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Linking University Students' Mindfulness to Positive Adjustment Amidst COVID-19 Pandemic: a 6-month Cross-Lagged Panel Design

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Abstract

Objectives In the face of a global pandemic, research on wellness-fostering resources is urgently needed, especially with longitudinal designs and diverse samples. According to the mindfulness-to-meaning theory and broaden-and-build theory, this study examined the reciprocal associations among a group of Chinese university students' trait mindfulness, positive and negative affect, and use of positive coping strategies, including positive reappraisal, planning, and seeking of emotional support during the COVID-19 pandemic.

Methods Participants were 247 Hong Kong university students ($M_{age} = 20.96$, $SD = 2.38$; female = 86%) who completed survey measures of mindfulness, positive and negative affect, and positive coping strategies at baseline and 6-month follow-up. Data were analysed using a cross-lagged panel design, controlling for participants' age.

Results The proposed reciprocal model exhibited an excellent fit with the data. There was a reciprocal association between trait mindfulness and positive affect over time. However, no significant reciprocal effect was found among mindfulness, negative affect, and positive coping strategies.

Conclusions Theoretically, the current findings extended the two theories to a non-Western population during a critical time and suggested a long-term reciprocal association between positive affect and mindfulness. Our study provided important insight into university students' positive well-being during COVID-19 and demonstrated the wellness-fostering effect of mindfulness.

Keywords Emotional well-being · Mental health · Broaden-and-build theory · Coping strategies · Positive psychology

The COVID-19 pandemic undoubtedly challenges both physical and mental health (Pfefferbaum & North, 2020; Xiang et al., 2020). Indeed, around the globe, psychological distress across most age groups has been reported (Czeisler et al., 2020; Lansford et al., 2021). College students are among the most affected groups, given the societal and psychological impact of school closure, economic strain, and the turbulent job market (National Review, 2020). As a result, students have reported heightened depressive symptoms, anxiety, and uncertainty about the future (Hawley et al., 2021; Li et al., 2020; Sun et al., 2020). In the face of this collective hardship, mindfulness has attracted considerable attention from researchers, given its health-promoting effects (Lam et al., 2022; Sun et al., 2022; Vos et al., 2021). The bulk of this scholarship has focused on the problem-reducing aspects of mindfulness, while the wellness-fostering aspects of mindfulness have rarely been examined. According to the mindfulness-to-meaning theory (Garland et al., 2015b) and the broaden-and-build theory (Fredrickson, 2001), mindfulness promotes meaning-making, broadens individuals' thought-action repertoire, and consequently enhances positive experience and behaviours, which, in turn, reinforces individual mindful thinking (Fredrickson, 2001; Garland & Fredrickson, 2019; Garland et al., 2015a). However, the reciprocal associations between mindfulness

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and positive experience—such as positive affect, and positive behaviours—such as adaptive coping, are yet to be investigated. In addition, ironically, despite the cultural origin of mindfulness, relevant theories, including the two mentioned above, were developed mainly based on research on Western populations. In contrast, Asian populations were largely understudied (Fleming et al., 2022).

Using longitudinal data with a 6-month interval collected from 247 university students during two major waves of COVID-19 in Hong Kong, China, the present study tested the reciprocal associations among mindfulness, positive and negative affect, and positive coping strategies, including positive reappraisal, seeking emotional support, and planning. This study is timely and informative in that it focuses on the wellness-promoting aspect of mindfulness during a critical time when positive adjustment is desperately needed.

Researchers have postulated the associations among mindfulness, affect, and positive coping. The mindfulness-to-meaning theory describes how mindfulness facilitates a positive feedback loop of well-being processes from stress appraisal to meaningfulness and purpose in life (Garland et al., 2010, 2015a). The authors propose that mindfulness not only brings hedonic well-being—experiences of happiness and enjoyment—but also helps individuals obtain eudaimonic well-being—experiences of purpose and meaningful engagement with life even under adversity (Garland et al., 2015a). In other words, mindfulness-to-meaning theory suggests that mindfulness promotes well-being beyond simply pursuing happiness but instead facilitates a reappraisal of daily events, which allows individuals to derive deeper meaning and savour positive affect. According to the mindfulness-to-meaning theory, mindfulness functions through a series of regulatory processes that start with allowing individuals to detach themselves from stressful events when they encounter them. The de-centering from the stressful events consequently facilitates a metacognitive awareness and leads to re-evaluating the events in a nonreactive and metacognitive way. The reappraisal of events then promotes positive experiences.

