Original Paper

Hope Mitigates Depression throughout Adversities: The Immediate and Longitudinal Mediation of Flow

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Abstract

Positive psychology constructs such as hope and flow build resilience against psychological distress in major adversities, but it remains unknown how they interact to exert the protective effects. Taking advantage of the lifting of the "Zero-COVID" policy in December 2022 in mainland China, the current study incorporated a cross-sectional survey (study 1, n = 1185) and a longitudinal survey (n = 296) to investigate the interaction of these two factors in reducing depression during the COVID-lockdown and after the lockdown was finally abandoned. The results showed that hope during COVID-lockdown predicted concomitant flow experience and depression, and proactively predicted depression measured three months after the lockdown was lifted. Moreover, flow experience mediated the cross-sectional and longitudinal hope effects. These findings shed light on the inner dynamics of positive psychology constructs in protecting well-being, and are implicative for mental health intervention in disaster relief.

Keywords

positive psychology, hope, flow, depression, disasters, half-longitudinal design, COVID-19

1. Introduction

1.1 Disaster Mental Health and Positive Psychology

Major adversities such as natural disasters (Macleod et al., 2023), war (Chaaya et al., 2022), and pandemics (Kupcova, Danisovic, Klein, & Harsanyi, 2023; Prati & Mancini, 2021) pose catastrophic threats to human lives and mental health, particularly depression (Richardson, 2023) (Goldmann & Galea, 2014). Meta-analysis showed that the prevalence of depression after natural disasters ranged from 5.8% to 54.0% in adults and from 7.5% to 44.8% in children (Tang, Liu, Liu, Xue, & Zhang, 2014), on average around 20% within the two years following disaster exposure (Newnham et al.,

2022), leading to higher risks such as self-harm, suicidal ideation (Visser, Loess, Jeglic, & Hirsch, 2013) and incremental economic burden (Greenberg et al., 2021).

1.2 Hope and its Impact on Well-being and Depression

Existent studies have established that positive psychology is a useful lens to employ in the context of disaster mental health (Schulenberg, 2016; Senger, 2023). Positive psychology addresses how we best bring internal and environmental resources and capacities to facilitate adaptive responses amid of extreme adversities (Schulenberg, 2016). As an essential member of the positive psychology family, hope is primarily a cognitive, goal-oriented pattern of thought (Snyder, Rand, & Sigmon, 2002). It concerns one's self-related beliefs about the capability to produce workable routes to goals, as well as the beliefs about initiating and sustaining movement toward those goals (Corn, Feldman, & Wexler, 2020; Snyder, Cheavens, & Sympson, 1997). It is regarded as a protective element against distress, acting as a psychological force or "buffer" that provides resilience (Gilman, Schumm, & Chard, 2012; Grewal & Porter, 2007). Hopeful people are more likely to be happier, make adaptive adjustments and utilize effective coping strategies in the face of hardship (Gallagher, Long, & Phillips, 2020). In contrast, people of low hope demonstrated less goal-directed behavior and compromised well-being (Gallagher et al., 2020).

Hope protects against the development of depression-related disorders (Visser et al., 2013). It is recommended a framework to improve depression outcomes for patients diagnosed with cancer (Germann, Leonard, Heath, Stewart, & Leavey, 2018; Tao et al., 2022) or brain injury (Peleg, Barak, Harel, Rochberg, & Hoofien, 2009), women with infertility (Omani Samani, Vesali, Navid, Vakiliniya, & Mohammadi, 2017), veterans (Hassija, Luterek, Naragon-Gainey, Moore, & Simpson, 2012) after trauma exposure, victims in natural disasters amid climate change (Fritze, Blashki, Burke, & Wiseman, 2008; L. J. Long et al., 2020), children left-behind (Zhang, Chi, Long, & Ren, 2019) or bereaved (Kwok & Gu, 2019). It also longitudinally predicts delayed depression (Arnau, Rosen, Finch, Rhudy, & Fortunato, 2007; Li, Wang, Mao, & Yin, 2018). Moreover, hope is negatively associated with engagement in self-harm, and moderates the relationship between depression and suicidal ideation (Hirsch, Visser, Chang, & Jeglic, 2012; Tucker et al., 2013).

1.3 Flow and its Impact on Well-being and Depression

Another widely-explored concept in positive psychology is flow, which describes a state of optimal experience that an individual is completely immersed in an activity (Csikszentmihályi, 1988; Isham & Jackson, 2022). A person experiencing flow is entirely concentrated in the activity at hand, and likely to have a sense of time distortion where time either quickly passes or stops (Csikszentmihályi, 1988; Csikszentmihályi, Abuhamdeh, & Nakamura, 2005). It is observed in a variety of domains such as music playing, computer games and academic settings (Csikszentmihályi et al., 2005). For mental health, flow is positively correlated with the arousal of positive affect such as enthusiasm (Huang et al., 2019) and life satisfaction (Csikszentmihályi et al., 2005), and negatively correlated with negative

affects like sadness and disappointment (Marszalek, Hager, Anderson, & Waddell, 2021). Specifically for depression, flow proneness is significantly associated with less depression even when all shared genetic and familial factors are controlled. Enhancing an individual's flow proneness is believed able to reduce health problems such as depression and emotional exhaustion (Mosing, Butkovic, & Ullén, 2018), and foster meaningful changes in psychotherapy and mental health rehabilitation (Riva, Freire, & Bassi, 2016).

