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Gratitude, relatedness needs satisfaction, and negative psychological outcomes during the COVID-19 pandemic: A short-term longitudinal study

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Abstract

Objectives: Although gratitude relates to coronavirus disease 2019 (COVID-19) well-being outcomes in the United States, more evidence is needed to understand how this psychological strength reciprocally relates to mental health during this pandemic. This study examines the association of gratitude with stress, anxiety, and depression among undergraduate students in the United States via a longitudinal design.

Methods: An online survey was administered to 643 undergraduate students in a public university located in the southeastern region of the United States. There was a 1-month interval between the first and second waves of data collection.

Results: Cross-lagged panel structural equation modeling showed that whereas gratitude positively predicted subsequent relatedness needs satisfaction, it negatively predicted later stress, anxiety, and depression. Relatedness needs satisfaction was reciprocally linked to subsequent gratitude.

Conclusion: Results suggest that gratitude might serve as a protective psychological resource against the detrimental mental health impacts of the COVID-19 pandemic.

KEYWORDS

COVID-19, gratitude, mental health, relatedness, undergraduate students

1 | INTRODUCTION

The mental health hazards linked to the SARS-Cov-2 or coronavirus disease 2019 (COVID-19) pandemic have become a topical issue for many psychologists and mental health practitioners (Silva et al., 2021; Wang et al., 2020). Beyond exploring the pandemic's unfavorable impacts, there has been a growing interest in pinpointing dispositional and psychological factors that can promote mental health during this unprecedented era such as character strengths (Umucu et al., 2021), emotional intelligence (Bermejo-Martins et al., 2021), mindfulness (Götmann & Bechtoldt, 2021), and grit (Datu et al., 2021; Bono et al., 2020; Totosy de Zepetnek et al., 2021). One of the key psychological factors that has been linked to a diverse range of mental health outcomes is gratitude (Algoe et al., 2020; Froh et al., 2008; Lambert et al., 2012).

However, previous studies have some key limitations. First, either gratitude (Bono et al., 2020) or relatedness needs satisfaction (Cantanero et al., 2020) have been related to pandemic-related well-being outcomes, and hence we do not know if each acts independently of the other in protecting adolescents or emerging adults against COVID-19 mental health hazards. Second, the exploration of links between these psychological resources and mental health functioning using cross-sectional data, preclude understanding of how gratitude and relatedness needs satisfaction relate to well-being over time. Consequently, research is needed to explore potential reciprocal associations among gratitude, relatedness, and mental health using longitudinal designs.

In this study, we explore the role of gratitude and relatedness needs satisfaction in the mental health functioning of selected undergraduate students in the United States.

1.1 | Gratitude and well-being outcomes

Gratitude refers to individual differences in expressing feelings of thankfulness toward people, events, or things (Emmons & McCullough, 2003). Studies have demonstrated that gratitude was associated with optimal psychological outcomes such as positive emotions (Datu & Mateo, Emmons & McCullough, 2003; Froh et al., 2011), life satisfaction (Froh et al., 2008), and healthy eating behaviors (Fritz et al., 2019). The existing literature has shown that gratitude was linked to lower levels of depression (Lambert et al., 2012). Further, research has demonstrated the importance of gratitude in catalyzing healthy interpersonal relationships (Algoe, 2012; Algoe et al., 2020; Lambert et al., 2012; Wood et al., 2008).

There is evidence demonstrating the psychological benefits of gratitude in youth before the COVID-19 pandemic outbreak. Studies have shown that gratitude relates to higher levels of life satisfaction (Bono et al., 2019; O'Connell et al., 2018), resilience (Caleon et al., 2019), prosocial actions (Yost-Dubrow & Dunham, 2018), recipients' commitment to relationships (Baker, 2021), and marital satisfaction (Leong et al., 2020). Grateful individuals are also less likely to espouse attachment anxiety (Park, Johnson, et al., 2019) and experience the hazardous impacts of attachment insecurity on relational outcomes (Park, Impett, et al., 2019).