Mindfulness, characterised by a non-judgemental attitude and a particular focus orientated towards the present moment (Bishop et al., 2004; Kabat-Zinn, 1994), is theorised to help individuals develop the ability to observe their thoughts as if they are a temporary, objective event in mind (Josefsson et al., 2014). This ability helps individuals pull themselves back from the negative context and reset the emotional context back to low arousal and neutral state, improving cognitive flexibility and facilitating more adaptive coping strategies (Shapiro et al., 2006). Empirical work has also supported this view. Mindfulness has been documented to associate with more positive coping strategies. For instance, Hanley and Garland (2014) found that mindfulness was associated with more use of positive appraisal as a way of coping and better well-being. Similarly, de Vibe et al.

(2018) reported a 6-year follow-up of university students who received mindfulness-based interventions. They found that the mindfulness level of students in the training group steadily increased over a 6-year period. Moreover, these students' use of approach coping (including positive reappraisal and planning) increased significantly over the years. Although it dropped slightly after the fourth year of training, it was still significantly higher than their initial level and control-group counterparts after 6 years. Importantly, the authors found that the growth rate of approaching coping was associated with students' overall well-being measured by life satisfaction and positive mood.

Mindfulness engenders attention to the positive aspect of events, thereby facilitating individuals' recall and savouring of positive emotions (Garland et al., 2015b). On the contrary, in the absence of mindfulness, the positive affect of events might be overlooked (Jislin-Goldberg et al., 2012). In supporting this view, Roberts-Wolfe et al. (2012) found that after receiving a series of mindfulness training, a group of US university students recalled significantly more positive words during a word recall task than before the training. Moreover, LeBlanc et al. (2021) also documented a positive link between university students' mindfulness and self-reported positive emotions. McLaughlin et al. (2019) reported that positive emotions mediated between trait mindfulness and individuals' emotion dysregulation. However, the tendency to focus on positive emotions and experiences does not mean eschewing negative emotions and experiences (Garland et al., 2015b). ter Avest et al. (2020) reported that although higher levels of mindfulness were associated with lower levels of negative affect, the levels of negative affect did not increase or decrease throughout the mindfulness-based cognitive therapy sessions. Research suggests that positive and negative affect should consider a separate construct instead of different ends of a continuum. However, it remains unclear how mindfulness may influence them (Garland et al., 2010; Russell & Carroll, 1999).

According to a broaden-and-build theory, positive emotions expand individuals' thought-action repertoire and enhance adaptive coping behaviours and well-being (Fredrickson, 2001). Adaptive coping behaviours, in turn, help individuals find benefit and meaning in events, leading to a more positive experience and affect (Folkman & Moskowitz, 2007). On the other hand, negative emotions may narrow individuals' thought-action repertoire and lead to less adaptive behaviours and experiences. Fredrickson (2001, p. 3) explained that "In a life-threatening situation, a narrowed thought-action repertoire promotes quick and decisive action that carries direct and immediate benefit. Specific action tendencies called forth by negative emotions represent the actions that likely worked best to save human ancestors' lives and limbs in similar situations". In other words, negative emotions may help individuals to make prompt decisions but also limit the available coping strategy repertoire.

Indeed, empirical evidence has supported the link between positive coping strategies and positive affect. Chen et al. (2018) found in a group of American participants with a wide age range that problem-focused coping strategies (e.g. seeking alternative solutions) and positive emotion-focused coping strategies (e.g. strengthening ties with others) were positively related to more self-reported positive affect. To our knowledge, no extant study has reported the reciprocal association between positive coping and positive affect during the COVID-19 pandemic. However, Rogaten and Moneta (2015) reported that British university students' use of creative cognition to cope with learning problems was reciprocally linked to their self-reported positive affect. This finding implies the bidirectional association between positive coping and positive affect.

