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RESEARCH ARTICLE

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Beyond the blues: The protective influence of adaptability and well-being on university students' mental health

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Abstract

Introduction: Theoretical approaches suggest that adaptability and well-being could serve as protective factors in influencing mental health. However, it remains empirically unclear how students' prior adaptability and well-being predict depression (and vice versa) in the long term. Hence, using a longitudinal design, the present study explores the reciprocal relations among university students' adaptability, well-being, as well as depression before, during, and after the lockdown resulting from the COVID-19 pandemic.

Methods: In a sample of 7527 Chinese university students (51.7% female; mean age = 18.38, standard deviation [SD] = 0.77), we measured adaptability, university-related well-being, and depression. Self-report assessments were administered before (Time 1, October 2019), 1 year after (Time 2, March 2021), and 2 years after (Time 3, March 2022) the COVID-19 outbreak in a comprehensive public university in China.

Results: Cross-lagged panel analysis revealed that prior adaptability and university-related well-being negatively predicted subsequent depression, even when statistically controlling for demographic factors such as gender, family economic status, and so on. Moreover, results showed positive reciprocal relations between adaptability and university-related well-being.

Conclusions: Findings indicate that adaptability and university-related well-being have long-term protective effects on the mental health of university students, which could mitigate the negative effects of COVID-19 or other crises. The implications for practice and suggestions for future research are discussed.

KEYWORDS

adaptability, cross-lagged panel analysis, depression, university-related well-being

1 | INTRODUCTION

As a global issue of public concern, the COVID-19 pandemic has impacted nearly all aspects of our personal and work lives to a great extent. To effectively control and prevent the spread of the pandemic, many countries have implemented strict quarantine measures. However, these protective measures have also resulted in certain negative psychological outcomes (Brooks et al., 2020). For instance, according to various recent studies, university students have been found to be particularly vulnerable during the pandemic, as the abrupt shift to remote learning and social isolation has led to increased depression among them (Hawes et al., 2022; Le Vigouroux et al., 2021). Without proper intervention, depression could cause an increased risk of social exclusion (Dolphin & Hennessy, 2014), poorer educational and economic outcomes in later life (Fergusson et al., 2007), and could further escalate into irreversible extreme consequences, such as suicidal acts (Ribeiro et al., 2018). Therefore, it is crucial to identify measures that can effectively protect the mental health of university students under difficult circumstances.

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In the pre-pandemic era, university students could use multiple measures to reduce stress and protect their mental health. They enjoyed the freedom to actively engage in a multitude of outdoor and off-campus activities, ranging from shopping and socializing to exploring new travel experiences. Unfortunately, due to the unprecedented quarantine restrictions, the aforementioned known stress-reducing factors could not be fully implemented, thus limiting their beneficial roles (Gruber et al., 2021). Hence, it is paramount to identify other protective factors that were less bounded by traditional settings and measures, as a prepared response to future crises which might occur.

To find the effective protective factors, we focus on the Conservation of Resources (COR) theory (Hobfoll, 1989), which posits that people strive to retain, protect, and build resources they value and prevent the potential or actual loss of these valued resources. According to COR, resources may refer to anything that individuals value, including material possessions or personal traits. Using the lens of COR, researchers have observed that university students experienced feelings of resource loss during the pandemic (Plakhotnik et al., 2021). Depression, as suggested by Pagorek-Eshel et al. (2022), can be a natural consequence of resource loss during the crisis of the COVID-19 pandemic. In response to such losses and resulting issues like depression, individuals are theorized to proactively safeguard and bolster their resources using available means (Hobfoll et al., 2018). For university administrators, personal resources hold unique relevance: they are malleable traits that can be strengthened over time through training and intervention; potentially enhancing students' academic performance and well-being, both of which are desirable outcomes for universities and students alike (Feldman et al., 2014). Individuals with greater resources are less vulnerable to resource loss and more adept at resource accumulation (Hobfoll et al., 2018). Therefore, helping university students increase their resource gain seems to be a plausible way to strengthen their resilience and enhance their ability to successfully cope with their environment.

Previous studies have reported that several psychological resources could predict people's mental health, such as resilience (Liu et al., 2021), emotion regulation ability (Aldao & Nolen-Hoeksema, 2012), and perceived social support (Sun et al., 2020). Among them, two variables have drawn our special attention, due to their close relations with environmental change and university-specific experience; namely, adaptability (Zhang et al., 2022) and university-related well-being (Putwain et al., 2020; as defined below). Exploring these two variables holds high significance due to the imposition of rigorous quarantine measures in China and certain other nations. These measures necessitated university students to experience prolonged confinement within their campuses for the first time, which has drastically increased their on-campus time while limiting their choices of activities. The latter could be a great challenge with respect to their adaptability and damage concerning their well-being.

