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Reciprocal Association Between Negative Emotion Mindset and Quality of Life: A Two-wave Longitudinal Study Among Children and Adolescents

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Abstract

Quality of life (QoL) plays a crucial role in child development and emotional distress is common among adolescents. Emotions are natural responses to circumstances, and they change over time. Thus, individuals' beliefs about the changeability of emotions, particularly negative emotions, matter. Mindsets about negative emotions (i.e., negative emotion mindsets) are interrelated with QoL; however, few studies have studied this association. Hence, this study aimed to examine the longitudinal reciprocal relationships between mindsets about anxiety, depression, and stress and QoL. A total of 3,748 participants (357 in Grades 4 and 5 and 3,391 in Grades 7–10, age range: 10–20 years, age mean = 14.10 years, *SD* = 1.62; boys *n* = 1,591, 42.4%) participated in a two-wave survey with a one-year interval. We measured demographic factors; family economic conditions; life satisfaction; negative emotion mindsets; and symptoms indexed by depression, anxiety, and stress. Cross-lagged panel model (CLPM) analyses were conducted to examine the reciprocal relationships between negative emotion mindsets and QoL (including life satisfaction and mental health symptoms). Results showed that the belief that negative emotional states could be changed at Time 1 predicted better QoL at Time 2. In addition, QoL measured at Time 1 predicted growth mindsets of negative emotional states at Time 2. Subgroup analyses based on sex showed that the relationship between mindsets and life satisfaction among boys was unidirectional, whereas it was bidirectional among girls. These novel findings in the Chinese context highlight the belief about the changeability of negative emotions as a promising factor for promoting QoL among children and adolescents.

Keywords Life satisfaction · Depression · Anxiety · Stress · Negative emotion mindset · Cross-lagged panel model · Children and adolescents

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1 Introduction

Quality of life (QoL) is widely recognized as a crucial factor in adolescent development, with significant influence on physical health, educational attainment, and future socioeconomic opportunities (Patton et al., 2016; UNICEF, 2017, 2021). As emotional distress is common during adolescence, the ability to cope through a growth mindset—a belief that emotional states can be improved—may offer protection (Schroder, 2020). Although adolescence is a pivotal period for forming mindsets, little is known about the mechanisms through which QoL may interact with adolescents' mindsets. In addition, empirical research is lacking on whether QoL fosters a growth mindset or whether adolescents' mindsets about emotional distress influence their QoL. This study fills this gap by examining the bidirectional relationship between adolescents' mindsets about emotional distress and their QoL. Using a two-wave longitudinal design, this study aims to provide novel evidence on how mindset and QoL mutually shape each other, informing interventions to enhance adolescent well-being.

1.1 QoL among Children and Adolescents

The World Health Organization (WHO) defines QoL as an individual's perception of their position in life, considering their culture, value systems, goals, expectations, and concerns (The WHOQOL Group, 1995). QoL is widely recognized as a multidimensional construct that encompasses mental health and life satisfaction (Huebner, 2004; Ravens-Sieberer & Bullinger, 1998). Studies have shown that children's and adolescents' experiences and well-being have lasting effects on their adult lives, highlighting the need to enhance QoL early in development (Patton et al., 2016; Sawyer et al., 2018). In this study, we conceptualize QoL in terms of life satisfaction and common mental health symptoms and provide a comprehensive view of well-being in children and adolescents.

1.2 Beliefs about Emotions: Emotion Mindsets

Belief is a powerful force in shaping adolescent behavior, such as in the conception of success (Cheung et al., 1998). In the area of beliefs about emotions, emotions can be regarded as neutral signals that direct attention to events; however, how individuals perceive and interpret these emotions—shaped by their mindsets—affects coping and mental health (Schroder et al., 2016). Negative emotion mindset refers to an individual's belief about whether negative emotional states, such as depression, anxiety, and stress, are changeable (Zhu et al., 2022). Individuals with a growth mindset believe these emotions can improve, whereas those with a fixed mindset hold that negative emotions are unchangeable or difficult to alter. Research shows that a belief in positive change promotes active emotion regulation and adaptive strategies such as cognitive reappraisal (Kneeland et al., 2016), whereas fixed mindsets are associated with more mental health symptoms, emotion suppression, less help-seeking, and increased suicidal ideation among adolescents (Schroder, 2020; Zhu & Wong, 2022).