1.4 Gap in Previous Studies

However, research in positive psychology is not satisfied by what factors are contributing to resilience, but importantly how. Some interesting questions are: what is the relationship between the positive constructs and how do they interact in building resilience? Answer to this question could help unravel the inner operating mechanism of positive psychology and inform us about which could constitute more effective target component in mental health intervention.

Though hope and flow both enhance performance outcomes and protect against mental health problems (Asakawa, 2010; Faria, 2016; Leite et al., 2019), they differ in substantial ways. Hope primarily concerned with one's beliefs about possessing the strategies to reach a goal and the ability to maintain their behavior towards the goal (Corn et al., 2020; Snyder et al., 1997). It is a goal-orientated cognitive construct providing the energy to find practical pathways to deal with challenging tasks (Snyder & Lopez, 2001). In contrast, flow describes the consequent mental state due to the match of perceived ability and perceived challenges (Csikszentmihályi, 1988; Fong, Zaleski, & Leach, 2015).

Previous studies have explored the cognitive route about the way hope or flow reduces depression, from the perspectives such as the mediation of social support and spiritual coping (Tao et al., 2022), forgiveness (Kaleta & Mróz, 2020) and resilience (Cooper, Kramers-Olen, & Pretorius, 2021), or the moderation of rumination (H. Sun, Tan, Fan, & Tsui, 2014) and social support (Lamis, Ballard, May, & Dvorak, 2016). However, most of the studies investigated the effect of either hope or flow in isolation, and the limited few studies that simultaneously considered hope and flow were cross-sectional (Button & De Pretto, 2023), leaving it unknown about how they jointly and dynamically affect depression in disasters and through what cognitive mechanism, especially how they interact to reshape long-term post-disaster depression.

The challenge-skill balance flow theory posits that flow experience is more likely to occur when an individual perceives a balance between the challenge of the activity and his or her own skill, especially when the perceived challenge and skill are both high (Csikszentmihályi, 1988; Fong et al., 2015). In other words, for flow to occur, the individual must have clear goals and the confidence in the ability to complete the task. They should believe they are able to complete the task, and meanwhile, feel challenged and stretched to do their best (Csikszentmihályi et al., 2005). This theory suggests that hope may constitute an antecedent of flow, and flow could mediate the impact of hope on well-being as a consequence of hope.

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1.5 The Present Study

We test these hypotheses by incorporating cross-sectional and longitudinal questionnaire surveys spanning the COVID-19 lockdown and its subsequent lifting in late 2022 in China. The COVID-19 virus, which first identified in an outbreak in December 2019, spread rapidly and developed into one of the deadliest and most-lasting pandemics in history. To reduce spread of the coronavirus, many countries introduced restrictive measures such as social distancing or lockdown and gradually abandoned them since September 2020 (Wikipedia, 2023). In mainland China, the government implemented the "Zero-COVID" Policy. This policy was characterized by mass testing and mass quarantine, and was finally abandoned on December 7, 2022 (Xinhua, 2022).

Existent evidence across the countries shows that the COVID-19 pandemic and accompanying restrictive measures exacerbated public mental health, leading to lasting psychological distress, depression and psychiatric symptoms (Serafini et al., 2020; Vindegaard & Benros, 2020). The research also reveals that the adverse impacts of the COVID pandemic on well-being (Feng & Yin, 2021) could be mitigated by hope and flow. For instances, hope reduced anxiety and depression of patients with COVID-19 via the mediation of perceived stress (Senger, 2023; Wang et al., 2022), and modulated the effect of religious coping on depression during COVID lockdown (Captari et al., 2022). Flow experiences moderated the link between quarantine length and well-being in away that people who experienced high levels of flow showed little or no association between quarantine length and poorer well-being (Sweeny et al., 2020). However, most of those studies were cross-sectional (Hong, Juan, & Hung, 2022; Sweeny et al., 2020). In the few longitudinal studies (Y. Sun, Lam, & Chung, 2022) that explored hope and flow before, during, and after the lockdown, the data were collected before the lockdown was finally over because the virus was still widely circulating and soon later the countries had to bounce back to new waves of lockdown (Patel et al., 2022). There is a paucity of research on their joint roles in restoring normalcy after COVID-19 restrictive measures were ultimately abandoned.

In this article, we explored three important questions: 1) how did hope and flow, two important members of the positive psychology family, affect depression during the stressful "Zero-COVID" lockdown? 2) how was depression changed as the restrictions were dropped? and 3) longitudinally, how did hope and flow during the "Zero-COVID" lockdown contribute to depression after the restrictions were lifted? To this end, we conducted a cross-sectional questionnaire survey (study 1, n = 1185) during late November 2022 when the "Zero-COVID" Policy was in action, and a longitudinal survey (study 2, n = 296) which spanned late November (T1, during "Zero-COVID" lockdown) and March 1st to April 3rd 2023 (four months after the "Zero-COVID" Policy was abandoned). We also proposed and tested models that assumed flow experience cross-sectionally (in study 1) and longitudinally (in study 2) mediated the effect of hope on depression. Answers to these questions may account for the dynamic synergy of positive psychology constructs in mitigating depression throughout major disasters such as the COVID-19 pandemic, and shed light on prevention, targeted care, or

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interventions in relief in these events. The current study received ethic approval from Chongqing Normal University, China. All participants provided written consents.