1.1 | The protective effects of adaptability and well-being on depression

1.1.1 | Adaptability

Adaptability refers to the appropriate cognitive, behavioral, and/or affective modification when people are confronted with significant changes, novelty as well as uncertainty in critical situations (Martin et al., 2013). According to COR theory, individuals' adaptability may also be considered a type of personal resource. Specifically, the cognitive aspect refers to the ability to engage in thoughtful and adaptable problem-solving when confronted with novel and uncertain challenges. The behavioral dimension refers to making adjustments by attempting new behaviors or modifying existing ones. The affective facet pertains to regulating the intensity and duration of emotions (Martin et al., 2012). Researchers have concluded that individuals are expected to make every effort to adapt themselves to the changes that often come with the disruption of routines and/or challenges that emerge from a new environment (Pinquart & Silbereisen, 2004).

Amidst the pandemic's pervasive uncertainty, examining individuals' adaptability was of utmost importance. This may be especially pertinent to students, whose academic experience was switched from face-to-face to remote learning which represented a substantial shift accompanied by the ramifications of social isolation. Despite navigating an array of stressors, students with greater adaptability were more likely to experience positive academic emotions and to proactively engage in learning and academic activities (Zhang et al., 2021). University students' self-perceived adaptability was associated with higher self-efficacy, which in turn alleviated the disengagement during the COVID-19 lockdown (Martin et al., 2023). Adaptability could thus act as a protective factor against depressive symptoms (Li et al., 2017; Zhang et al., 2022). Similarly, adaptable individuals may be less likely to use avoidant coping strategies, which were found to relate to higher levels of depressive symptoms (Dyson & Renk, 2006). In summary, the synthesis of these findings suggests a compelling inference—adaptability emerges as a potent protective factor against depression. Thus, in our study, we aimed to examine the long-term protective effect of prior adaptability on subsequent depression in the context of the pandemic.

1.1.2 | Well-being

In line with previous research on subjective well-being, the present study conceptualized well-being as individuals' subjective evaluation and emotional experience of their overall lives or specific domains (Diener et al., 2018). Based on the premises of

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COR theory, this characteristic may be deemed as a personal resource as well. More specifically, university-related subjective well-being is a quality of experience characterized by the dominance of positive feelings and cognitions toward university life, as opposed to negative ones (Hascher, 2010), which captures the cognitive and affective components of students' psychological well-being within university, and show that it meaningfully predicts several essential student outcomes, for example, health and academic achievement (e.g., Stockinger et al., 2024). Considering the substantial time that students spend in university on a daily basis, researchers have extensively examined university students' well-being.

Prior research has revealed a negative correlation between well-being and depression among university students in the context of COVID-19 (Gundogan, 2023) and in the general context (Lin, 2015) from a cross-sectional perspective. Moreover, from a longitudinal perspective well-being was negatively reciprocally related to the subsequent risk of developing an emotional disorder over 7 months (Putwain et al., 2021). These studies suggested that well-being may serve a protective function against depression. However, most studies have treated well-being as an outcome variable. There is limited research examining well-being as a predictor variable, particularly in exploring its protective influence on university students' mental health from a longitudinal perspective. Our study addresses this gap by investigating how university-related well-being may act as a buffer against mental health challenges over time in the university setting.

1.1.3 | Linking adaptability and well-being

Drawing from COR theory, resources are not isolated entities; instead, they exhibit interdependence and co-occurrence within both individual and organizational contexts (Hobfoll et al., 2018). This suggests a potential reciprocal relationship between adaptability and well-being. For example, individuals with higher adaptability have a stronger sense of well-being, and conversely, students who experience a stronger sense of well-being tend to be more adaptive (Putwain et al., 2020).

The adaptation theory of well-being could further help us to understand the link between adaptability to subsequent well-being. It posits that individuals with higher adaptability are likely to opt for more effective strategies when responding to adverse events, resulting in an elevated level of well-being (Diener et al., 2006). The ability to positively adjust to changes has been proven to be a favorable factor for maintaining and enhancing individuals' mental health in various situations. Previous research has found that adaptability and four well-being factors (i.e., achievement, school enjoyment, purpose and meaning, and life satisfaction; Martin et al., 2012) were positively and moderately correlated. Studies also revealed that adaptability positively predicted students' positive academic emotions during the COVID-19 pandemic (Zhang et al., 2021), which could contribute to students' well-being.

The link between well-being and subsequent adaptability could be supported by the role of positive emotions. The broaden-and-build theory (Fredrickson, 2001) posits that experiences of positive emotions may expand individuals' momentary thought-action repertoires. This expansion, in turn, contributes to the development of their enduring personal resources, encompassing physical, intellectual, social, and psychological dimensions. As a defining feature of subjective well-being, positive emotions have been proven to enhance resilience directly as well as indirectly by improving adaptive coping and reducing maladaptive coping strategies (Gloria & Steinhardt, 2016). From the cognitive aspect of subjective well-being, life satisfaction can also positively predict approach coping and negatively predict avoidance coping (Jiang et al., 2019). Individuals with greater well-being may be able to develop stronger personal resources and embrace more adaptive strategies when confronted with uncertain and novel circumstances, thereby enhancing their overall adaptability. However, a study by Putwain et al. (2020) showed that although well-being could promote subsequent adaptability, the reverse relation did not hold. Given these inconsistent findings, the present study sets out to investigate the presumably reciprocal links between adaptability and well-being.