Emotion mindsets also influence QoL, particularly in adolescents who face heightened emotional fluctuations. While emotions may not determine QoL, how adolescents appraise and cope with negative emotions shapes their subjective well-being (Schachter & Singer, 1962). Despite this, the relationship between negative emotion mindsets and QoL remains understudied. Investigating this relationship could identify targets for psychoeducational interventions to improve adolescent well-being by fostering adaptive mindsets and better coping with emotional distress.

1.3 Potential Association Between QoL and Mindset

Theoretically, the relationship between QoL and negative emotion mindsets may be reciprocal; however, this conceptualization remains under-researched. Existing studies have found evidence to support the effect of mindset on QoL (Burnette et al., 2020; Schleider et al., 2015). Growth mindsets, which refer to the beliefs that negative emotions can change, promote resilience, persistence, and adaptive coping strategies, thereby enhancing well-being (Dweck & Yeager, 2019; Schroder et al., 2017). Conversely, fixed mindsets, which view negative emotions as unchangeable, are associated with greater mental health symptoms, frustration, and lower life satisfaction. Adolescents with growth mindsets are more proactive in managing distress, buffering its negative effect on QoL (Burnette et al., 2020; Schleider et al., 2015).

Conversely, QoL may also shape mindsets. Individuals' experiences, education, social interactions, and culture shape their thoughts, beliefs, and attitudes (Dweck, 2017; Lebow, 1993; Yolles & Fink, 2013). Children and adolescents struggling with mental health symptoms may develop learned helplessness and negative beliefs about their capacity for change. They also tend to suppress or control their worries, which may increase their negative intrusive thoughts and perceptions of the uncontrollability of their symptoms, ultimately leading to greater anxiety and vulnerability (Mineka & Zinbarg, 2006). Conversely, higher life satisfaction is associated with higher self-efficacy (Çakar, 2012), which may lead individuals to believe in their ability to change and give them the confidence to instigate change.

Thus, it can be conjecture that there are reciprocal relationships between negative emotion mindsets and QoL. However, longitudinal research on this bidirectional association is scarce, and studies on belief-in-change and mental health have been predominantly cross-sectional. Although the bidirectional relationship between belief-in-change in intelligence and academic achievement was studied previously (Jones et al., 2012), it was also a cross-sessional study. Moreover, no empirical study has examined whether QoL influences the development of negative emotion mindsets. Therefore, the interaction between belief-in-change and QoL should be further examined via longitudinal studies.

Understanding the interplay between negative emotion mindsets and QoL has unique significance for mental health theories and interventions. Belief-in-change provides the implicit premise or precondition for cognitive behavioral therapy (Kneeland et al., 2016), thus influencing an individual's motivation to engage in the intervention and subsequent therapeutic effect. De Castella et al. (2015) have found that the belief in the malleable nature of emotions is a key mechanism in the success of cognitive behavioral therapy for anxiety.

Clarifying the reciprocal relationship between QoL and belief-in-change in negative emotions also provides theoretical insight into whether QoL shapes beliefs about the malleability of negative emotions. This is particularly important given the increasing number of children and adolescents experiencing symptoms of depression, anxiety, and stress. Attitudes toward negative emotions influence perceived hope and help-seeking. The belief that emotions can be changed in a positive direction has been shown to mediate the association between depressive symptoms and suicidality (Zhu & Wong, 2022) and to be associated with reduced social difficulty (Yeager, 2017) and better emotional and social adjustment during the transitional stage to adulthood (Tamir et al., 2007).

1.4 Sex-related Differences

Existing studies mainly reported the overall positive association between growth mindset and life satisfaction (Jiang et al., 2023; Liu et al., 2024; Zhu et al., 2020a, 2020b). Studies have found that girls exhibit higher fixed mindset (Zhu et al., 2020a, 2020b) and lower well-being than boys (Eriksson & Strimling, 2023). A study on the relationship between stress-is-enhancing mindset and well-being found the effect only in girls, but not in boys (Jiang et al., 2019). As the existing literature remains inconclusive, the current study moves one step forward to explore the possible sex differences in the association between belief of changeability and QoL.