Table 1. Demographic Information of Participants in Study 1 and study 2

Variable	Category	Study 1	Study 2
Gender	Female	470	191
	Male	715	105
	< 26 years old	956	255
	26-30	111	22
Age	31-40	68	15
	> 40 years old	50	4
	≤ High school	102	15
	Associate	150	29
Education level	Bachelor	761	191
	≥ Master	172	60
COVID-contracted	Self (Yes/No)	3/1166	246/50
	Friends, family (Yes/No)	284/901	276/20
	< 1000	65	19
	1001-1500	127	28
	1501-2000	111	37
	2001-3000	178	41
monthly income	3001-5000	300	63
(yuan)	5000—8000	210	52
	5000—8000	72	23
	10000-20000	96	25
	> 20000	26	8

2. Study 1: Cross-Sectional Questionnaire Study

2.1 Method

The questionnaires were distributed through Wenjuanxing, an online platform widely used for surveys in mainland China. The survey included four trap questions (e.g., "I cannot read Chinese characters right now".) to verify the authenticity of responses. All responses were anonymized to safeguard the participants' privacy.

2.1.1 Participants

A total of 1185 valid individuals were paid a minimum of 4 RMB upon completing the survey. Among them, 60.338% were females, 80.675% were aged between 18 and 25 years old, 65.5% held a

bachelor's degree, 64.219% were students, and 25.316% reported a monthly income in the range of 3,001-5,000 RMB. Details can be seen in Table 1.

2.1.2 Measurements

Hope: The Chinese version of the Adult Hope Dispositional Scale (Chen, Shen, & Li, 2009), adapted from Snyder, Irving, & Anderson (1991), was used to assess participants' hope. This 12-item self-report questionnaire consists of 3 subscales: 4 items for the agent thinking subscale, 4 items for the pathway subscale, and 4 filler items. Participants rated the items on a 4-point Likert scale, from 1 (absolutely wrong) to 4 (absolutely right). An example item is: "I can think of many ways to get out of a difficult situation". In the current study, the scale had a Cronbach's alpha coefficient of 0.860. Following the advice of Snyder et al. (1991), the mean value of the 8 items in the pathway thinking and agent thinking subscales was used for subsequent analyses.

Flow: The experience of flow was measured using the Chinese version of the Short Flow State Scale (SFSS) (Liu, 2010), which was adapted from Jackson and Marsh (Jackson & Marsh, 1996). Participants were asked to recall how they performed a recent task and rate the experience level of 9 descriptions from 1 (never experienced) to 5 (always experienced). One description is: "I fully absorbed in the current learning task". The mean value of these ratings was submitted for later analysis, with higher scores indicating a stronger flow experience. In our sample, the SFSS demonstrated satisfactory reliability with a Cronbach's alpha of 0.872.

Depression: Depression in the past week was evaluated using the depression subscale of the Depression, Anxiety, and Stress Scale (DASS-21) (Lovibond & Lovibond, 1995), translated into Chinese by Wen and colleagues (Wen & Wu, 2012). This subscale contains seven items, such as "I felt that life was meaningless", and is rated on a 4-point scale from 0 (never) to 3 (always). Higher scores correspond to more severe depression symptoms. In our study, this subscale had a Cronbach's alpha of 0.837.

Covariates: Covariates included demographic variables like gender, age, and monthly income. Participants also rated their attitude towards the current pandemic on a 5-point Likert scale from 1 (very optimistic) to 5 (very pessimistic), as well as whether they or their acquaintances (friends, family members) had contracted the COVID-19 virus.

2.1.3 Data Processing

First, we assessed the normality of the data, carried out descriptive statistics, correlation analyses, and evaluated common method bias in SPSS 24.0. Next, we transformed variables such as sex, age, education level, and whether acquaintances had contracted COVID-19 into dummy variables. We also demeaned monthly income and the level of pessimism about COVID spreading. Variables including hope, flow, and depression were standardized.

Subsequently, we conducted hierarchical regression analysis to explore how hope, flow, and demographic variables contributed to predicting depression during the "Zero-COVID" Policy lockdown. Finally, we used MPlus 8.3 (Muthén & Muthén, 2017) to test a mediation model. This

model hypothesized that flow mediated the impact of hope on depression while controlling for demographic variables. To determine the significance of the mediation effect, we implemented 5,000 bootstrapping iterations with bias-corrected 95% confidence intervals. An effect was considered significant if the confidence interval (CI) did not contain zero. Since only three participants reported having contracted the virus, information about the participants themselves contracting COVID was not included as a covariate.