1.2 | The present study

Studies suggest that adaptability and well-being independently exert an influence on university students' mental health, but it remains unclear about the potential reciprocal links between these two variables from a longitudinal perspective, and whether their impacts on mental health are transient or enduring. In this context, we aimed to examine the presumed enduring long-term protective effects of adaptability and university-related well-being on depression, as well as the hypothesized positive relations between adaptability and university-related well-being. We collected three waves of data on university students' adaptability, university-related well-being, and depression before and during the pandemic over a 3-year period. Drawing upon the aforementioned theoretical considerations and empirical evidence, we formulated the following hypotheses:

Hypothesis 1. Adaptability explains a decrease in depression.

Hypothesis 2. University-related well-being explains a decrease in depression.

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Hypothesis 3. There are reciprocal relations between adaptability and university-related well-being, that is, adaptability explains a subsequent increase in university-related well-being and vice versa.

2 | METHODS

2.1 | Participants and design

We collected three waves of longitudinal data from a typical comprehensive public university (including 35 schools: School of Chemistry, School of Economics, and so on) in China. We used a Chinese online research platform, Wenjuanxing (https://www.wjx.cn/), which is functionally equivalent to Amazon's Mechanical Turk. The three waves of assessments took place in October 2019 (T1), March 2021 (T2), and March 2022 (T3). All measurements focused on students' adaptability, university-related well-being, and depression. Identical instruments were used in each wave. 7527 first-year university students from 31 provinces of China, majoring in 73 different subjects (physics, education, and so on), participated in the T1 assessment, out of which 6784 took part in the T2 assessment, with 5950 students completing all three waves of assessments (20.95% attrition rate). Participants ranged in age between 15 and 25 years ($M = 18.38$; SD = 0.77). Demographic variables were collected at T1, including age, gender, residence, family economic status,[1] student loan application,[2] single child, and single-parent family status. Given that these demographic variables have been shown to relate to depression (e.g., Sun et al., 2021; Wu et al., 2021), we included them as covariates to control for potential confounding effects. Table 1 shows detailed demographic characteristics for all participants.

When analyzing sample attrition, we compared the characteristics of the participants who completed all three assessments (i.e., completers) with the dropouts (i.e., non-respondents at T2 or T3). Regarding their demographic variables, no significant differences were found between completers and drop-outs on their family economic status, student loan application, single child, or single-parent family status ($ps > .05$). Further, students who dropped out tended to be slightly older [$t(2008.089) = 10.212$, $p < .001$, $d = .316$], were more likely to be female [$\chi^2(1) = 11.483$, $p < .001$, Cramer's $V = .039$] and came from rural areas [$\chi^2(1) = 13.745$, $p < .001$, Cramer's $V = .043$]. In regard to the main study variables, students who dropped out showed lower university-related well-being [$t(7525) = -2.366$, $p = .018$, $d = -.066$] and had higher depression [$t(2301.822) = 3.161$, $p = .002$, $d = .092$] than those who completed all three waves of the study. No difference was found between the two groups in adaptability [$t(2317.685) = -0.838$, $p = .402$].

In sum, attrition analysis indicated that data in the study were missing at random (MAR). Although the completers and the dropouts differed in gender, residence, university-related well-being, and depression at T1, these effects were relatively small (Cohen, 1992; Kim, 2017). Note that the interpretation should be based on effect size measures rather than statistical significance due to the large sample size and resulting high statistical power. Furthermore, beyond the mean level differences, there is no reason to presume that the structural relations among the study variables would differ across both groups. Therefore, the full information maximum-likelihood method was used to deal with the missing data (Enders, 2022).

2.2 | Measures

2.2.1 | Adaptability

Adaptability was measured using the nine-item Adaptability Scale (Martin et al., 2012). This scale comprises six items gauging students' cognitive-behavioral adaptability (e.g., "I am able to adjust my thinking or expectations to assist me in a new situation if necessary") and three items referring to their affective adaptability (e.g., "When uncertainty arises, I am able to minimize frustration or irritability so that I can deal with it best"). The items were assessed on a 7-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The Cronbach's α values for adaptability at three time points were .91, .96, and .97, respectively.

2.2.2 | Well-being

Students' university-related well-being was measured using the six-item School-Related Well-Being Scale, which assesses their cognitive and affective evaluations of their university experiences (Stockinger et al., 2023). The scale has been used in

[1]A subjective report about students' own family economic status, good or poor.
[2]Students from low-income families can apply for student loans to cover the tuition and accommodation expenses during their school period.

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TABLE 1 Demographic characteristics for all participants.

Variable	Number	Percent (%)
Gender		
Female	3891	51.69
Male	3636	48.31
Residence		
Urban	3204	42.57
Rural	4323	57.43
Family economic status		
Good	5868	77.96
Poor	1659	22.04
Student loan application		
Yes	848	11.27
No	6679	88.73
Single child		
Yes	3129	41.57
No	4398	58.43
Single-parent family		
Yes	476	6.32
No	7051	93.68

university settings (e.g., Stockinger et al., 2024) and various socio-cultural backgrounds (e.g., Stockinger et al., 2023), demonstrating its reliability and structural validity. Participants responded to items (e.g., "I feel comfortable at school") on a 5-point Likert scale ranging from 1 (*Not at all true*) to 5 (*Completely true*), so that a higher score indicated a greater sense of well-being. The Cronbach's α values for university-related well-being at three time points were .89, .93, and .96, respectively.