1.5 The Current Study

The current study is a pioneering longitudinal study examining the reciprocal relationships between negative emotion mindsets and QoL among children and adolescents, a topic that has been underexplored in previous research. There are three novel features of the study. First, unlike previous studies that predominantly used cross-sectional designs, this study employed a two-wave, one-year interval survey to investigate how beliefs about the changeability of negative emotional states (depression, anxiety, and stress) influenced QoL over time and vice versa. Second, it is among the first to explore whether QoL predicts the development of negative emotion mindsets, addressing a significant gap in understanding the bidirectional dynamics between emotional beliefs and well-being. Third, this study uniquely examined whether boys and girls differed in the interplay between their mindsets and life satisfaction over time. This comprehensive approach advances the field by clarifying the temporal and reciprocal nature of these associations, which has important implications for mental health interventions that target children and adolescents.

Based on the existing scientific literature, we hypothesized that negative emotion mindsets on depression, anxiety, and stress had close bidirectional relationships with QoL. Specifically, we hypothesized that a belief in the potential to improve these negative emotional states at Time 1 was associated with higher levels of life satisfaction and lower levels of depression, anxiety, and stress symptoms at Time 2. Moreover, we hypothesized that life satisfaction and mental health symptoms at Time 1 predicted the three negative emotion mindsets at Time 2. Finally, based on the previous findings (Zhu & Wong, 2022), we hypothesized that the cross-lagged effects

between the negative emotion mindsets and QoL (life satisfaction and mental health symptoms) differed between boys and girls.

2 Methods

2.1 Procedure

This school-based survey study adopted a two-wave longitudinal design. Data were collected during the second last month of two academic years (June 2021 and June 2022) from four primary schools and 11 secondary schools that agreed to participate in the study. The higher grades (Grades 4–5) in the primary schools and lower grades (Grades 7–10) in the secondary schools were invited to participate. Grade 6 students were not included in this study, as they would have been lost to follow-up after secondary school enrolment. Grade 11 students were also excluded because at T2, they would have left school after the university admission exams. Grade 12 students were excluded, as they would have left school at T1 after the exams. Lower-grade primary students were excluded because they might find it difficult to understand the survey questions. Through the participating schools, the children's parents were provided with the parental consent form and research information sheet, which described in detail the research objectives and possible risks and benefits of participation. Ethical approval was acquired from the Human Subjects Ethics Sub-Committee of the first author's university.

Consent was obtained from the students and their parents before the survey. The students were assured that their participation was voluntary and that they could withdraw at any time. They were also reassured that their responses would not be accessed by their teachers or parents to reduce concerns about being labelled. The surveys were conducted in classrooms. One or two trained research assistants were present to introduce the surveys using a standard script, provide guidance on completing the questionnaires, and answer queries. The students could choose to complete the questionnaires in either Chinese or English. After completion, the research assistants packed, sealed, and returned the questionnaires to the first author's university. All participants received stationery worth US$5 as a token of thanks after completing each survey.

2.2 Participants

At baseline (T1), 3,748 participants aged 10–20 years (1,591 boys; 357 students in Grades 4–5 and 3,391 students in Grades 7–10) were included in the data analyses as the target study population. The participants were recruited from schools across Hong Kong Island, Kowloon, and New Territory. Majority of them (98.0%) were Chinese, and 2.0% identified themselves as non-Chinese. Of them, 79.6% lived with both parents, whereas 16.3% were from single-parent households, and 3.8% lived with neither parent. Of the participants, 94.6% were from families with medium or high affluence, with only 0.7% from families with low affluence. Tables S.1 shows the baseline demographic characteristics of participants.

At T2, 3,318 participants (1,399 boys; 88.53% of the T1 sample) from four primary schools ($n=322$) and 11 secondary schools ($n=2,996$) remained in the study, and 430 were lost to follow-up. Attrition analysis was conducted between the 3,318 participants who participated at both time points and 430 who participated at T1 only, and no significant differences were found between the two groups across age, sex, or socioeconomic status (SES).

2.3 Measurements

Negative emotion mindsets were measured using the Mindsets of Depression, Anxiety, and Stress Scale (Zhu et al., 2022). This 12-item scale measures the belief-in-change regarding negative emotional states, with four items each for the three subscales: depression, anxiety, and stress mindsets. A sample item includes "When you have a certain level of depression, you really cannot do much to change it." Each item was rated on a 6-point Likert scale from *strongly disagree* to *strongly agree*. A higher mean score for the four subscale items indicated a lower belief-in-change (a more fixed mindset) about depression, anxiety, and stress. Cronbach's alpha (α) of the scale scores in our sample was.94 at both T1 and T2, and McDonald's omega (ω) was.95 at T1 and.94 at T2 for the depression mindset subscale; both α and ω were.94 at T1 and T2 for the anxiety mindset subscale; and both α and ω were.92 at T1 and.91 at T2 for the stress mindset subscale.