Similarly, a number of recent investigations have generated concrete evidence on the beneficial role of gratitude during the COVID-19 pandemic outbreak. A prospective correlational study has shown that gratitude was related to lower academic-related impacts of the COVID-19 pandemic among undergraduate students in the United States (Bono et al., 2020). Research has also demonstrated how a 3-week gratitude intervention had beneficial impacts on positive emotions among Filipino undergraduate students during the pandemic outbreak (Datu et al., 2021). Another cross-sectional investigation has shown that gratitude serves as a key predictor of well-being outcomes among adults in the United Kingdom (Mead et al., 2021). Given that gratitude offers a pathway for individuals to think of alternative and adaptive ways of interpreting undesirable life events (Stone & Schmidt, 2020) and maintaining smooth interpersonal ties (Algoe et al., 2020), it is likely that students who espouse higher levels of gratitude may experience optimal mental health outcomes even in the midst of adversities such as

the pandemic situation. During the COVID-19 outbreak, research shows that people still feel grateful and anticipate that their sense of gratitude may improve over time (Watkins et al., 2021).

Further, past studies have shown that gratitude can serve as a predictor of relatedness needs satisfaction. Before the pandemic, there is evidence supporting how gratitude relates to sense of relatedness among a sample in an online platform in Australia (Naqshbandi et al., 2020), undergraduate students in Singapore (Lee et al., 2015), early adolescents in China (Tian et al., 2016), undergraduate students in Croatia (Brdar & Kashdan, 2010), and college students in the United States (Kashdan et al., 2009). Apart from the direct link of gratitude to relatedness, research suggests that the basic needs for relatedness can predict subsequent gratitude (Lee et al., 2015).

In addition, other research revealed that gratitude and optimal psychological outcomes are reciprocally related. For example, Lee et al. (2015) have shown that gratitude has positive and bidirectional links to relatedness needs satisfaction among Singaporean students. However, we do not know of any research that specifically explores the reciprocal links among gratitude, relatedness needs satisfaction, and mental health outcomes during the COVID-19 pandemic.

1.2 | Relatedness needs satisfaction and well-being

Relatedness needs satisfaction encompasses one's perceived sense of connectedness to others such as parents, teachers, and peers (Ryan & Deci, 2000). Self-determination theory proposes that fulfilment of basic psychological needs for relatedness, autonomy, and competence can foster achievement and well-being outcomes (Ryan & Deci, 2000, 2017). Before the pandemic outbreak, there is evidence suggesting that students with fulfilled needs for relatedness tend to achieve higher levels of well-being in China (Tian et al., 2016), Croatia (Brdar & Kashdan, 2010), and Norway (Leversen et al., 2012). Even during the COVID-19 pandemic, there is evidence highlighting the mental health benefits of fulfilling relatedness needs in various contexts (Behzadnia & FatahModares, 2020; Cantanero et al., 2020). For example, research has shown that satisfying basic needs for relatedness was linked to higher life satisfaction among adults in Serbia (Šakan et al., 2020). Engagement in activities that can fulfill relatedness needs (e.g., encouraging other people and using affirmative notes when interacting with others) has resulted in well-being during the pandemic outbreak (Behzadnia & FatahModares, 2020).

Alternatively, findings on the links of well-being to later relatedness needs satisfaction is mixed. On one hand, some research showed that well-being dimensions (e.g., life satisfaction, self-esteem, and vitality) did not predict and reciprocally link to relatedness needs satisfaction (León & Núñez, 2013). On the other hand, there is evidence showing the reciprocal associations of relatedness with students' well-being in school contexts (Su et al., 2021; Tian et al., 2014). These inconclusive findings highlight the importance of examining the bidirectional links between relatedness needs satisfaction and well-being over time.

Guided by the *engine-model-of-well-being* (Jayawickreme et al., 2012) which underscores the importance of intrinsic and extrinsic factors in catalyzing positive psychological processes and well-being outcomes, this investigation examined the links of gratitude and relatedness needs satisfaction to stress, anxiety, and depression via a two-wave cross-lagged panel design in selected undergraduate students in the United States. This framework assumes that intrinsic psychological resources (e.g., gratitude and hope) can facilitate well-being outcomes given that such psychological resources promote internal psychological states that affect decisions and behaviors, which in turn shape psychological health (Jayawickreme et al., 2012). Corroborating the *upward spiral hypothesis* of the broaden-and-build theory (Fredrickson, 1998, 2001) that emphasizes the ability of well-being to boost acquisition of social, psychological, and physical resources, which in turn fosters increased happiness over time, we argue that gratitude might serve as a psychological strength that may be linked not only to fulfilment of relatedness needs and but also well-being over time.