To recap, the mindfulness-to-meaning theory (Garland et al., 2015b) and the broaden-and-build theory (Fredrickson, 2001) suggest a positive feedback loop of mindfulness, positive affect, and positive coping. Mindful individuals are more likely to re-evaluate stressful events through non-judgmental attention, thereby recalling more positive affect and having more adaptive coping behaviours. These behaviours, in turn, bring about a more positive experience and affect and foster more mindful thinking (Fredrickson, 2001; Garland & Fredrickson, 2019; Garland et al., 2015a). Although mindfulness has been investigated before and during the COVID-19 pandemic (Dunning et al., 2022), the long-term wellness-fostering aspects of mindfulness have been understudied (Behan, 2020; Garland et al., 2015b). In addition, studies showing the effects of mindfulness-based interventions—promoting emotional well-being, such as reducing feelings of hopelessness, and improving mental health, such as reducing depressive symptoms during COVID-19—were less commonly conducted with university students (Duarte et al., 2022). Moreover, the current study collected data from students from Hong Kong, which was among the earliest region to adopt a stringent epidemic-control policy. Public places like schools were closed for months at the beginning of the pandemic (2020–2021). The prolonged home confinement and social distancing may have put Hong Kong college students at greater risk for maladjustment (Lee et al., 2022; Sun et al., 2020).

Guided by the broaden-and-build theory (Fredrickson, 2001), mindfulness-to-meaning theory (Garland & Fredrickson, 2019; Garland et al., 2015a), and empirical studies (Garland et al., 2017; ter Avest et al., 2020), we hypothesised that positive affect, mindfulness, and positive coping strategies would have positive reciprocal associations over time (hypothesis 1). We further hypothesised that negative affect would have negative reciprocal associations with mindfulness and positive coping strategies over time (hypothesis 2).

Method

Participants

Participants were recruited from a major public university in Hong Kong, China. At time 1 (June–July 2020), project information was emailed to 627 students. Finally, 253 students provided written consent and completed the online questionnaire, resulting in a response rate of 40%. Of those students, 6 of them were excluded because they reported they were suffering from emotional distress. Finally, 247 students ($M_{age} = 20.96$, $SD = 2.38$; female = 86%) were included in the study. They were contacted again 6 months later (time 2, December 2020–February 2021) to complete the follow-up questionnaire. At time 2, 186 students ($M_{age} = 21.36$, $SD = 2.30$; female = 86%) provided complete data, resulting in a retention rate of 75%, which is consistent with typical longitudinal study retention ranges (Gustavson et al., 2012).

Procedure

All participants were invited to complete a survey package after providing their consent. The present research was a 6-month longitudinal study that included two waves of data collection that occurred at time 1 (June–July 2020) and time 2 (December 2020–February 2021). Hong Kong has adopted strict social distancing policies since the pandemic's beginning (January 2020). Universities in Hong Kong followed the government's suggestions and adopted online teaching until September 2021. Time 1 and time 2 data collection were during the third and fourth wave of the pandemic, respectively. Social distancing policies, including the closure of entertainment venues, forbidding public gatherings with more than four people, banning eating at restaurants, and wearing face masks in public places, were applied depending on the pandemic situations. Participants who provided complete data received a supermarket coupon of HK $50 (≈US $6) at each time point.

Measures

Mindfulness

Participants' mindfulness was measured using the 10-item Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman et al., 2007). Participants rated the items on a four-point Likert scale ranging from 1 (*Not at all*) to 4 (*Almost always*). Sample questions are "I am able to focus on the present moment" and "I try to notice my thoughts without judging them". The Chinese version of the scale showed good internal consistency (i.e. Cronbach's

Alpha = 0.86; Chan et al., 2018) and validity in previous studies (Chan et al., 2016). In this study, the CAMS-R displayed good reliability (i.e. at time 1 Cronbach's α = 0.84; McDonald's ω = 0.85 and at time 2 Cronbach's α = 0.84; McDonald's ω = 0.84).