2.2.3 | Depression

We used the depression subscale of the Symptom Checklist 90 (SCL-90; Derogatis et al., 1973; Wang, 1984) to assess depression. The depression subscale includes 13 items (e.g., "Feeling no interest in things"). The items were rated along a 5-point Likert scale with: "1 = *no*," "2 = *light*," "3 = *moderate*," "4 = *quite heavy*," and "5 = *severe*." The Cronbach's α values for depression at three time points were .89, .92, and .94, respectively.

2.3 | Measurement model and longitudinal measurement invariance

A series of confirmatory factor analyses was conducted in M*plus* 8.6 (Muthén & Muthén, 1998–2017) to evaluate longitudinal measurement models for adaptability, university-related well-being, and depression (see Table 2). The configural invariance model showed an acceptable model fit for all scales according to the common cutoff criteria for fit indices, that is, CFI and TLI >0.90 and RMSEA and SRMR <0.08 (Little, 2013). The metric invariance model with factor loadings constrained to be equal across time showed a decrease in model fit in terms of the change in CFI, RMSEA, and SRMR between the configural and metric invariance models. However, there was no meaningful decrease in model fit in any of the scales supporting metric invariance according to the cutoff criteria for evaluating the assumption of measurement invariance, that is, ΔCFI ≥−0.01, ΔRMSEA ≥0.015, and ΔSRMR ≥0.030 (Chen, 2007). Composite reliability based on the metric invariance model showed acceptable reliability for all scales at each time point ranging $\omega = .865$ to $\omega = .939$.

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TABLE 2 Confirmatory factor analysis results: Testing longitudinal measurement invariance and composite reliability.

Scale	χ^2	*df*	CFI	ΔCFI	TLI	RMSEA	ΔRMSEA	SRMR	ΔSRMR	Composite reliability T1	T2	T3
Adaptability										0.865	0.904	0.921
Configural invariance	4735.76	285	0.957		0.947	0.046		0.031				
Metric invariance	4936.47	301	0.955	−0.002	0.947	0.045	−0.001	0.038	0.007			
University-related well-being										0.876	0.871	0.939
Configural invariance	1573.58	111	0.977		0.968	0.042		0.015				
Metric invariance	1848.05	121	0.973	−0.004	0.966	0.044	0.002	0.034	0.019			
Depression										0.883	0.905	0.914
Configural Invariance	4597.75	648	0.951		0.944	0.028		0.030				
Metric Invariance	5311.70	672	0.943	−0.008	0.937	0.030	0.002	0.041	0.011			

Note: T1: October 2019, T2: March 2021, and T3: March 2022.

2.4 | Analytic strategy

A cross-lagged panel model (CLPM; Little, 2013) was used to investigate the relation between adaptability, university-related well-being, and depression across time. The model comprises autoregressive effects representing the rank-order stability of constructs across time and cross-lagged effects representing rank-order change in one construct predicted by the prior measurement of another construct. M*plus* 8.6 was used to estimate all models using the maximum likelihood estimation method with a robust chi-square test statistic and robust standard errors.

Four models based on different assumptions about the autoregressive and cross-lagged effects were estimated: (1) A first-order CLPM with an autoregressive effect between adjacent time points, (2) a second-order CLPM with an additional lag-2 autoregressive effect representing the effect across two units of time, (3) a second-order CLPM with stationary autoregressive effects based on cross-wave equality constraints of the first-order autoregressive effects, and (4) a second-order CLPM with stationary autoregressive and cross-lagged effects based on cross-wave equality constraints of the first-order autoregressive and cross-lagged effects. The best fitting and most parsimonious model was determined using the Bayesian information criterion (BIC), where lower BIC values indicate a better trade-off between model fit and complexity. We also followed Orth et al. (2024) review of effect sizes in providing potential benchmarks of cross-lagged coefficients as effect sizes.

All models were estimated using a single indicator (SI) model with fixed reliability (Cole & Preacher, 2014) to take into account measurement error (i.e., model-based correction for unreliability). Specifically, the analysis is based on latent variables each representing a composite variable as the sole indicator, where reliability was fixed to the composite reliability estimated in the previous step. This approach is recommended by methodologists as a parsimonious alternative to a full structural equation modeling approach (e.g., Bollen, 1989; Hayduk, 1987; Jöreskog & Sörbom, 1999).

3 | RESULTS

3.1 | Descriptive statistics and latent bivariate correlations

Descriptive statistics and latent bivariate correlation coefficients are shown in Table 3. Adaptability showed a positive correlation with university-related well-being (*r* ranging between .19 and .70) and a negative correlation with depression (*r* ranging between −.54 and −.18). Likewise, university-related well-being was negatively correlated with depression (*r* ranging between −.51 and −.19). Demographic variables showed statistically significant correlations with adaptability, university-related well-being, and depression depending on the time point except age, which showed no statistically significant correlations with any of the main study variables. Hence, age was not included in the subsequent analysis, whereas all other demographic variables were included as covariates in the CLPM.