In this study, we tested the following hypotheses:

Hypothesis 1. *Time 1 gratitude will positively predict Time 2 relatedness needs satisfaction after controlling for auto-regressor effects, relatedness needs, and demographic covariates (i.e., age, gender, and race/ethnic background).*

Hypothesis 2. *Time 1 gratitude will negatively predict Time 2 maladaptive outcomes (i.e., Time 2 stress, anxiety, and depression) after controlling for auto-regressor effects, relatedness needs, and demographic covariates (i.e., age, gender, and race/ethnic background).*

Hypothesis 3. *Time 1 relatedness will negatively predict Time 2 maladaptive outcomes after controlling for auto-regressor effects, gratitude, and demographic covariates (i.e., age, gender, and race/ethnic background).*

Hypothesis 4. *Longitudinal reciprocal associations will be observed among gratitude, relatedness, and maladaptive outcomes.*

2 | METHODS

2.1 | Participants and procedures

Participants were 643 undergraduate students from a public university located in southeastern region of the United States. Convenience sampling was used to recruit participants. However, only 454 managed to complete the survey at both time points, yielding an attrition rate of around 29.49%. The average age of participants was 19.84 with a standard deviation of 1.36. The majority of the participants were female ($n = 576$; 89.58%). In terms of race/ethnic background, most participants reported that they were White American/European American ($n = 410$; 63.76%) and Latino ($n = 111$; 17.11%) while others were African American ($n = 61$; 9.49%) and Asian/Pacific Islander ($n = 32$; 4.98%). Other participants did not specify their race/ethnic background. This study was approved by the Institutional Review Board of the second author's university. After securing approval from the research ethics committee to implement this study, the second author sent email invitations to various classes of undergraduate students. Students who consented to participate received a link to the online survey of this investigation. These students received a small amount of extra course credit for joining this investigation. There was an approximately 1-month interval between the first and second wave of data collection, which took place in the first semester of the academic year between October and November 2020.

2.2 | Measures

2.2.1 | Gratitude

The Gratitude Questionnaire-Six Item Form (McCullough et al., 2002) was used to provide an estimate of the participants' dispositional gratitude. Items were rated on a 7-point Likert scale (1 = *Strongly disagree*; 7 = *Strongly agree*). The average score for all items was computed to create a composite gratitude score. Sample items include "I have so much in life to be thankful for." and "I am grateful to a wide variety of people." Research has shown that this scale had good psychometric properties in a diverse range of samples (Froh et al., 2011; McCullough et al., 2002). Confirmatory factor analysis (CFA) using maximum likelihood estimation with Time 1 data indicated that the unidimensional model of the latent gratitude construct had poor fit: $\chi^2 = 34.75$, $df = 9$, comparative fit index

(CFI) = 0.90, Tucker Lewis Index (TLI) = 0.83, standardized root mean square residual (SRMR) = 0.31, and root mean square error of approximation (RMSEA) = 0.21. A review of the modification indices (MI) suggested the need to correlate item number 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.") due to their high MI estimate (201.29). As these items were both negatively worded, we tested an alternative model after correlating their errors which resulted in better fit: $\chi^2 = 61.78$, $df = 8$, CFI = 0.98, TLI = 0.97, SRMR = 0.02, and RMSEA = 0.095. All items significantly loaded on the latent gratitude construct at $p < 0.001$. The modified measurement model has acceptable fit except for RMSEA with the Time 2 data: $\chi^2 = 113.84$, $df = 8$, CFI = 0.97, TLI = 0.94, SRMR = 0.03, and RMSEA = 0.13. All items significantly loaded on the latent gratitude construct at $p < 0.001$. Cronbach's coefficients for the scale were $\alpha_{Time1} = 0.80$ and $\alpha_{Time2} = 0.77$.