Life satisfaction was measured using the validated Chinese version of the Satisfaction with Life Scale (SWLS) (Diener et al., 1985; Sachs, 2003). The scale contains five items, such as "In most ways, my life is close to my ideal." Each item was rated on a 7-point Likert scale from *strongly disagree* to *strongly agree*, with higher mean scores indicating higher life satisfaction. Cronbach's α was.89, and McDonald's ω was.88 at T1; both α and ω were.90 at T2.

Depression was measured using the Chinese version of the Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001; Wang et al., 2014). The scale comprises nine items that measure the frequency of depressive symptoms experienced by respondents in the past two weeks, rated on a 4-point scale ranging from 1 (*not at all*) to 4 (*nearly every day*). An example item is "Little interest or pleasure in doing things." Higher mean scores indicated higher levels of depression severity. Both Cronbach's α and McDonald's ω were.87 at T1 and.86 at T2.

Anxiety was measured using the Chinese version of the Generalized Anxiety Disorder (GAD-7) scale (He et al., 2010; Spitzer et al., 2006). The 7-item scale assesses how often respondents have experienced general anxiety symptoms during the past two weeks using a 4-point scale ranging from 1 (*not at all*) to 4 (*nearly every day*). An example item is "Feeling nervous, anxious, or on edge." Higher mean scores indicated higher levels of anxiety. Both Cronbach's α and McDonald's ω were.92 at T1 and.93 at T2.

Stress was assessed by a single item: "Overall, how much stress do you have in your life right now?" and was rated on a 7-point Likert scale ranging from 1 (*no stress*) to 7 (*high stress*), with higher scores indicating higher levels of perceived stress.

Sociodemographic information including age, sex, grade, and SES was collected. Details of the SES measurement are shown in the Supplemental Information.

Attention-checking questions were included in the T2 survey to screen out participants who did not take the questionnaire seriously. Three attention-checking items were distributed throughout the questionnaire (Schroder et al., 2015), and respondents were asked to select a specific answer from the five options (from 1 = *strongly disagree* to 5 = *strongly agree*). Only those who answered all three items correctly were included in the analyses.

2.4 Statistical Analysis

All analyses were conducted using SPSS version 26 (IBM Corp.) and R (R Core Team, 2020). Specifically, the cross-lagged panel model (CLPM) analyses were performed using the lavaan package in R (Rosseel, 2012). Descriptive statistics for each variable were calculated. Paired-samples *t*-tests were performed to detect changes in depression, anxiety, and stress mindsets and QoL at follow-up compared with baseline, and Pearson correlation analyses were conducted to examine the associations between the variables. CLPM analyses using structural equation modeling were used to examine the directional relationships between depression, anxiety, and stress mindsets and QoL, including life satisfaction and mental health symptoms (anxiety, depression, and stress).

First, we tested the measurement invariance of the studied variables as a prerequisite for the CLPM analyses. To determine the level of measurement invariance among the configural, metric, scalar, and residual models, a decrease in the comparative fit index (CFI) of no more than.01 (Kline, 2015) indicated that the more stringent model should be retained and was therefore preferred. Residual invariance was established for all the studied variables, except the single-item measure of stress.

Maximum likelihood estimation with robust standard errors (Yuan & Bentler, 2000) was applied in the structural equation modeling because this estimate was robust to the non-normality and non-independence of repeated measures data (Marshall et al., 2013). Model fit was evaluated based on the following criteria (Kline, 2015): CFI (good > .95 and acceptable > .90), root-mean-square error of approximation (RMSEA; good < .05 and acceptable < .08), and standardized root-mean-square residual (SRMR; good < .05 and acceptable < .08).

For respondents who failed to correctly answer all three attention-checking items in the T2 survey ($N = 722$), their T1 data were retained; however, their T2 data were treated as missing. Missing data were handled with full information maximum likelihood procedures (Acock, 2005).