Positive and Negative Affect

The 10-item International Positive and Negative Affect Schedule Short Form (I-PANAS-SF; Thompson, 2007) was adopted to measure participants' positive and negative affect. On a 5-point scale (1 = *Never*; 5 = *Always*), participants indicated the extent to which they had certain positive and negative feelings in general (e.g. "inspired" and "nervous"). The Chinese version of I-PANAS-SF showed decent internal consistency reliability (i.e. Cronbach's Alphas > 0.81) and validity (Liu et al., 2020). In the current study, the positive affect (i.e. at time 1 Cronbach's α = 0.78; McDonald's ω = 0.78 and at time 2 Cronbach's α = 0.76; McDonald's ω = 0.76) and negative affect (i.e. at time 1 Cronbach's α = 0.86; McDonald's ω = 0.87 and at time 2 Cronbach's α = 0.88; McDonald's ω = 0.89) showed acceptable reliability.

Coping Strategies

Three subscales from the Brief-COPE questionnaire (Carver, 1997) were adopted to measure participants' coping strategies of positive reappraisal (e.g. "I've been trying to see it in a different light to make it seem more positive"), seeking emotional support (e.g. "I've been getting emotional support from others") and planning (e.g. "I've been thinking hard about what steps to take"). The three coping strategies were selected because they were aligned with the broaden-and-build (Fredrickson, 2001) and mindfulness-to-meaning theory's (Garland & Fredrickson, 2019; Garland et al., 2015a) interpretation of coping. There are 2 items in each subscale. Items were rated using a 5-point Likert scale (1 = *Never*; 5 = *Always*). The Chinese version of Brief-COPE has shown adequate internal consistency reliability (i.e. Cronbach's Alpha > 0.61; Su et al., 2015). In the current study, the inter-item correlations of positive reappraisal, seeking emotional support, and planning at time 1 and time 2 ranged from 0.60 to 0.79.

Data Analyses

Reliabilities, means, standard deviations, skewness, kurtosis, and correlation of our study variables were examined. The reciprocal relations among participants' affect, mindfulness, and coping strategies controlling for participants' age and constructs' stability over time were tested using path modelling in Mplus version 8.4 (Muthén & Muthén, 2017).

The path analysis was controlled for participants' age. As suggested by studies (Chen et al., 2018; Mahlo & Windsor, 2021), age was associated with one's coping strategies, positive affect, and mindfulness. We adopted the conventional fit indices to access the model fit, including the Comparative fit index (CFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardised root mean square residual (SRMR). Models were considered acceptable goodness-of-fit with the data if CFI and TLI values approached or exceeded 0.90 and the RMSEA and SRMR values below 0.08 (Hu & Bentler, 1999). According to the results of Little's missing completely at random (MCAR) test (i.e. $\chi^2 = 57.46$, $df = 83$, $p = 0.99$), our data failed to reject the null hypothesis of MCAR (Little & Rubin, 2019). The results provided evidence that no clear pattern existed in the missing data, the 61 students who did not complete the time 2 questionnaire. Hence, the path analysis adopted the maximum likelihood (ML) estimation, which adjusts the likelihood function in that each case contributes information to the observed variables (Muthén & Muthén, 2017). Research supported the reliability of ML estimation in handling datasets with missing responses and possible response violation of multivariate normality (Shin et al., 2017).

Results

Preliminary Analysis

Descriptive statistics of the study variables, i.e. positive affect, negative affect, mindfulness, planning, positive reappraisal, and emotional support from time 1 and Time 2, are presented in Table 1. All the variables were correlated significantly ($rs = -0.48$ to 0.62, $ps = 0.00$ to 0.04), except for positive and negative affect ($rs = -0.06$ to -0.02, $ps = 0.40$ to 0.73), see Table 2.

Path Analysis

The proposed reciprocal path model of mindfulness, affect, and positive coping strategies displayed excellent fit to the data, $\chi^2(8) = 8.16$, CFI = 1.00, TLI = 0.99, RMSEA = 0.01 [90% CI = 0.00 to 0.08], SRMR = 0.02 (see Fig. 1). All autoregressive paths were positive and significant ($\beta s = 0.28$ to 0.57, $ps < 0.001$). The results indicated all variables were predictive of their corresponding variables after 6 months. Regarding the reciprocal relations, positive affect at time 1 could predict mindfulness at time 2 ($\beta = 0.17$, $p = 0.02$) and mindfulness at time 1 significantly predicted positive affect at time 2 ($\beta = 0.16$, $p = 0.02$). However, contrary to what we hypothesised, mindfulness and positive affect had no reciprocal relation with positive coping strategies. Mindfulness at