3.2 | Model comparison

To determine the best fitting and most parsimonious model, four CLPMs were estimated: (1) A first-order CLPM, (2) a second-order CLPM with additional lag-2 autoregressive effect, (3) a second-order CLPM with stationary autoregressive effects, and (4) a second-order CLPM with stationary autoregressive and cross-lagged effects (see Table 4). All models showed

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TABLE 3 Descriptive statistics: Latent correlations, means, and standard deviations.

Variable	*M*	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Adaptability, T1	5.96	0.79															
2. Adaptability, T2	5.90	1.01	**.34**														
3. Adaptability, T3	5.99	1.04	**.29**	**.45**													
4. University-related well-being, T1	4.06	0.69	**.61**	**.26**	**.25**												
5. University-related well-being, T2	4.03	0.87	**.34**	**.70**	**.41**	**.31**											
6. University-related well-being, T3	4.27	0.87	**.19**	**.30**	**.56**	**.25**	**.37**										
7. Depression, T1	1.42	0.48	**−.42**	**−.28**	**−.23**	**−.45**	**−.28**	**−.19**									
8. Depression, T2	1.39	0.49	**−.20**	**−.50**	**−.34**	**−.22**	**−.51**	**−.28**	**.44**								
9. Depression, T3	1.34	0.51	**−.18**	**−.32**	**−.54**	**−.19**	**−.33**	**−.38**	**.32**	**.47**							
10. Age	18.38	0.77	.01	.00	.00	.00	.02	−.01	.00	.01	.01						
11. Gender	–	–	−.01	**.03**	**−.04**	−.01	.01	**−.03**	**−.05**	**−0.07**	−.01	**.06**					
12. Residence	–	–	.01	.02	.00	**.04**	−.02	**−.03**	.00	**.03**	**.04**	**−.08**	−.02				
13. Family economic status	–	–	**.05**	**.04**	**.04**	**.10**	**.05**	**.03**	**−.09**	**−.04**	**−.03**	**−.09**	.01	**.32**			
14. Student loan application	–	–	**−.04**	**−.03**	−.01	**−.06**	**−.03**	.01	**.05**	.01	.01	.02	−.01	**−.20**	**−.41**		
15. Single child	–	–	.02	.01	.00	**.03**	−.01	**.03**	.00	.00	**.04**	−.02	**.16**	**.46**	**.22**	**−.19**	
16. Single-parent family	–	–	.00	−.02	**−.03**	−.02	.00	**−.04**	**.07**	**.03**	**.04**	**.03**	**−.03**	.02	**−.15**	**.05**	**.07**

Note: Adaptability (range from 1 to 7). University-related well-being (range from 1 to 5). Depression (range from 1 to 5). Gender (0 = female, 1 = male). Residence (0 = rural, 1 = urban). Family economic status (0 = poor, 1 = good). Student loan application (0 = no, 1 = yes). Single child (0 = no, 1 = yes). Single-parent family (0 = no, 1 = yes). Statistically significant correlation coefficients at $\alpha = .05$ are shown in boldface. T1: October 2019, T2: March 2021, and T3: March 2022.

an acceptable model fit according to common cutoff criteria for fit indices. The BIC indicated that Model 4 showed the best trade-off between the model fit and model complexity in terms of the number of estimated parameters and thus it was selected for the main analysis of the current study.

3.3 | Cross-lagged relationship between adaptability, well-being, and depression

The results of the CLPM are shown in Figure 1 (standardized estimates) and Table 5 (unstandardized and standardized estimates). The effects of the covariates are provided in Supporting Information S1: Table S1. The cross-lagged paths of adaptability predicting subsequent depression (Hypothesis 1) and university-related well-being predicting subsequent depression (Hypothesis 2) were statistically significant indicating a decrease in depression with higher prior adaptability and well-being while statistically controlling for all other predictors. Moreover, the results showed a reciprocal relationship between adaptability and university-related well-being (Hypothesis 3), that is, an increase in adaptability with higher prior well-being and an increase in well-being with higher prior adaptability. We followed Orth et al. (2024) recommendations for interpreting the magnitude of standardized coefficients, such that βs > .03 are considered as small, βs > .07 as medium, and βs > .12 as large. Therefore, the cross-lagged relations observed in the present study range from small to large.

4 | DISCUSSION

Given the increasing cases of depression among university students during the COVID-19 pandemic, it is critical to identify factors that may effectively alleviate such problems and equip them to face similar future crises. Drawing upon the COR theory, we attempted to examine the predicted protective effects of adaptability and well-being on subsequent depression. Consistent with our Hypotheses 1 and 2, a higher level of adaptability and university-related well-being predicted a lower level of depression. Further, consistent with Hypothesis 3, university students' higher level of adaptability predicted a higher level of university-related well-being thereafter, and vice versa. It should be noted that we found these effects even after controlling for the autoregressive effects and relevant demographic variables. This indicates that the relationship between adaptability, university-related well-being, and depression is robust.

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TABLE 4 Cross-lagged panel model: Model comparison.