The CLPM involved three types of estimates: autoregressive estimates to assess the construct stability of the variables, concurrent estimates to control for within-time associations between variables, and lag estimates to examine the associations between negative emotion mindsets and QoL over time. To control for the effects of the demographic variables on the cross-lagged effects, all the CLPM analyses included age, sex, and SES level (ranging from 2 to 6) as covariates.

Furthermore, to examine whether the cross-lagged effects of depression, anxiety, and stress mindsets and QoL (life satisfaction and mental health symptoms) differed

between boys and girls, subgroup CLPM analyses with age and SES level as covariates were conducted separately for male and female participants. According to the guideline of cross-lagged effects (Orth et al., 2022), an effect size of.01–.04 is considered small;.05–.09 is medium; and above.10 is large.

3 Results

Paired-samples *t*-tests showed no significant difference between the two waves for life satisfaction ($t=1.68$, $p=.093$). However, depression ($t=6.00$, $p<.001$), anxiety ($t=5.79$, $p<.001$), and stress ($t=3.76$, $p<.001$) levels were significantly higher at follow-up.

All the negative emotion mindsets became more fixed at follow-up, which took place during the COVID-19 pandemic ($t=3.09$, $p=.002$ for depression mindset; $t=5.49$, $p<.001$ for anxiety mindset; and $t=3.49$, $p<.001$ for stress mindset).

Table 1 shows the descriptive statistics of and correlation coefficients between all the studied variables across the two waves. All the variables were significantly correlated at the $p<.001$ level in the expected directions. The CLPM of the relationship between depression mindset and life satisfaction (SWLS) fitted the data adequately: $\chi^2(192)=1508.05$, $p<.001$; CFI=.97; RMSEA=.043, 90% confidence interval=[.041,.045]; and SRMR=.073. The CLPM of the relationship between depression mindset and depression level (PHQ-9) also fitted the data: $\chi^2(388)=3009.40$, $p<.001$; CFI=.95; RMSEA=.042, 90% confidence interval=[.041,.044]; and SRMR=.071. Table 2 summarizes the CLPM estimates of the relationship between depression mindset and SWLS/PHQ-9. Depression mindset and SWLS/PHQ-9 were significantly correlated at T1 and T2, and the autoregressive and cross-lagged paths were all significant. Depression mindset predicted life satisfaction and depression level after one year, and life satisfaction and depression level predicted later depression mindset.

The CLPM of the relationship between anxiety mindset and life satisfaction fitted the data adequately: $\chi^2(192)=1542.54$, $p<.001$; CFI=.97; RMSEA=.043, 90% confidence interval=[.041,.045]; and SRMR=.070. The CLPM of the relationship between anxiety mindset and anxiety level (GAD-7) also fitted the data: $\chi^2(282)=2019.33$, $p<.001$; CFI=.97; RMSEA=.041, 90% confidence interval=[.039,.042]; and SRMR=.067. Tables 3 summarizes the CLPM estimates of the relationship between anxiety mindset and SWLS/GAD-7. All the concurrent, autoregressive, and cross-lagged paths for the relationships between anxiety mindset and SWLS/GAD-7 were significant. Anxiety mindset predicted life satisfaction and anxiety level after one year, and life satisfaction and anxiety level predicted anxiety mindset one year later.

The CLPM of the relationship between stress mindset and life satisfaction fitted the data: $\chi^2(192)=1539.69$, $p<.001$; CFI=.97; RMSEA=.043, 90% confidence interval=[.041,.045]; and SRMR=.071. The CLPM of the relationship between stress mindset and level also fitted the data well: $\chi^2(60)=668.08$, $p<.001$; CFI=.97; RMSEA=.052, 90% confidence interval=[.048,.056]; and SRMR=.067. Table 4 shows the CLPM estimates for the relationship between stress mindset and life satisfaction and stress level. All the concurrent, autoregressive, and cross-lagged paths

Table 1 Descriptive statistics and correlations between the variables for the entire sample

