team. (2024). *R: A programming environment for data analysis and graphics.* Retrieved from https://cran.r-project.org/manuals.html.

R Development Core Team. (2024). *grid: A graphical framework for R.* Retrieved from https://CRAN.R-project.org/package=grid

Rogowska, A. M., Kuśnierz, C., & Bokszczanin, A. (2020). Examining anxiety, life satisfaction, general health, stress and coping styles during COVID-19 pandemic in Polish sample of university students. *Psychology Research Behavior Management, 13,* 797–811. doi: 10.2147/PRBM.S266511

Roose, N. J. (1997). Counterfactual thinking. *Psychological Bulletin, 121*(1), 133–148. doi: 10.21146/2074-1472-2017-23-2-98-122

RStudio Team (2024). *RStudio: Integrated development for r. Boston, MA: RStudio, Inc.* Retrieved from http://www.rstudio.com/.

Slowikowski, K., Schep, A., Hughes, S., Dang, T. K., Lukauskas, S., Irisson, J.-O., Kamvar, Z. N., Ryan, T., Dervieux, C., Yutani, H., Gramme, P., Abdol, A. M., Barrett, M., Cannoodt, R., Krassowski, M., Chirico, M., Aphalo, P., Barton, F., & others. (2024). *ggrepel: Automatically position non-overlapping text labels with 'ggplot2'.* Retrieved from https://doi.org/10.32614/CRAN.package.ggrepel

Smith, L., Jacob, L, Yakkundi, A., McDermott, D., Armstrong, N. C., Barnett, Y., López-Sánchez, G. F., Martin, S., Butler, L., & Tully, M. A. (2020). Correlates of symptoms of anxiety and depression and mental wellbeing associated with COVID-19: A cross-sectional study of UK-based respondents. *Psychiatry Research, 291,* 1–7. doi: 10.1016/j.psychres.2020.113138

Tennant, C. (2002). Life events, stress and depression: A review of recent findings. *Australian and New Zealand Journal of Psychiatry, 36*(2), 173–182. doi: 10.1046/j.1440-1614.2002.01007.x

Terry, P. C., Parsons-Smith, R. L., & Terry, V. R. (2020). Mood responses associated with COVID–19 restrictions. *Frontiers in Psychology, 11*(589598), 1–10. doi: 10.3389/fpsyg.2020.589598

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070. doi: 10.1037/0022-3514.54.6.1063

Wickham, H. (2023d). *tidyverse: Easily install and load the 'Tidyverse'*. Retrieved from https://CRAN.R-project.org/package=tidyverse

Wickham, H., Bryan, J., Kalicinski, M., Valery, K., Leitienne, C., Colbert, B., Hoerl, D., & Miller, E. (2023a). *readxl: Read excel files*. Retrieved from https://cran.r-project.org/web/packages/readxl/index.html

Wickham, H., Chang, W., Henry, L., Pedersen, T. L., Takahashi, K., Wilke, C., Woo, K., Yutani, H., & Dunnington, D. (2023b). *ggplot2: Create elegant data visualisations using the grammar of graphics*. Retrieved from https://cran.r-project.org/web/packages/ggplot2/index.html

Wickham, H., Vaughan, D., Girlich, M., & Ushey, K. (2024). *tidyr: Tidy messy data*. Retrieved from https://CRAN.R-project.org/package=tidyr

Wickham, W., François, R., Henry, L, Müller, K., & Vaughan, D. (2023c). *dplyr: A grammar of data manipulation*. Retrieved from https://cran.r-project.org/web/packages/dplyr/index.html.

Wilke, C. O. (2024). *cowplot: Streamlined plot theme and plot annotations for 'ggplot2'*. Retrieved from https://CRAN.R-project.org/package=cowplot

Wood, A. M., Froh, J. J., & Geraghty, A. W. A. (2010). Gratitude and well-being: A review and theoretical integration. *Clinical Psychology Review, 30*(7), 890–905. doi: 10.1016/j.cpr.2010.03.005

Wood, A. M., Maltby, J., Stewart, N., Linley, P. A., & Joseph, S. (2008). A social-cognitive model of trait and state levels of gratitude. *Emotion, 8*, 281–290. doi: 10.1037/1528-3542.8.2.281

Zhang, L., Zhu, N., Li, W., Li, C., & Kong, F. (2022). Cognitive-affective structure of gratitude and its relationships with subjective well-being. *Personality and Individual Differences, 196*, 1–7. doi: 10.1016/j.paid.2022.111758

Zhang, Y., & Ma, Z. F. (2020). Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: a cross-sectional study. *International Journal Environmental Research and Public Health, 17*(7), 1–12. doi: 10.3390/ijerph17072381