Model	χ^2	*df*	CFI	TLI	RMSEA	SRMR	BIC
1. CLPM, AR(1)	371.73	27	0.975	0.916	0.041	0.030	125,569.93
2. CLPM, AR(2)	154.78	24	0.990	0.964	0.027	0.020	125,347.35
3. CLPM, AR(2), Stationary autoregressive effects	165.24	27	0.990	0.966	0.026	0.022	125,341.31
4. CLPM, AR(2), Stationary autoregressive and cross-lagged effects	195.91	33	0.988	0.967	0.026	0.023	125,326.40

Note: AR(1) = First-order autoregressive model; AR(2) = First- and second-order autoregressive model; Stationary AR(2) = First- and second-order autoregressive model with cross-wave equality constraints for the autoregressive paths; Stationary AR(2), Stationary cross-lagged effects = First- and second-order autoregressive model with cross-wave equality constraints for the autoregressive and cross-lagged paths.

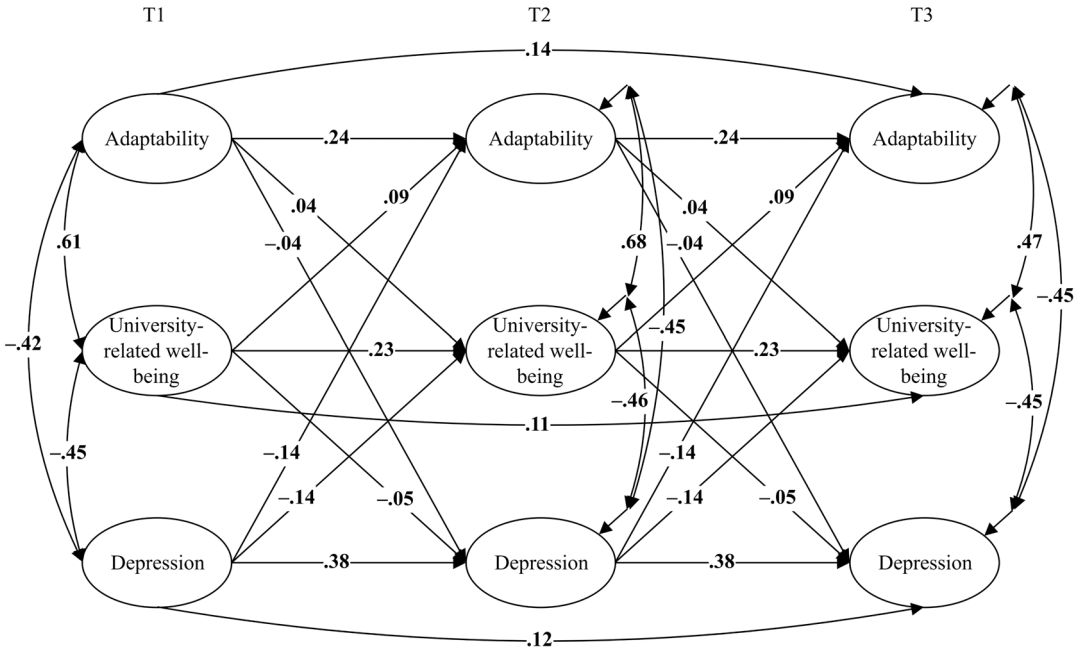

FIGURE 1 Path diagram for the cross-lagged panel model: Standardized estimates. Measurement model and covariates were omitted from the path diagram due to brevity. T1: October 2019, T2: March 2021, and T3: March 2022.

4.1 | Protective effects of adaptability and well-being

Adaptability is a crucial ability that enables an individual to cope with changing, novel, and uncertain situations. Prior research has demonstrated that adaptability protected university students from anxiety, depression, and insomnia during the COVID-19 pandemic (Zhang et al., 2022). The present study further demonstrated that adaptability could assist university students in reducing depression for over 2 years, highlighting the long-term protective effect of this characteristic. The persistence of this protective effect over an extended period, despite its small to medium effect size, underscores the subtle yet enduring influence of adaptability. This longitudinal impact suggests that adaptability functions as a continuous buffer against depressive symptoms, positioning it as a potential long-term protective factor in university students' mental health. The sustained nature of this effect, even if modest in size, highlights the importance of fostering adaptability skills in higher education contexts to promote resilience against depression.

The protective role of adaptability may be interpreted through the following three aspects. First, the cognitive component of adaptability was found to be significantly correlated with positive automatic thoughts (Besser et al., 2020). This suggests that adaptable students may actively adjust their thought patterns, viewing experiences from a more constructive perspective. For instance, during challenging times such as the recent pandemic, adaptable students might have reframed the situation as an opportunity for focused studying or personal growth. They could have motivated themselves to see the lockdown as a chance to improve their physical fitness or academic skills, anticipating positive outcomes when normal activities resumed. Second, the affective component of adaptability can play a role in enabling university students to experience positive emotions more often and longer, while concurrently minimizing the occurrence and duration of negative emotions,

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TABLE 5 Cross-lagged panel model results: Autoregressive and cross-lagged paths for main variables.