2.2.2 | Relatedness needs satisfaction

The eight-item relatedness subscale of the domain-general Basic Needs Satisfaction Scale (Gagné, 2003) was used to measure relatedness needs satisfaction. Items were rated on a 7-point Likert scale (1 = *Not at all true*; 7 = *Very true*). The average score for all items was computed to create a relatedness needs satisfaction composite score. Sample items in the scale include: "I really like the people I interact with." and "People in my life care about me." This scale had acceptable psychometric properties among undergraduate students in the United States (Wei et al., 2005) and Canada (Gagné, 2003). Findings of a CFA demonstrated that the single-factor model of relatedness with Time 1 data had poor fit: $\chi^2 = 437.00$, $df = 20$, CFI = 0.81, TLI = 0.73, SRMR = 0.28, and RMSEA = 0.17. A review of the MI indicates the need to correlate two items ("I pretty much keep to myself and don't have a lot social contacts" and "There are not many people that I am close to.") (MI = 250.62). The modified measurement model after correlating the error terms of such items with Time 1 data yielded a model with better fit: $\chi^2 = 141.11$, $df = 19$, *CFI* = 0.94, TLI = 0.92, SRMR = 0.085, and RMSEA = 0.09. All items significantly loaded on the relatedness latent construct at $p < 0.001$. This model had the following fit indices with the Time 2 data: $\chi^2 = 200.69$, $df = 19$, CFI = 0.95, TLI = 0.92, SRMR = 0.16, and RMSEA = 0.11. All items significantly loaded on the latent construct at $p < 0.001$. Cronbach's coefficients for this scale were $\alpha_{Time1} = 0.80$ and $\alpha_{Time2} = 0.78$.

2.2.3 | Maladaptive psychological outcomes

The 21-item Depression, Anxiety, and Stress Scale-21 (Lovibond & Lovibond, 1995) was used to assess the perceived levels of stress, depression, and anxiety. Items were rated on a 4-point Likert scale (0 = *Did not apply to me at all*; 3 = *Apply to me very much, or most of the time*). Consistent with the recommended scoring approach from prior research (Henry & Crawford, 2005; Lovibond & Lovibond, 1995), composite scores were created by adding score on each item and multiplying it by 2. These are sample items in the scale: "I tended to over-react to situations" (stress), "I was aware of dryness of my mouth" (anxiety), and "I couldn't seem to experience any positive feeling at all" (depression). Prior studies provide evidence regarding the psychometric validity of this scale in clinical (Antony et al., 1998) and nonclinical (Henry & Crawford, 2005) samples. Results of a CFA with Time 1 data showed that the three-factor model of maladaptive outcomes with depression, anxiety, and stress as latent factors yielded the following had fit indices: $\chi^2 = 785.69$, $df = 186$, CFI = 0.92, TLI = 0.91, SRMR = 0.026, and *RMSEA* = 0.066. All items significantly loaded onto their respective latent factors at $p < 0.001$. There was evidence supporting the validity of this measure at Time 2 as evidenced by the following fit indices except for RMSEA: $\chi^2 = 1216.96$, $df = 186$, CFI = 0.91, TLI = 0.90, SRMR = 0.027, and RMSEA = 0.087. All items significantly loaded on the latent depression, anxiety, and stress constructs at $p < 0.001$. Further, although depression, anxiety, and stress had positive and high interfactorial latent correlations, we treated them as separate constructs given that prior studies (Henry &

Crawford, 2005; Khan et al., 2020) have explored how individual dimensions of these maladaptive states correlate with a wide range of resilience factors. In this investigation, Cronbach's α for the subscales were $\alpha_{\text{Time 1 stress}} = 0.84$ and $\alpha_{\text{Time 2 stress}} = 0.91$; $\alpha_{\text{Time 1 anxiety}} = 0.83$ and $\alpha_{\text{Time 2 anxiety}} = 0.90$; and $\alpha_{\text{Time 1 depression}} = 0.81$ and $\alpha_{\text{Time 2 depression}} = 0.89$.

2.3 | Data analyses

Missing value analyses were conducted to analyze any pattern of missing responses in the current data set. Descriptive statistical and reliability (i.e., Cronbach's α and ω coefficients) analyses were performed. Pearson's r correlational coefficients were computed to assess the associations among the variables. Descriptive, reliability, and correlational analyses were performed using the 26th version of the SPSS. Confirmatory factor analyses were conducted to generate evidence about the validity of the gratitude, relatedness, depression, anxiety, and stress scales in this investigation. Harman's single-factor test was carried out by conducting exploratory factor analysis with all items in the gratitude, relatedness needs satisfaction, depression, anxiety, and stress via SPSS v26. If a single factor accounts for the majority of covariance in the measurement model (e.g., total variance extracted exceeds 50%), common method bias may be present (Podsakoff et al., 2003, 2012). To address the main research objectives, cross-lagged panel structural equation modeling using maximum likelihood estimation was performed using the 26th version of the AMOS. Given that constructs with too many indicators are likely to yield models with poor fit indices, a parceling approach was adopted through randomly aggregating items that characterize each construct in the study (Matsunaga, 2008). It is appropriate to use parceling in this study given that all explanatory (e.g., Time 1 gratitude and Time 1 relatedness) and outcome variables (e.g., Time 2 stress and Time 2 depression) were unidimensional in nature. In total, the final cross-lagged model had 10 latent constructs, 30 parcel indicators, 35 error terms, and 3 covariates. Consistent with the recommended strategy of Marsh and Yeung (1998) to control for halo effects, we correlated the error terms of similar indicators in each latent constructs across time. Following the recommended cut-off values of Hair et al. (2010), this investigation would conclude that the path model exhibited acceptable fit if the (a) CFI and TLI exceeded 0.90 and (b) RMSEA and SRMR were lower than 0.08.