	M (SD)	MAnx T1	MDep T1	MStr T1	SWL T1	GAD-7 T1	PHQ-9 T1	Str T1	MAnx T2	MDep T2	MStr T2	SWL T2	GAD-7 T2	PHQ-9 T2	Str T2
MAnx T1	3.06 (1.26)	-													
MDep T1	2.63 (1.26)	.76	-												
MStr T1	3.25 (1.28)	.74	.67	-											
SWL T1	4.24 (1.28)	-.33	-.36	-.32	-										
GAD-7 T1	1.81 (0.76)	.62	.54	.56	-.37	-									
PHQ-9 T1	1.79 (0.63)	.56	.57	.53	-.43	.79	-								
Str T1	4.13 (1.37)	.44	.42	.52	-.34	.57	.54	-							
MAnx T2	3.21 (1.26)	.52	.46	.46	-.29	.45	.42	.37	-						
MDep T2	2.70 (1.23)	.45	.53	.41	-.30	.40	.43	.34	.75	-					
MStr T2	3.36 (1.25)	.44	.41	.50	-.24	.39	.38	.38	.74	.68	-				
SWL T2	4.33 (1.26)	-.27	-.29	-.27	.58	-.30	-.37	-.31	-.39	-.38	-.36	-			
GAD-7 T2	1.91 (0.78)	.44	.41	.41	-.29	.56	.50	.41	.65	.57	.59	-.40	-		
PHQ-9 T2	1.85 (0.62)	.43	.46	.40	-.35	.52	.59	.39	.59	.60	.55	-.46	.78	-	
Str T2	4.24 (1.30)	.34	.34	.40	-.27	.38	.37	.51	.48	.43	.55	-.38	.59	.54	-

M mean, *SD* standard deviation, *T1* Time 1, *T2* Time 2, *MAnx* anxiety mindset (range: 1–6; a higher value indicates a more fixed mindset about anxiety), *MDep* depression mindset (range: 1–6; a higher value indicates a more fixed mindset about depression), *MStr* stress mindset (range: 1–6; a higher value indicates a more fixed mindset about stress), *SWL* satisfaction with life (range: 1–7; a higher value indicates a higher level of life satisfaction), *GAD-7* Generalized Anxiety Disorder-7 scale (range: 1–4; a higher value indicates a higher level of anxiety), *PHQ-9* Patient Health Questionnaire-9 (range: 1–4; a higher value indicates a higher level of depression), *Str* stress (range: 1–7; a higher value indicates a higher level of perceived stress). All correlations were significant at $p<.001$ level

Table 2 Summary of the CLPM results between depression mindset and SWL/PHQ-9 among the entire sample

MDep—SWL	Covariance/Coefficient	*p*	Correlation/Standardized coefficient
Concurrent paths[a]			
MDep T1 and SWL T1	**-.35 [-.38, -.32]**	**<.001**	**-.35**
MDep T2 and SWL T2	**-.36 [-.41, -.30]**	**<.001**	**-.36**
Autoregressive paths[b]			
MDep T1 to MDep T2	**.49 [.44,.53]**	**<.001**	**.43**
SWL T1 to SWL T2	**.54 [.50,.58]**	**<.001**	**.47**
Cross-lagged paths[b]			
MDep T1 to SWL T2	**-.077 [-.12, -.035]**	**<.001**	**-.066**
SWL T1 to MDep T2	**-.12 [-.16, -.074]**	**<.001**	**-.10**
MDep—PHQ-9	Covariance/Coefficient	*p*	Correlation/Standardized coefficient
Concurrent paths[a]			
MDep T1 and PHQ-9 T1	**.59 [.56,.62]**	**<.001**	**.59**
MDep T2 and PHQ-9 T2	**.61 [.57,.64]**	**<.001**	**.61**
Autoregressive paths[b]			
MDep T1 to MDep T2	**.41 [.36,.46]**	**<.001**	**.35**
PHQ-9 T1 to PHQ-9 T2	**.53 [.48,.59]**	**<.001**	**.44**
Cross-lagged paths[b]			
MDep T1 to PHQ-9 T2	**.16 [.12,.21]**	**<.001**	**.14**
PHQ-9 T1 to MDep T2	**.21 [.16,.25]**	**<.001**	**.18**

CLPM cross-lagged panel model, *MDep* depression mindset, *SWL* satisfaction with life, *PHQ-9* Patient Health Questionnaire-9, *T1* Time 1, *T2* Time 2. The CLPM analyses were conducted while controlling for age, sex, and SES level

95% confidence intervals are given in brackets in the Covariance/Coefficient column

Bold values indicate significance at $p < 0.05$

[a] Values indicating covariance/correlation coefficients

[b] Values indicating regression coefficients/standardized regression coefficients

for the relationship between stress mindset and life satisfaction and stress level were significant. Stress mindset predicted life satisfaction and stress level one year later, and life satisfaction and stress level predicted stress mindset after one year.