2.2 Results

2.2.1 Common Method Bias, Descriptive Statistics and Correlation Analysis

When items from the depression, flow, and hope measurements were included in a dimension-reduction analysis, four principal components were extracted. The first unrotated component accounted for 34.913% of the total variance. Significantly, after varimax rotation, the first and second components corresponded well with flow and depression respectively, while the third and fourth components only covered the items of hope. These results indicated that there was no significant common method bias in the data (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

As shown in Table 3, normality tests on the data distribution of hope, flow, and depression revealed acceptable skewness and kurtosis scores (see Table 2) that were less than 2 (Curran, West, & Finch, 1996). Hope was positively correlated with flow, but both were negatively correlated with depression (all p-values < 0.01).

Table 2. Descriptive Statistics and Correlations among Variables in Study 1 (n = 1185)

Variable	1	2	3	4	5
1 Gender (0 = male)	1.00				
2 COVID pessimism	0.082**	1.00			
3 Hope	-0.059*	-0.205***	1.00		
4 Flow	-0.051	-0.224***	0.632***	1.00	
5 Depression	0.064*	0.273***	-0.447***	-0.414***	1.00
Mean	0.603	2.795	2.731	3.364	1.621
SD	0.489	0.893	0.493	0.653	0.473
Skewness	-0.423	-0.021	0.061	0.081	1.073
Kurtosis	-1.824	0.232	0.493	0.418	1.939

Note: ***$p < 0.001$, **$p < 0.01$, *$p < 0.0$

2.2.2 Hope and Flow Negatively Predict Depression during COVID-19 Lockdown

Table 3 summarizes the results of the hierarchical regression analyses on factors that predicted depression at during COVID lockdown. The model 1, which included only the demographic variables, accounted for 0.092 of the variance in depression. In model 2, adding hope raised the percentage of explained variance to 0.242 (F = 33.951, p < 0.001) with a significant increase of 0.15. After incorporating flow experience in model 3, the total explanatory variance rose to 0.265 (F = 35.294, p < 0.001), specifying that the additive flow increased explanatory variance by 0.024. These results suggest significant prediction of hope and flow for depression during the lockdown.

Table 3. Results of Hierarchical Regression Analyses in Study 1

	Step 1 Depression		Step 2 Depression		Step 3 Depression	
	beta	t	beta	t	beta	T
Sex (0 = male)	0.066	1.088	0.038	0.695	0.023	0.419
Age (0 = 25 years old or younger)						
26-30	0.021	0.204	0.068	0.735	0.092	1.005
31-40	0.078	0.623	-0.002	-0.022	0.001	0.006
>40	-0.370	-2.532*	-0.176	-1.313	-0.178	-1.345
Income	0.006	0.415	0.021	1.526	0.023	1.697
COVID Pessimism	0.303***	9.549***	0.201***	6.732***	0.180***	6.074***
Education level (0 = High school or lower)						
associate	-0.098	-1.469	-0.105	-1.719	-0.099	-1.658
university	-0.015	-0.115	-0.125	-1.082	-0.117	-1.024
Master or higher	0.100	0.945	-0.032	-0.328	0.032	0.329
Acquittance COVID contraction (0 = no)	-0.145	-1.165	-0.111	-0.977	-0.065	-0.576
Hope			-0.407***	-15.230***	-0.281***	-8.448***
Flow					-0.204***	-6.182***
R²	0.092***		0.241***		0.265***	
ΔR²	0.092***		0.150***		0.024***	
F	11.825***		33.951***		35.294***	

2.2.3 Flow Mediates the Effect of Hope on Depression during COVID-19 Lockdown

Subsequently, we tested the model in which flow mediated the impact of hope on depression while controlling for covariates including gender, age, education level, and monthly income. The mediation model showed an excellent fit: $\chi^2/df = 4.653$, RMSEA = 0.056, SRMR = 0.03, CFI = 0.963, TLI =

0.915. Specifically, hope had a positive predictive effect on flow experience ($\beta = 0.632$, SE = 0.027, 95% CI = [0.580, 0.685]), and flow experience negatively predicted depression ($\beta = -0.204$, SE = 0.040, CI = [-0.282, -0.127]). This led to a negative indirect effect of hope on depression through flow ($\beta = -0.129$, SE = 0.025, CI = [-0.177, -0.081]) (see Fig. 1). Additionally, the direct effect of hope on depression was also negative ($\beta = -0.281$, SE = 0.043, CI = [-0.366, -0.200]).
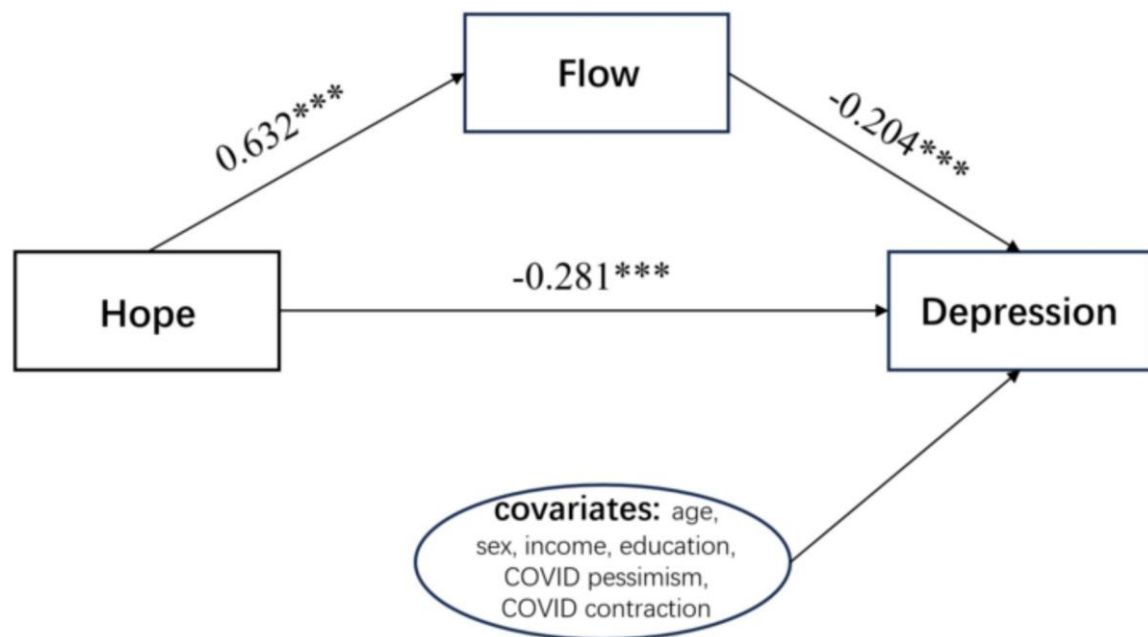