3 | RESULTS

There is limited evidence of common method bias in the study as the results of Harman's single-factor test showed that a general factor explained 29.65% of the covariance of all items in each construct. Preliminary data analysis indicated that the percentages of missing responses ranged from 1.10% to 29% which were not missing completely at random, $\chi^2 = 214.22$, $df = 192$, $p < 0.01$. Consistent with previous methodological guidelines (Schlomer et al., 2010), the expectation-maximization imputation technique was adopted and the imputed data set was used in conducting succeeding analyses. The findings of descriptive statistical and bivariate correlational analyses of the predictor and outcome variables are shown in Table 1. Further, a review of Mahalanobis distance and absolute values of skewness values indicate that there was no evidence of severe violations of normality in this data set. All scales exhibited acceptable reliability coefficients. As expected, gratitude had positive associations with concurrent and subsequent levels of relatedness needs satisfaction. Importantly, gratitude had negative correlations with concurrent and subsequent levels of depression, anxiety, and stress.

The hypothesized cross-lagged panel structural equation model, which explored the bidirectional associations among gratitude, relatedness needs satisfaction, depression, anxiety, and stress after controlling for age, gender, and race/ethnic backgrounds at two time points had acceptable fit: $\chi^2 = 1717.27$, $df = 423$, CFI = 0.93, TLI = 0.92, SRMR = 0.056, and RMSEA = 0.064 (0.061–0.067). Time 1 gratitude correlated positively with Time 1 relatedness needs satisfaction. Further, Time 1 gratitude and relatedness needs satisfaction had negative correlations with Time

TABLE 1 Descriptive statistics, reliability, and correlational analyses among gratitude, relatedness needs satisfaction, and well-being outcomes during the COVID-19 pandemic.

					r									
	α	*ω*	*M*	SD	1	2	3	4	5	6	7	8	9	10
1. Time 1 gratitude	0.80	0.76	5.85	0.97	-									
2. Time 1 relatedness needs satisfaction	0.80	0.75	5.68	0.87	0.43***	-								
3. Time 1 stress	0.84	0.83	11.92	8.34	−0.20***	−0.25***	-							
4. Time 1 anxiety	0.83	0.81	7.61	7.84	−0.26***	−0.33***	0.82***	-						
5. Time 1 depression	0.81	0.88	8.20	8.13	−0.29***	−0.36***	0.82***	0.86***	-					
6. Time 2 gratitude	0.77	0.74	5.59	0.98	0.55***	0.37***	−0.21***	−0.24***	−0.30***	-				
7. Time 2 relatedness needs satisfaction	0.78	0.76	5.40	0.90	0.39***	0.58***	−0.23***	−0.27***	−0.28***	0.59***	-			
8. Time 2 stress	0.91	0.82	12.26	8.95	−0.31***	−0.25***	0.76***	0.68***	0.67***	−0.29***	−0.30***	-		
9. Time 2 anxiety	0.90	0.83	8.35	8.81	−0.35***	−0.31***	0.68***	0.74***	0.68***	−0.35***	−0.34***	0.89***	-	
10. Time 2 depression	0.89	0.90	9.10	9.49	−0.36***	−0.29***	0.69***	0.70***	0.72***	−0.36***	−0.33***	0.89***	0.90***	-