The subgroup CLPMs all showed good fit (see Table S.2 for detailed fit measures) and revealed distinct patterns for boys and girls regarding the cross-lagged effects between negative emotion mindsets and life satisfaction. There was a unidirectional effect from life satisfaction at T1 to depression, anxiety, and stress mindsets at T2 among boys; however, the cross-lagged paths from depression, anxiety, and stress mindsets at T1 to life satisfaction at T2 were not significant. For girls, both cross-lagged effects from life satisfaction at T1 to depression, anxiety, and stress mindsets at T2 and from depression, anxiety, and stress mindsets at T1 to life satisfaction at T2 were significant (Figs. 1, 2, and 3, respectively). However, the CLPM analysis results showed bidirectional relationships between depression, anxiety, and stress mindsets and depression, anxiety, and stress symptoms among both boys and girls (Figs. S1, S2, and S3, respectively).

Table 3 Summary of the CLPM results between anxiety mindset and SWL/GAD-7 among the entire sample

MAnx—SWL	Covariance/Coefficient	*p*	Correlation/Standardized coefficient
Concurrent paths[a]			
MAnx T1 and SWL T1	**-.33 [-.36, -.30]**	**<.001**	**-.33**
MAnx T2 and SWL T2	**-.38 [-.43, -.33]**	**<.001**	**-.38**
Autoregressive paths[b]			
MAnx T1 to MAnx T2	**.49 [.45,.53]**	**<.001**	**.43**
SWL T1 to SWL T2	**.55 [.51,.59]**	**<.001**	**.47**
Cross-lagged paths[b]			
MAnx T1 to SWL T2	**-.066 [-.11, -.024]**	**.002**	**-.057**
SWL T1 to MAnx T2	**-.13 [-.17, -.090]**	**<.001**	**-.11**
MAnx—GAD-7	Covariance/Coefficient	*p*	Correlation/Standardized coefficient
Concurrent paths[a]			
MAnx T1 and GAD-7 T1	**.63 [.61,.65]**	**<.001**	**.63**
MAnx T2 and GAD-7 T2	**.63 [.60,.66]**	**<.001**	**.63**
Autoregressive paths[b]			
MAnx T1 to MAnx T2	**.40 [.34,.45]**	**<.001**	**.34**
GAD-7 T1 to GAD-7 T2	**.51 [.45,.56]**	**<.001**	**.43**
Cross-lagged paths[b]			
MAnx T1 to GAD-7 T2	**.15 [.094,.20]**	**<.001**	**.12**
GAD-7 T1 to MAnx T2	**.21 [.16,.26]**	**<.001**	**.19**

CLPM cross-lagged panel model, *MAnx* anxiety mindset, *SWL* satisfaction with life, *GAD-7* Generalized Anxiety Disorder-7 scale, *T1* Time 1, *T2* Time 2. The CLPM analyses were conducted while controlling for age, sex, and SES level

95% confidence intervals are given in brackets in the Covariance/Coefficient column

Bold values indicate significance at $p < 0.05$

[a] Values indicating covariance/correlation coefficients

[b] Values indicating regression coefficients/standardized regression coefficients

4 Discussion

This study provides novel evidence that beliefs about the changeability of negative emotions do not only predict future well-being in children and adolescents but also shape their QoL. Specifically, a stronger belief in change about negative emotions predicted better life satisfaction and fewer symptoms of depression, anxiety, and stress one year later, and higher life satisfaction and lower mental health symptoms also fostered a higher level of change belief. The discovery of a self-reinforcing, reciprocal relationship between mindset and well-being, particularly the nuanced sex differences, offers critical insights for mental health promotion. By highlighting the transformative power of adaptive emotion mindsets and the dynamic interplay with QoL, these findings underscore the importance of targeting both beliefs and well-being in interventions. This study paves the way for more effective, tailored strategies to foster resilience and psychological growth in youth. The findings also contribute to theoretical advances in this field.