Table 1 Descriptive statistics of the study variables

Variables	Mean	SD	Cronbach's alpha[1]	McDonald's omega[1]	Skewness	Kurtosis
Time 1						
1. Positive affect	2.90	0.65	0.78	0.78	−0.07	0.33
2. Negative affect	2.54	0.85	0.86	0.87	0.20	−0.63
3. Mindfulness	2.57	0.44	0.84	0.85	0.25	0.26
4. Planning	3.52	0.69	0.62	0.62	−0.39	−0.02
5. Positive reappraisal	3.50	0.75	0.71	0.71	−0.26	−0.22
6. Emotional support	3.52	0.77	0.73	0.73	−0.09	−0.46
Time 2						
7. Positive affect	2.88	0.61	0.76	0.76	0.01	−0.16
8. Negative affect	2.43	0.87	0.88	0.89	0.17	0.89
9. Mindfulness	2.49	0.45	0.84	0.84	0.39	−0.10
10. Planning	3.47	0.7	0.60	0.60	0.14	−0.37
11. Positive reappraisal	3.34	0.81	0.79	0.79	−0.12	−0.09
12. Emotional support	3.42	0.84	0.72	0.72	−0.35	0.07

[1]Inter-item correlations were presented for the coping strategies variables (i.e. planning, positive reappraisal, and emotional support) instead of Cronbach's alphas

Table 2 Zero-order correlations of the study variables

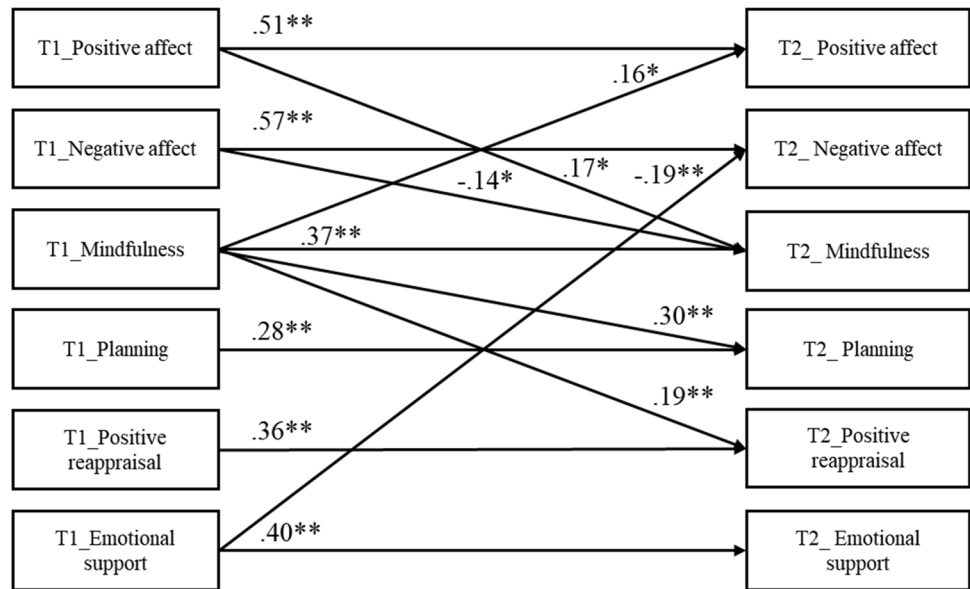| Variables	1	2	3	4	5	6	7	8	9	10	11	12
Time 1												
1. Positive affect	1											
2. Negative affect	−.02	1										
3. Mindfulness	.34**	−.33**	1									
4. Planning	.33**	−.36**	.43**	1								
5. Positive reappraisal	.41**	−.39**	.44**	.60**	1							
6. Emotional support	.33**	−.25**	.33**	.53**	.58**	1						
Time 2												
7. Positive affect	.53**	−.03	.28**	.15*	.18*	.22**	1					
8. Negative affect	−.06	.62**	−.30**	−.35**	−.30**	−.32**	−.04	1				
9. Mindfulness	.28**	−.28**	.47**	.28**	.23**	.21**	.45**	−.31**	1			
10. Planning	.27**	−.20**	.44**	.41**	.32**	.34**	.38**	−.26**	.34**	1		
11. Positive reappraisal	.32**	−.24**	.41**	.35**	.48**	.37**	.36**	−.37**	.34**	.53**	1	
12. Emotional support	.24**	−.48*	.27**	.28**	.24**	.50**	.33**	−.32**	.30**	.50**	.54**	1