Figure 1. Flow Mediated the Impact of Hope on Depression during COVID Lockdown

3. Study 2: Longitudinal Study

The cross-sectional survey in Study 1 indicates a negative association between depression, on one hand, and hope and flow, on the other hand. It also shows that flow mediates the impact of hope on depression during the pandemic. However, it doesn't clarify how hope and flow interact dynamically to mitigate delayed depression. In Study 2, we aimed to answer this question using a longitudinal design. A separate group of 296 participants were enlisted for surveys at two time points: T1 (late November 2022) and T2 (March 1st to April 16th, 2023). On December 7, 2022, the Chinese government began to ease many of the strict "Zero-COVID" policies, ending them by the end of December 2022. These two data collection time points enabled us to explore the following two questions:

1) How did the lifting of the "Zero-COVID" policy coincide with changes in depression?

2) How did positive constructs like hope and flow during the COVID-lockdown contribute to depression after the policy was finally lifted?

3.1 Method

3.1.1 Participants

296 participants provided valid responses at both time-points. Among them, 191 were women and 105 were men. 85.57% of the participants were aged 18-25 years old. 64.430% held bachelor's degrees, 21.141% reported monthly incomes between 3001-5000 yuan, and 80.5% were students. Details can be found in Table 1.

3.1.2 Measurements

The measurement tools used in Study 2 were identical to those in Study 1. The Cronbach's alpha values were as follows: 0.872 at T1 for the Adult Hope Scale, 0.828 at T1 and 0.814 at T2 for the Short Flow Scale, and 0.801 at T1 and 0.811 at T2 for the Depression subscale.

3.1.3 Data Processing

First, we carried out pairwise T-tests to determine the changes in hope and depression between T1 and T2. Subsequently, hierarchical regression analyses were performed to examine how hope and flow at T1, as well as hope at T2, contributed to the depression level at T2.

After that, we tested a half-longitudinal mediation model. This model hypothesized that flow mediated the impact of hope at T1 on depression at T2. The variables of hope, flow, and depression were standardized. Covariates such as sex, age, education level, and COVID contraction (whether the participants themselves, their family members, or friends had contracted COVID-19) were transformed into dummy variables. Monthly income and pessimism regarding the virality, curability, and spreading of COVID were demeaned and controlled in these two analyses.

3.2 Results

3.2.1 Common Method Bias, Descriptive Statistics and Correlation among Variables

Harman's test, which included items from T1 hope, T1 flow, T2 flow, T1 depression, and T2 depression, resulted in 9 principal components with an eigenvalue greater than 1. The first unrotated component accounted for 26.42% of the total variance.

As shown in Table 4, the skewness and kurtosis of the scores for T1 hope, T1 flow, T2 flow, T1 depression, and T2 depression were all less than 2 (see Table 4), indicating a normal data distribution (Curran et al., 1996). T1 hope, T1 flow, and T2 flow were positively correlated with each other but negatively correlated with T1 depression and T2 depression (all p-values < 0.01). There was a positive correlation between flow at T1 and flow at T2 (r = 0.452, p < 0.001), as well as between depression at T1 and depression at T2 (r = 0.328, p < 0.001).

Table 4. Descriptive Statistics and Correlations among Variables of Study 2

Variable	1	2	3	4	5	6
1 Sex	1					
2 T1 Hope	-0.150**	1				
3 T1 Flow	-0.069	0.614***	1			
4 T1 Depression	-0.017	-0.531***	-0.377***	1		
5 T2 Flow	-0.094	0.527***	0.529**	-0.302***	1	
6 T2 Depression	-0.024	-0.383***	-0.313***	0.563***	-0.440***	1
Mean	0.3525	2.705	3.333	1.648	3.355	1.650
SD	0.479	0.417	0.577	0.427	0.488	0.420
Skewness	0.650	0.088	0.223	0.651	-0.13	0.819
Kurtosis	-1.626	0.124	0.147	0.426	0.266	1.262

3.2.2 No Significant Changes in Flow Experience and Depression after "Zero-COVID" Policy was Lifted

Paired samples t-tests did not show a significant difference between flow at T1 and T2 (t(295) =-0.741, p = 0.459), nor between depression at T1 and T2 (t(295) =-0.084, p = 0.933).