***$p < 0.001$.

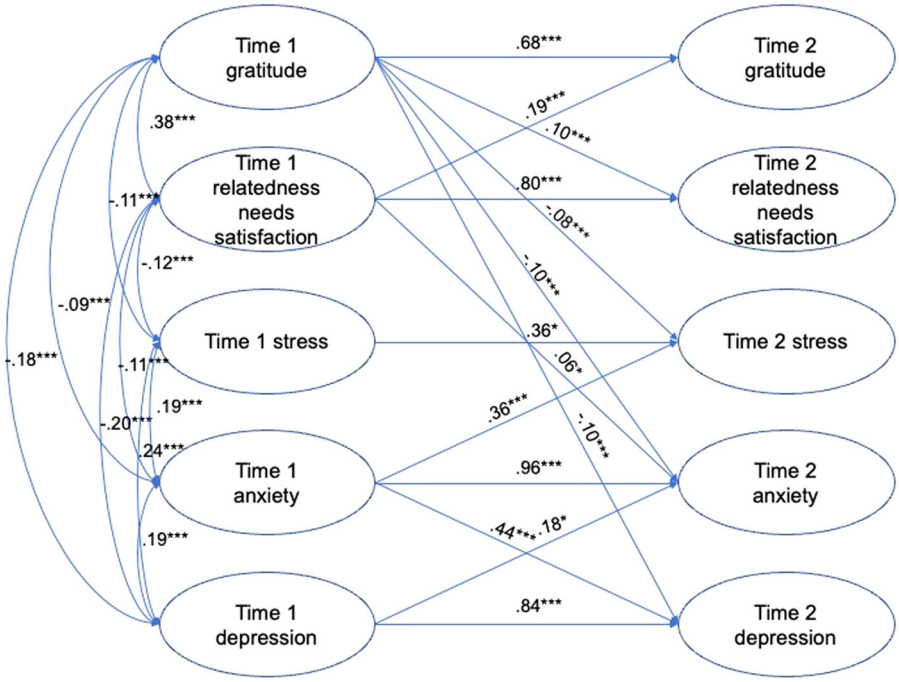

FIGURE 1 Final cross-lagged structural equation model showing the associations among gratitude, relatedness needs satisfaction, and mental health outcomes. For ease of presentation, nonsignificant paths, demographic covariates, correlations, and error estimates are omitted; only unstandardized path coefficients are shown in this diagram. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

1 stress, anxiety, and depression. As expected, Time 1 depression, Time 1 anxiety, and Time 1 stress were positively correlated with each other (Figure 1).

Consistent with Hypothesis 1, Time 1 gratitude positively predicted Time 2 relatedness needs satisfaction even after controlling for auto-regressor effects (i.e., Time 1 relatedness) and relevant demographic covariates (i.e., age, gender, and race/ethnic backgrounds). Hypothesis 2 was also supported as Time 1 gratitude negatively predicted Time 2 stress, anxiety, and depression after controlling for auto-regressor effects and demographic variables. Hypothesis 3 was not supported as Time 1 relatedness needs satisfaction positively predicted Time 2 anxiety when controlling for auto-regressor effects and demographic covariates. Hypothesis 4 was partly supported as some reciprocal associations were observed between gratitude and outcome variables across two time points. Specifically, Time 1 relatedness needs satisfaction positively predicted Time 2 gratitude. There is also evidence showing reciprocal positive associations between anxiety and depression at both time points.

4 | DISCUSSION

Increasing evidence on the mental health hazards associated with the COVID-19 pandemic highlights the importance of identifying protective dispositional and interpersonal resources especially in countries with high numbers of viral transmissions. This study contributes to existing individual differences literature through exploring the associations of gratitude and relatedness satisfaction with stress, anxiety, and depression among undergraduate students in the United States via a cross-lagged panel path analytic design.

This study demonstrated that gratitude was linked to increased relatedness needs satisfaction and reduced stress, anxiety, and depression over time even after controlling for the baseline scores on each outcome, age, gender, and race/ethnic background during the COVID-19 pandemic. Specifically, gratitude accounts for approximately around 58%–69% of the variance in succeeding relatedness needs satisfaction and maladaptive psychological outcomes. Although our findings resemble results from a recent study (Bono et al., 2020), which showcased the learning-related benefit of gratitude during this pandemic outbreak and other investigations that explored correlates of this virtue before the pandemic crisis (Datu & Mateo, 2020; Emmons & McCullough, 2003; Froh et al., 2011), this study contributes to existing literature documenting the temporal relationships among gratitude, relatedness needs satisfaction, and maladaptive psychological outcomes. Our research provides some support for the "engine model of well-being" (Jayawickreme et al., 2012) through demonstrating the role of intrinsic psychological resources (e.g., gratitude) in promoting positive psychological processes and well-being outcomes over time. Gratitude may serve as an "engine" for promoting relatedness needs satisfaction and preventing negative psychological outcomes over time.