$^*p < .05$; $^{**}p < .01$

time 1 could significantly predict time 2 planning ($\beta = 0.30$, $p < 0.001$) and positive reappraisal ($\beta = 0.19$, $p = 0.01$), but not emotional support ($\beta = 0.10$, $p = 0.15$). On the other hand, no positive coping strategies at time 1 were associated with future mindfulness ($\beta s = -0.10$ to 0.07, $ps = 0.27$ to 0.97). Positive affect at time 1 had no effect on all the coping strategies at time 2 ($\beta s = 0.06$ to 0.11, $ps = 0.07$ to 0.32) and the coping strategies at time 1 could not predict positive affect at time 2 ($\beta s = -0.09$ to 0.03, $ps = 0.26$ to 0.71). Inconsistent with our hypothesis 2, negative affect were not reciprocally linked mindfulness and positive coping strategies over time. Mindfulness at time 1 was not

predictive of negative affect at time 2 ($\beta = -0.06$, $p = 0.31$); however, negative affect had small effects on future mindfulness ($\beta = -0.14$, $p = 0.04$). Negative affect at time 1 was not associated with the positive coping strategies at time 2 ($\beta s = -0.06$ to 0.03, $ps = 0.40$ to 0.72). Time 1 planning ($\beta = -0.06$, $p = 0.43$) and positive reappraisal ($\beta = 0.07$, $p = 0.39$) could not predict time 2 negative affect. Emotional support at time 1 had significant negative effects on negative affect at time 2 ($\beta = -0.19$, $p = 0.01$).

Hypothesis 1 was partially supported. Positive affect and mindfulness were positively associated reciprocally over time but such associations were not found between

Fig. 1 Proposed reciprocal model of affect, mindfulness and coping strategies adjusting for participants' age. Non-significant pathways are omitted for readability. T = Time. *p < .05, **p < .01

Discussion

The mindfulness-to-meaning theory proposes that mindfulness can facilitate a positive feedback loop of well-being processes starting from stress appraisal to meaningfulness and purpose in life (Garland et al., 2010, 2015a). The study investigates the associations between university students' positive and negative affect, mindfulness, and coping strategies amidst the COVID-19 pandemic. The findings showed that positive affect and mindfulness were associated reciprocally. On the other hand, there were no reciprocal relations between mindfulness, negative affect, and positive coping strategies. Consistent with the mindfulness-to-meaning theory (Garland & Fredrickson, 2019; Garland et al., 2015a), our findings revealed a reciprocal relation between positive affect and mindfulness in Chinese university students. Based on our results, this section describes the connections proposed by the mindfulness-to-meaning theory: mindfulness and affect, mindfulness and coping strategies, and affect and coping strategies. Theoretical and practical impacts, limitations, and future direction of this investigation were also discussed.

mindfulness with positive coping strategies, and positive affect with positive coping strategies. Hypothesis 2 was not supported. Negative affect did not have negative reciprocal associations with mindfulness and positive coping strategies over time.

Mindfulness and Affect

The study's findings supported the positive feedback loop of positive affect speculations from the mindfulness-to-meaning theory (Garland & Fredrickson, 2019; Garland et al., 2015a). In particular, positive affect and mindfulness were reciprocally associated. University students who appeared to be mindful could experience more positive experiences in the future. In turn, these students who experienced more positive affect could be more mindful in the future, displaying the positive feedback loop. The current investigation extended the previous literature on the mindfulness-to-meaning theory (Garland et al., 2015b). ter Avest et al. (2020) examined the week-to-week effects of mindfulness and affect. Only one significant cross-lagged effect between positive emotion and subsequent mindfulness was found over eight sessions in 8 weeks. Another study discovered the positive reciprocal relations between mindfulness and positive emotion within a study period of a week (Du et al., 2019). The relatively long-term (i.e. 6 months) reciprocal effects between mindfulness and affect were first manifested in the current study. Our findings supported the theory that the positive feedback loop not only takes place at the moment but also unfolds over time (Garland et al., 2015b). The findings might also explain why individuals' positive affect could be retained for a year after receiving a mindfulness training programme (Amutio et al., 2015). Moreover, the findings supported the view that being mindful and practising mindfulness would effectively promote self-care and well-being (Brown & Ryan, 2003; Shapiro et al., 2008) and