3.2.3 Hope during the COVID Lockdown Predicted Depression after the Lockdown was Lifted

As presented in Table 5, when compared to the model that only incorporated demographic variables, adding hope and flow at T1 in Model 2 increased the proportion of the accounted variance of depression at T2 to 0.229 (F = 5.542, $p < 0.001$), with a significant increase of 0.144. In Model 2, hope at T1 negatively predicted depression at T2 (β = -0.335, t = -4.779, $p < 0.001$). Participants older than 30 years old had significantly more depression at T2 compared to those 25 years old or younger (β = 0.669, t = 2.892, $p < 0.001$). Those whose family members had contracted COVID-19 showed less depression at T2 than those who had not (β = -0.592, t = -2.495, p = 0.013). However, flow experience at T1 predicted depression at T2 with marginal significance (β = -0.113, t = -1.670, p = 0.096).

In Model 3, adding flow at T2 increased the accounted variance to 0.290 (F = 7.138, p < 0.001), with a significant increase of 0.062. Hope at T1 (β = -0.245, t = -3.508, $p < 0.001$) and flow at T2 (β = -0.315, t = -4.919, $p < 0.001$) negatively predicted depression at T2, but flow at T1 did not (β = -0.013, t = -0.195, p = 0.846). Being older than 30 years old (compared to those 25 years old or younger) and having family members with COVID-19 (compared to those without) remained significant predictors of depression at T2.

Table 5. Hierarchical Regression Analysis Against Depression at T2 in Study 2

	Step 1 Depression T2		Step 2 Depression T2		Step 3 Depression T2	
	β	t	β	t	β	t
Sex (0 = female)	-0.039	-0.304	-0.152	-1.259	-0.189	-1.623
Age (0 = 25 years old or younger)						
26-30 years old	-0.135	-0.586	-0.105	-0.492	-0.152	-0.741
>30 years old	0.566*	2.258*	0.669**	2.892**	0.624**	2.802**
Income	-0.015	-0.496	0.016	0.577	0.023	0.849
COVID Contraction (yes or no)						
Self	0.100	0.619	-0.085	-0.562	-0.104	-0.713
Family members	-0.613*	-2.388*	-0.592*	-2.495*	-0.540*	-2.364*
Friends	0.118	0.514	0.251	1.176	0.331	1.611
Education experience （ 0 = Junior high school and below）						
Associate	-0.258	-0.817	0.074	0.252	0.047	0.166
Bachelor	-0.133	-0.498	0.158	0.634	0.206	0.860
Master	-0.412	-1.412	0.030	0.110	0.122	0.459
The COVID-virus is						
Uncontrollable	0.080	1.319	0.096	1.722	0.082	1.536
Uncurable	0.056	0.745	-0.010	-0.144	-0.022	-0.324
Spreading	0.087	1.409	0.056	0.980	0.030	0.552
T1 hope			-0.335***	-4.779***	-0.245***	-3.508***
T1 flow			-0.113	-1.670	-0.013	-0.195
T2 flow					-0.315***	-4.919***
R^2	0.085*		0.229***		0.290***	
ΔR^2	0.085*		0.144***		0.062***	
F	2.018*		5.542***		7.138***	
F change	2.018*		26.112***		24.198***	

3.2.3 Flow Longitudinally Mediated the Impact of Pre-lifting Hope on Post-lifting Depression

Our half-longitudinal mediation model showed a satisfactory fit to the data: (χ^2/df = 1.866, RMSEA = 0.054, SRMR = 0.070, CFI = 0.874, TLI = 0.899). Consistent with Study 1, at T1, hope was positively associated with flow experience (β = 0.612, SE = 0.069, CI = [0.486, 0.761]) but negatively associated with depression (β = -0.530, SE = 0.065, CI = [-0.666, -0.411]), and flow experience was also negatively associated with depression (β = -0.376, SE = 0.058, CI = [-0.494, -0.266]). At T2, flow

experience was also negatively associated with depression (β = -0.187, SE = 0.046, CI = [-0.294, -0.112]) (see Fig. 2).