	Est.	SE	Std. Est.
Autoregressive paths			
Adaptability, first-order autoregression	**0.28**	0.02	0.24
Adaptability, second-order autoregression	**0.19**	0.02	0.14
University-related well-being, first-order autoregression	**0.26**	0.02	0.23
University-related well-being, second-order autoregression	**0.15**	0.02	0.11
Depression, first-order autoregression	**0.40**	0.02	0.38
Depression, second-order autoregression	**0.13**	0.02	0.12
Cross-lagged paths			
University-related well-being → adaptability	**0.12**	0.02	0.09
Depression → adaptability	**−0.29**	0.03	−0.14
Adaptability → university-related well-being	**0.04**	0.02	0.04
Depression → university-related well-being	**−0.25**	0.02	−0.14
Adaptability → depression	**−0.02**	0.01	−0.04
University-related well-being → depression	**−0.03**	0.01	−0.05
R^2			
T2 adaptability	0.19		
T3 adaptability	0.25		
T2 university-related well-being	0.13		
T3 university-related well-being	0.25		
T2 depression	0.10		
T3 depression	0.18		

Note: Est. = Unstandardized estimate. SE = Standard error. Std. Est. = Standardized estimate. Statistically significant results at $\alpha = .05$ are shown in boldface.

thereby fostering a more resilient and optimistic outlook in their academic journey (Zhang et al., 2021). Third, the behavioral aspect of adaptability can facilitate students' deep engagement fostering productivity through traits like persistence, planning, and task management, while concurrently reducing less constructive behaviors that hinder favorable outcomes, such as disengagement or self-handicapping (Collie et al., 2017). Therefore, students with a higher level of adaptability were better equipped to efficiently adapt to changes in their lifestyle and study routines during the pandemic, thus exhibiting a decreased susceptibility to depression.

Well-being is an important aspect of university students' life and has usually been treated as an outcome variable in previous studies. However, the present study revealed that university-related well-being can assist university students in reducing depression for over 2 years, highlighting the long-term protective effect of university-related well-being and extending existing research on well-being and depression (Gundogan, 2023). Despite the small to medium effect size, the findings suggest that well-being can act as a protective factor against depression. Individuals with a high level of well-being are likely to maintain their positive equilibrium and stable positive mood (Cummins, 2013). Thus, they may handle negative emotions more adeptly and be less prone to depression. Conversely, university students with a lower level of well-being are more likely to ruminate after a stressful event (Zanon et al., 2016). Such rumination, combined with negative affect, could trigger a vicious cycle that inhibits constructive behaviors and exacerbates depression alongside other adverse consequences (Lyubomirsky & Tkach, 2003). In alignment with these patterns, a 10-year longitudinal study found that the absence of positive well-being was a substantial risk factor for future depression (Wood & Joseph, 2010). To sum up, students with a higher level of well-being are more likely to confidently confront negative emotions and reduce the likelihood of depression.

Notably, the reverse effects of depression on adaptability and university-related well-being are more pronounced, as reflected in the effect sizes. This indicates that individuals with depression are less likely to be adaptable and have a sense of well-being. The profound and enduring impact of multifaceted stressors arising from COVID-19 (Graupensperger et al., 2021) potentially disrupts their positive equilibrium. In such circumstances, the overwhelming nature of negative

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challenges may precipitate negative affect and depression, consequently decreasing well-being (Cummins, 2013). Additionally, depressed students may exhibit vulnerable personality traits, such as dependence and self-criticism, which are associated with lower adaptability (Besser et al., 2020). These findings underscore the importance of providing targeted support for university students suffering from depression to foster their adaptability and well-being and recognize the adverse cycles that depression may engender. Providing such support can help mitigate the negative impacts and promote a more positive and resilient student population.

4.2 | Reciprocal relationship between adaptability and well-being

As for adaptability and well-being, previous studies have generally concluded that adaptability was positively correlated with students' positive emotions (Martin et al., 2012; Zhang et al., 2021). However, one study yielded a divergent result, showing that prior adaptability did not predict subsequent well-being (Putwain et al., 2020). Our study supported the former results and demonstrated that adaptability was a long-term predictor of university-related well-being in the context of COVID-19 with a small to medium effect size, thereby bolstering the established relation between adaptability and well-being. According to the adaptation theory of well-being, adaptable students are more likely to use effective coping strategies in dealing with negative events (Diener et al., 2006). Such students tend to show greater school enjoyment and a higher level of life satisfaction (Martin et al., 2013). During the pandemic, highly adaptable students may be more capable of dealing with novel and uncertain demands and have adjusted their learning strategies in a timely fashion (as mentioned above) to accommodate the challenges of online learning, resulting in a higher level of well-being. In summary, our results highlighted the important role of adaptability in influencing subsequent well-being.

Furthermore, we demonstrated that university-related well-being predicted subsequent adaptability over time with a medium to large effect size, consistent with and extending prior findings (Jiang et al., 2019; Putwain et al., 2020). According to the broaden-and-build theory, experiences of positive emotions broaden people's momentary thought-action repertoires, thus contributing to the enhancement of enduring personal resources (Fredrickson, 2001). Students with greater well-being may be more inclined to proactively engage in various measures to cope with challenges amidst the pandemic, thereby developing a high level of adaptability. This suggests a complex interplay between adaptability and well-being, characterized by sustained and long-lasting effects on each other.