develop a positive feedback loop. However, our findings did not support the negative feedback loop between negative affect and mindfulness (Garland et al., 2010, 2015b).

Previous studies investigating the connection between negative affect and mindfulness in intervention settings also revealed similar findings (Adair et al., 2018; ter Avest et al., 2020). In ter Avest et al.'s (2020) study, participants' negative affect was stable, and no cross-lagged effects between negative affect and mindfulness were found throughout the course of the intervention programme. Similarly, in Adair et al.'s (2018) study, the change in mindfulness could not predict the change in negative emotions after their intervention. One explanation for this result was that the connection between mindfulness and negative affect was relatively weak compared to the one between mindfulness and positive affect (Johnson et al., 2021). This finding may indicate that positive and negative affect should be examined as separate constructs instead of the opposite ends of a continuum because the associations of positive and negative affect with mindfulness are different (Garland et al., 2010). Nesse (2005, p. 5) also illustrated the idea with an example: "happiness cannot be expected to arise in the absence of suffering". Negative affect, a natural defensive mechanism, does not necessarily represent ill-being. In Forgas' (2013) study, the author listed multiple benefits of negative affect, including cognitive, judgemental, motivational, and interpersonal benefits, based on their experiments. For example, mild negative affect can promote a more accommodative-focused thinking strategy, driving one to be more cautious and vigilant (Forgas, 2013, 2017). Meanwhile, intense and enduring negative affect does not yield the same benefits (Forgas, 2013). Further investigations are warranted to examine the associations between different degrees of negative affect with mindfulness.

Mindfulness and Coping Strategies

Our results suggested a non-significant reciprocal relation between mindfulness and positive coping strategies. Mindfulness unidirectionally predicted future planning and positive reappraisal. The findings were in line with the inconsistent results of Garland et al.'s (2017) mindfulness-based intervention study. Specifically, they found a reciprocal relation between mindfulness and positive reappraisal in one of their models, but such a relation was not apparent in another reciprocal model (Garland et al., 2017). Indeed, the evidence of positive coping strategies predicting mindfulness was relatively lacking. The strength of the cross-lagged effects of positive reappraisal and mindfulness was also found to be modest (Garland et al., 2017). Nevertheless, the current findings provided additional evidence of the association between mindfulness and positive reappraisal. Mindfulness might improve individuals' cognitive flexibility, induce the reperceiving and de-centering cognitive state, and broaden

attention to contextual information from which reappraisals can be generated (Garland et al., 2017; Josefsson et al., 2014).

Affect and Coping Strategies

Contrary to our hypotheses, broaden-and-build theory (Fredrickson, 2001) and mindfulness-to-meaning theory (Garland et al., 2015a), affect, and coping strategies had no reciprocal association. Aligned with studies (Rogowska et al., 2021; Wang & Hall, 2021), non-significant cross-lagged effects between affect and positive coping strategies were found. Previous studies suggested that individuals tend to use coping strategies more frequently when distressed. In the current study, participants' affect scores were relatively consistent over time (i.e. positive affect at time 1 = 2.90 and time 2 = 2.88; negative affect at time 1 = 2.54 and time 2 = 2.43). According to the results of supplementary paired sample t-tests, there are no significant changes between the two-time points for positive ($t(187) = 0.52$, $p = 0.61$) and negative affect ($t(187) = 0.45$, $p = 0.65$). At the time of the data collection, the university students had been through four-wave of COVID-19 pandemic, had experienced different degrees of social distancing policies, and attended online classes for over 12 months. Perhaps participants were acclimatised to the pandemic-control policies and the "new normal" living arrangement. Also, studies have suggested that adverse events (e.g. COVID-19 and divorce) have temporary effects on individuals' well-being. However, individuals tend to adapt to the situations and restore their well-being to the pre-event levels (i.e. adaption effect; Diener et al., 2009; Hu & Subramony, 2022). Alternatively, it might indicate that the participants did not need to adopt coping strategies regularly during the measurement period (Rogowska et al., 2021). Besides, the current coping scale measured participants' tendency to adopt each coping strategy. The score might not be relevant if participants did not adopt the strategies. To address this methodological issue, counting the number of coping strategies used would be a more appropriate approach to assessing individuals' coping styles (Heffer & Willoughby, 2017). Unsurprisingly, seeking emotional support at time 1 had negative effects on the prospective negative affect. One possible explanation is that the study was conducted in Hong Kong, where people endorse collectivism and seek emotional support from others to cope with problems (Hofstede Insights, 2022; Kuo, 2013; Lee et al., 2020).