After controlling for variables such as age, sex, education level, and attitude towards COVID spreading, hope at T1 positively predicted flow at T2 (β = 0.262, SE = 0.075, CI = [0.113, 0.403]) when flow at T1 was taken into account. Flow at T1 negatively predicted depression at T2 (β = -0.110, SE = 0.056, CI = [-0.221, -0.005]) when depression at T1 was controlled. This led to a significant indirect effect from hope at T1 to depression at T2 that was mediated by flow experience (β = -0.029, SE = 0.017, CI = [-0.073, -0.004]).
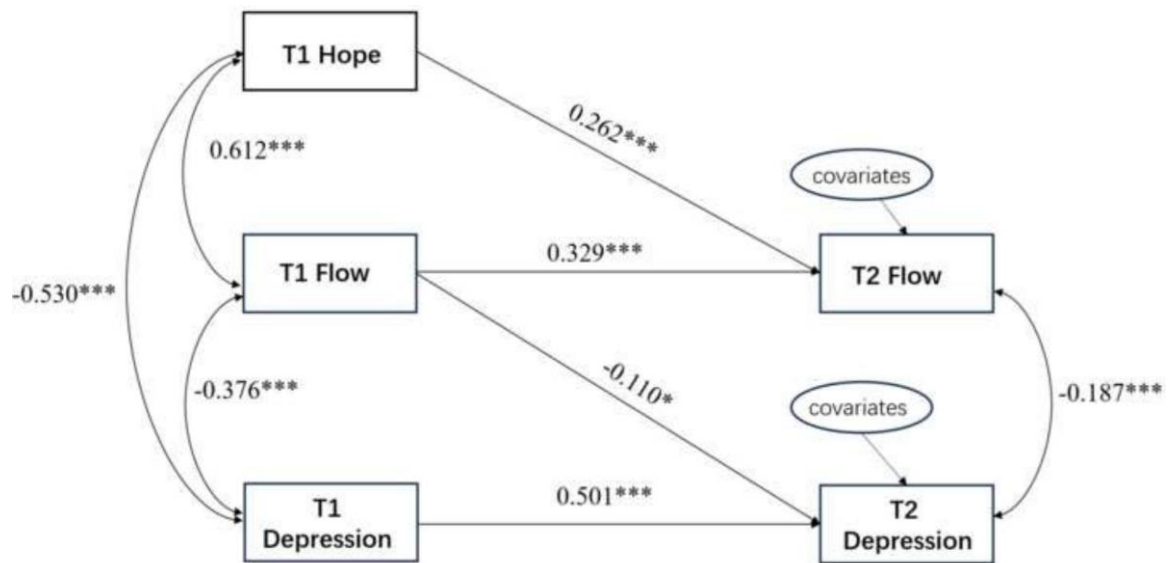

Figure 2. The Semi-longitudinal Mediation of Flow in the Effect of Hope on Depression

4. Discussion

Maintaining psychosocial well-being during disasters and rebuilding mental health normalcy afterwards are of utmost significance for disaster relief (Vernberg, Hambrick, Cho, & Hendrickson, 2016). Our cross-sectional survey showed that hope and flow, two key elements in positive psychology, negatively predicted depression during the stressful lockdown, with flow mediating the impact of hope on depression. The longitudinal study further reinforced these findings, revealing that hope during the COVID-lockdown negatively predicted depression three months after the lockdown was lifted, and flow again played a significant mediating role in the effect of hope. These two studies provided complementary evidence for the protective effect of hope on psychological well-being during disasters and when people start to restore psychosocial normalcy. They also illuminated the mechanism of how positive psychology constructs interact to exert protective effects.

Our research differs from previous studies exploring the association between hope and mental health in disasters in two ways. First, we used both cross-sectional and longitudinal designs to examine the

immediate and delayed interplay of hope and flow. The findings from these two studies converged in supporting the benefits of hope and the mediating role of flow. Second, we collected data before and after the COVID restrictions were finally lifted, which was different from the few longitudinal studies that assessed mental health after the relaxation of COVID-lockdown in 2020-2021. In those studies, surveys were conducted when COVID was still prevalent, and countries had to re-introduce new lockdown measures after data collection (Alharbi, Alharthi, Alzahrani, Dakhel, & Alawaji, 2022; Patel et al., 2022). In our study, the post-lockdown survey was carried out in early 2023 when the virus mortality had significantly decreased, and it "is no longer a public health emergency of international concern (PHEIC)" (Lenharo, 2023). Most countries had already reopened, demonstrating the feasibility of "living with Covid". As the last large country to end the "Zero-COVID" Policy, China shifted its focus to economic and social development (Xiao, Wang, Liu, & Unger, 2023). Thus, the results of our study are valuable in revealing the variables that contribute to restoring psychosocial normalcy after major disasters.

Given the abundant evidence that the coronavirus and associated restrictive measures worsened public mental health (Serafini et al., 2020; Vindegaard & Benros, 2020), one might expect that easing lockdown measures would quickly improve psychological well-being. Contrary to this expectation, our study did not observe a significant decrease in depression in March 2023, even three months after the "Zero-COVID" Policy was fully lifted. This suggests that ending the "Zero-COVID" Policy did not lead to rapid mental health benefits; instead, it was followed by a transitional period characterized by the persistence of some mental symptoms. This is consistent with the results of Alharbi and colleagues (Alharbi et al., 2022), who observed significant psychological distress among the Saudi population after the temporary lifting of lockdown. In a representative review of 11 longitudinal studies in the United Kingdom, Patel and colleagues also found that mental health deterioration did not improve when social restrictions were eased (Patel et al., 2022).