However, different levels of well-being may exert an effect with varying degrees. For instance, previous studies suggested that well-being was beneficial in many life activities, but in some cases, too much of it might not be optimal (Diener et al., 2018). Excessive well-being may cause students to be content with the status quo and reluctant to consider changes (Oishi et al., 2009). Therefore, the positive relationship between well-being and adaptability found in the current study warrants a more nuanced investigation.

4.3 | Practical and theoretical implications

Recent studies have reported that there have been increasing incidents of depression and suicidal ideations among university students during the pandemic (Wang et al., 2020). Our study holds practical implications for various stakeholders. First of all, this longitudinal investigation showed that strengthening university students' adaptability and university-related well-being could help them to reduce the occurrence of depression in the face of public health emergencies. Additionally, it highlights the mutually reinforcing relationship between students' adaptability and well-being. Understanding the protective role of adaptability and well-being against the adverse outcomes of COVID-19 is especially relevant as most countries still grapple with ongoing recovery or deep-seated impacts from the pandemic, marked by profound uncertainties and unprecedented global health challenges.

Furthermore, the present study may contribute to the field by identifying levels of adaptability as a convenient and reliable indicator of students' mental health, and providing insights into developing potential intervention programs (Martin et al., 2023). On the one hand, university students should actively seek opportunities to acquire effective and varied strategies to adjust their emotions (e.g., by minimizing negative feelings and bolstering positive feelings during the pandemic), cognitive mindset (e.g., by thinking about new online learning methods when they are shifted to lockdown learning process), and behaviors (by approaching new tasks in different ways and recording their adaptive behaviors in the face of disruption) in daily activities. This proactive approach will enhance their adaptability and maintain an appropriate level of well-being. On the other hand, practitioners and researchers in education and university psychology should also recognize the important role of university-related well-being in protecting students' mental health in the face of global or local health crises. For example, establishing a supportive and nurturing campus environment that further empowers students to preserve and develop their own resources, such as high level of well-being in campus, aligning with COR theory's premise that such resources are likely to emerge from supportive social conditions (Hobfoll et al., 2018).

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5 | LIMITATIONS

The present study examined the long-term relations among adaptability, university-related well-being, and depression, providing initial interpretations of the possible mechanisms underlying these associations. However, this study is not without limitations. First, the data were collected exclusively via self-reported questionnaires. To enhance the robustness and depth of findings, future studies could incorporate methodologies such as interviews, direct observations, or interventions. These approaches may help to identify specific and effective behaviors related to adaptability and well-being. Second, we applied the school-related well-being scale (Stockinger et al., 2023) to the university context. "School" in Chinese is "学校(xué xiào)", which could be used both in school context and university context in Chinese. University students in China not only study in school, but also live on school campus, and similar to middle school students and high school students, they spend majority of their time in school. Therefore, we proposed to apply this scale to the university context. However, the generalizability of the findings from the university context requires further examination. Future research should involve different populations and stressors to determine if adaptability and well-being are also predictors of depression under stress more broadly. Third, given that the three components of adaptability may exert different protective effects on mental health, future research could analyze the three components separately and identify targeted interventions. Fourth, the binary measure of "family economic status" used in the present study may be too weak to capture the socioeconomic nuances. On the one hand, this measure was assessed by the student subjectively. On the other hand, student loan application information was also collected, which is a widely-used important objective index in indicating family economic status in China. Although there may be other more sensitive measures, we think these two subjective and objective measures are simple but sensitive combinations for the present longitudinal study, while future research might also benefit from utilizing more well-recognized measures in capturing family economic status.

6 | CONCLUSION

This research was among the first ones to concurrently examine university students' adaptability, university-related well-being, and depression from a longitudinal reciprocal modeling perspective. We found that students' adaptability and well-being have long-term protective effects on their emotional health. Furthermore, a reciprocal and mutually reinforcing dynamic emerged between adaptability and well-being. The findings of this study further underscore that adaptability and well-being constitute valuable personal resources, and the enhancement of adaptability and well-being could potentially alleviate the negative effects of unexpected challenges (e.g., COVID-19) on students' mental health.

AUTHOR CONTRIBUTIONS

Keshun Zhang: Conceptualization; investigation; methodology; formal analysis; resources; writing—original draft. **Wenshu Liu**: Formal analysis; resources; writing—original draft. **Zhuo Wang**: Writing—original draft. **Thomas Goetz**: Writing—review and editing. **Anastasiya A. Lipnevich**: Writing—review and editing. **Takuya Yanagida**: Formal analysis; resources; methodology.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OSF at https://osf.io/bgyjn/?view_only=7ec5f48aaf6e47a3be2abfdb726682d6.

ETHICS STATEMENT

This study was conducted in compliance with the ethical standards of the WMA Declaration of Helsinki and approved by the first author's university's Research Ethics Committee. All participants gave their informed consent to take part in the study after having been informed of the purpose of the study.

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