Findings regarding the reciprocal associations of gratitude and relatedness needs satisfaction resonates with prior evidence (Algoe et al., 2013; Lambert & Fincham, 2011; Zhang et al., 2021) on how gratitude can promote better interpersonal ties. There are a number of reasons that may account for the relational benefits of gratitude in challenging times. First, research has shown that engaging in gratitude exercises can facilitate behaviors that strengthen relationship with relationship partners (Lambert & Fincham, 2011) and sense of responsibility for partner's welfare (Lambert et al., 2010). Second, research has demonstrated that gratitude has the potential to boost positive reframing (Lambert et al., 2012), which enables individuals to recognize alternative interpretations regarding beneficial aspects of an undesirable circumstance. However, this study contributes to this line of evidence regarding the social payoffs of being grateful during the COVID-19 pandemic.

Whereas relatedness needs satisfaction positively predicted subsequent anxiety, it did not predict succeeding depression and stress, which did not support our hypothesis or replicate prior findings (Behzadnia & FatahModares, 2020; Cantanero et al., 2020). It is possible that relatedness needs satisfaction may relate to anxiety, given that there are limited prospects for establishing and maintaining smooth interpersonal ties due to the social distancing measures imposed during the COVID-19 pandemic outbreak. Fulfilling relatedness needs alone might not be enough to reduce negative psychological outcomes which indirectly points to the importance of other basic needs (i.e., autonomy and competence). For example, research (Ryan & Deci, 2017) has emphasized that it is essential to design environmental conditions that promote satisfaction of basic needs for autonomy, relatedness, and competence to boost optimal psychological functioning. Given that we did not measure other dimensions of needs satisfaction, this speculation requires further testing in future research.

Further, stress was linked to higher levels of subsequent gratitude. This result suggests that individuals who experience stress are likely to show a sense of thankfulness. Although this finding appears to contradict our predictions, there is a reason to argue that stress may relate to positive traits such as gratitude given that studies have shown that positive forms of stress (also known as eustress) have the potential to activate positive psychological processes such as increased physical activity and self-efficacy, which in turn, promote well-being outcomes (Branson et al., 2019; Crum et al., 2017).

Our study findings should be interpreted in light of several limitations. As we relied on self-reported measures of gratitude and outcomes, findings might have been influenced by common method variance which can be addressed in future studies through adopting alternative approaches in assessing the constructs studied (e.g., peer-report measure of gratitude). Given the 1-month interval between first and second lags of data collection, results could provide limited insights on the longitudinal associations among these constructs so future research needs to increase the interval and waves of measurement for gratitude and psychological outcomes. As we recruited undergraduate students in the United States in this investigation, findings might not be generalizable to students in non-Western cultural contexts. Future research is needed that adopts cross-cultural designs to explore the longitudinal trajectories between gratitude and well-being outcomes in Western and non-Western societies.

Because power analysis was not conducted before implementing this study, future research may conduct a priori power analysis to identify the optimal sample size needed to detect a significant range of effect sizes.

Despite these shortcomings, this study contributes to the psychological literature by providing preliminary evidence on the longitudinal mental health payoffs associated with individual differences in gratitude during the COVID-19 pandemic. This investigation also contributes to existing evidence on the reciprocal associations of gratitude with relatedness needs satisfaction and depression amid the pandemic crisis. This study indicates that individuals' tendencies to be grateful may serve as a possible route to fulfilment of basic psychological needs for relatedness and lower levels of maladaptive outcomes during the pandemic outbreak.

Importantly, this study has implications for mental health practitioners. Given the links of gratitude to longitudinal decreases in anxiety, stress, and depression, clinical psychologists and guidance counselors are encouraged to integrate gratitude-enhancing activities when implementing prevention programs to at-risk and typically developing college students. As gratitude was associated with cross-temporal increases in relatedness needs satisfaction, mental health professionals are recommended to design online or hybrid gratitude-based interventions to adolescents who are at greater risks of loneliness during the pandemic outbreak. Indeed, there is a need to explore psychological resources that facilitate optimal psychological functioning during the COVID-19 pandemic.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data are available from the authors upon request.

ETHICS STATEMENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was also obtained from all participants.

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