There are at least two possible explanations for the non-significant changes in depression. First, although lifting the lockdown freed participants from social restrictions and COVID-19 mortality had decreased in March and April 2023, the virus's infectiousness remained high, and easing the lockdown made participants more likely to contract the virus. As shown in Table 1, during our second data collection time-point, the number of infected cases was significantly higher than at the first time-point (November 2022), with over 83% of participants themselves and 93% of their family members or friends reporting COVID-19 infection. At the same time, the lifting of the "Zero-COVID" policy also brought various new uncertainties as people tried to restore normal life. Specifically, economic instability, concerns about subsequent epidemic outbreaks (Pan, Lin, Shi, Ma, & Zhong, 2021), and the need to repair social relationships and habits (N. J. Long et al., 2022) served as additional stressors.

Second, the high level of depression after the lifting of the "Zero-COVID" policy may reflect a general chronic pattern of mental problems following long-lasting disasters. Previous studies have found that

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the type of disaster exposure significantly influences the onset of post-disaster symptoms and their recovery trajectories. Sudden-onset hazards like floods and earthquakes give people little time to prepare, causing shock, confusion, and disorientation. In contrast, ongoing disasters such as drought, pollution, or pandemics are slower-onset and more likely to result in chronic stress, anxiety, and depression (Newnham et al., 2022). For example, even 14-17 months after Hurricane Katrina, both exposed mothers and their children showed similar levels of post-traumatic symptoms as 4-7 months after Katrina (Lai, Beaulieu, Ogokeh, Self-Brown, & Kelley, 2015). A meta-analysis of over 200 English, Chinese, and Japanese studies has shown that the prevalence of depression and anxiety symptoms remained elevated for years after disasters, especially in children and adolescents (Newnham et al., 2022). Since the onset of the COVID-19 virus, the pandemic had affected the Chinese people for over 3 years, and the chronic mental health consequences may have accumulated, requiring a long-term recovery process.

The hope theory posits that hope is a psychological resource that helps individuals respond to adversities with resilience (Pleeging, Burger, & van Exel, 2021; Snyder & Lopez, 2001; Snyder et al., 2002). The negative association between hope and depression during the COVID-lockdown replicates previous observations in countries like Turkey (Genc & Arslan, 2021), Malaysia (Wider et al., 2022), and Pakistan (Flesia, Adeeb, Waseem, Helmy, & Monaro, 2023), where hope mitigated the adverse effects of stress on well-being during the pandemic. This is also consistent with previous studies that found hope effectively alleviated distress after short-term disasters such as floods (Cherry et al., 2023) caused by Hurricane Katrina (Hackbarth, Pavkov, Wetchler, & Flannery, 2012). Importantly, we observed that hope during the COVID-lockdown negatively predicted the depression level even three months after the lockdown was lifted. This is in line with previous longitudinal reports on American adults (Gallagher, Smith, Richardson, D'Souza, & Long, 2021) and Hong Kong college students (Y. Sun et al., 2022). These results suggest that hope not only has an immediate effect but also brings long-lasting benefits. They indicate that hope can act as a resilience or protective factor for mental health, providing evidence for the hope theory (Snyder & Lopez, 2001; Snyder et al., 2002).

The negative association between flow and depression in our studies is consistent with Mosing et al. (2018), who found that flow was significantly correlated with fewer depression symptoms even after controlling for genetic and familial factors. In clinical settings, it also aligns with the belief that flow can enhance psychotherapy and mental health rehabilitation (Riva et al., 2016). One major contribution of our study is revealing the mediating role of flow in the effect of hope on depression, both cross-sectionally and longitudinally. Extending previous theories that flow is a protective factor in disaster mental health, our research contributes to understanding the underlying mechanism, particularly how it interacts with positive psychology constructs like hope to mitigate adverse mental consequences. The impact of hope on flow experience is consistent with a previous study showing that user beliefs are an important determinant of flow experience for commercial websites (Hsu et al., 2013).

Our results also support the challenge-skill balance theory of flow, suggesting that fostering hope may be an effective way to enhance flow, which in turn can benefit mental health in adverse situations or in tailored interventions.

The high level of depression months after the "Zero-COVID" policy indicates the long-term nature of mental health recovery. Practitioners and policymakers are advised to take this into account and develop long-term disaster relief plans. Our research emphasizes the immediate and delayed benefits of positive psychology constructs such as hope and flow. Cultivating these elements not only provides short-term benefits during a crisis but also has long-term positive implications for post-disaster psychological reconstruction. Our findings have broader applications in other high-stress situations such as natural disasters and geopolitical tensions. Thus, the research has implications for shaping more general mental health policies and emergency response frameworks, as supported by prior studies on the Australian bushfires (Macleod et al., 2023) and the Ukraine War (Chaaya et al., 2022; Costanza et al., 2022; Mottola, Gnisci, Kalaitzaki, Vintilă, & Sergi, 2023). We recommend strengthening the sense of hope through cognitive-behavioral therapy and engaging in activities that induce a flow state as strategies to address psychological challenges during and after a crisis.

One limitation of this study is that it only included two time-points: during and immediately after the COVID-19 pandemic. This restricts our understanding of long-term mental health trajectories. Second, our study only involved participants from mainland China, so the results may be influenced by the specific cultural and political context. Future research could use extended timelines to gain a more detailed understanding of how hope and flow contribute to long-term emotional well-being and explore the applicability of hope and flow in mental health interventions across diverse populations and cultures.

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