Limitation and Future Direction

The present study has several limitations that future studies might address. First, the participants were recruited from only one university in Hong Kong, and the majority were

female (i.e. 86%) with limited age differences. The study findings cannot be generalised to all individuals in or outside of Hong Kong. Future research is encouraged to recruit samples from different backgrounds (e.g. degree levels, university programmes, modes, and years of study) to test the mindfulness-to-meaning theory in a university setting.

Second, only the emotional well-being of the participants was measured in this study. The COVID-19 pandemic has unprecedented effects on individuals' well-being, including eudaimonic and psychological well-being (Birditt et al., 2021). It has been documented that mindfulness and psychological well-being variables (i.e. presence of meaning and relationship) were positively connected (Garland et al., 2015b; Tan et al., 2021). Future investigation may consider exploring the reciprocal relation between mindfulness and eudaimonic well-being so as to provide further empirical evidence to support the mindfulness-to-meaning theory (Garland et al., 2010). In future research, incorporating measures of mental health and well-being outcomes (e.g. life satisfaction, sense of calling, and depression) might help strengthen our understanding of the association between mindfulness and well-being.

Third, although evidence supported the validity of the self-reported measures adopted in this study (Carver, 1997; Feldman et al., 2007; Thompson, 2007), the effect of social desirability on our measures remains unknown. It may be limited to capturing the whole construct. Our reliance on self-report measures might introduce common method variance to the relations and inflate the effects (Podsakoff et al., 2012). Therefore, future research should adopt multi-informant and multi-method designs to assess individuals' well-being and mindfulness, such as psychophysiological and biophysiological approaches (Bostanov et al., 2018; Kreibig & Gross, 2017).

Fourth, using the Chinese version of the Brief-COPE questionnaire could be a limitation of the current study. In particular, the planning subscale had a relatively low inter-item correlation (i.e. $r = 0.62$ and 0.60 for times 1 and 2, respectively). The reliability of this subscale is questionable. The Brief-COPE questionnaire only comprises two items for each sub-scales. Arguably, the constructs can be fully captured by the two-item questionnaire. Future investigators are encouraged to examine the validity and reliability of the Chinese version of the Brief-COPE questionnaire among their study populations before adopting the scale (Su et al., 2015).

Fifth, these data are correlational, so causal effects are inferred from theory alone, not the data. Research is needed to develop interventions targeting changes in affect, mindfulness, and coping strategies. Training programmes, including emotional regulation, gratitude diary, developing hope, and savouring habits, may improve individuals' positive affect (Datu et al., 2022; Ivtzan et al., 2016). To improve

mindfulness for university students, universities can provide mindfulness meditation training workshops and mindfulness-based cognitive therapy during difficult times (Chiodelli et al., 2020; Halladay et al., 2019; McConville et al., 2017). On the other hand, our finding on emotional support negatively predicting prospective negative affect may also encourage future researchers to promote the seeking of emotional support from others. Training on topics including social influence, psychological needs supportive in relatedness, positive experiences with peers, healthy responses with peers, and actively listening are effective ways to promote seeking emotional support from others (Lee et al., 2021).

Declarations

Ethics Approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The ethics approval for this study was provided by The Education University of Hong Kong.

Consent to Participate Informed consent was obtained from all participants involved in this study.

Conflict of Interest The authors declare no competing interests.

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