Table 4 Summary of the CLPM results between stress mindset and SWL/Str among the entire sample

MStr—SWL	Covariance/Coefficient	*p*	Correlation/Standardized coefficient
Concurrent paths[a]			
MStr T1 and SWL T1	**-.31 [-.35, -.28]**	**<.001**	**-.31**
MStr T2 and SWL T2	**-.35 [-.40, -.30]**	**<.001**	**-.35**
Autoregressive paths[b]			
MStr T1 to MStr T2	**.46 [.41,.50]**	**<.001**	**.41**
SWL T1 to SWL T2	**.54 [.50,.59]**	**<.001**	**.47**
Cross-lagged paths[b]			
MStr T1 to SWL T2	**-.083 [-.12, -.044]**	**<.001**	**-.072**
SWL T1 to MStr T2	**-.090 [-.13, -.048]**	**<.001**	**-.081**
MStr—Str	Covariance/Coefficient	*p*	Correlation/Standardized coefficient
Concurrent paths[a]			
MStr T1 and Str T1	**.68 [.64,.72]**	**<.001**	**.50**
MStr T2 and Str T2	**.50 [.45,.55]**	**<.001**	**.45**
Autoregressive paths[b]			
MStr T1 to MStr T2	**.43 [.38,.47]**	**<.001**	**.38**
Str T1 to Str T2	**.38 [.34,.43]**	**<.001**	**.40**
Cross-lagged paths[b]			
MStr T1 to Str T2	**.21 [.16,.27]**	**<.001**	**.16**
Str T1 to MStr T2	**.094 [.061,.13]**	**<.001**	**.11**

CLPM cross-lagged panel model, *MStr* stress mindset, *SWL* satisfaction with life, *Str* stress, *T1* Time 1, *T2* Time 2. The CLPM analyses were conducted while controlling for age, sex, and SES level

95% confidence intervals are given in brackets in the Covariance/Coefficient column

Bold values indicate significance at $p < 0.05$

[a] Values indicating covariance/correlation coefficients

[b] Values indicating regression coefficients/standardized regression coefficients

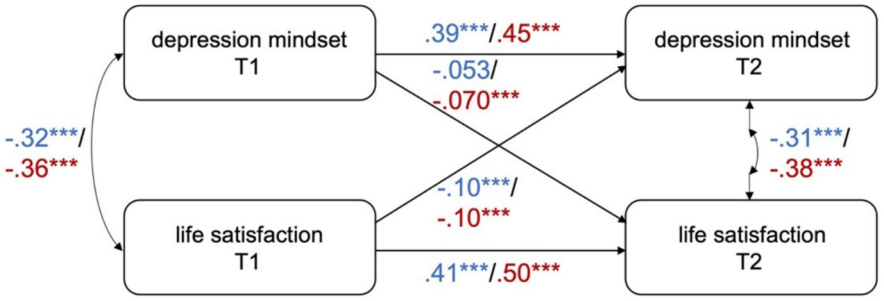

Fig. 1 CLPM results between depression mindset and life satisfaction among boys and girls. The values along the lines are the standardized coefficients of the relevant paths in boys (in blue) and girls (in red). *$p \leq 0.05$, **$p \leq 0.01$, and ***$p \leq 0.001$

4.1 Belief-In-Change As a Launchpad for QoL

The current study reveals that children and adolescents who believe their negative emotions—such as depression, anxiety, and stress—are changeable experience a significant and lasting improvement in their future QoL. Our results were consis-

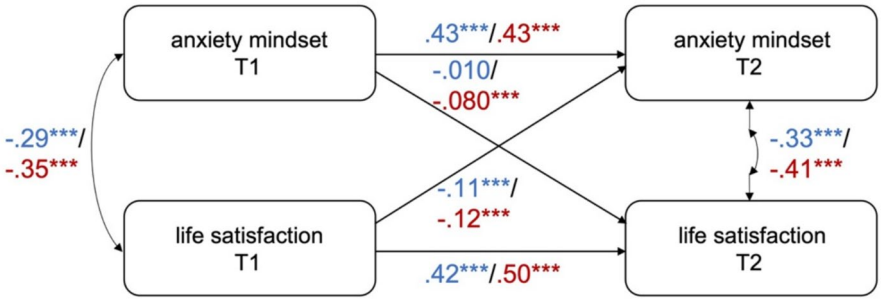

Fig. 2 CLPM results between anxiety mindset and life satisfaction among boys and girls. The values along the lines are the standardized coefficients of the relevant paths in boys (in blue) and girls (in red). *$p \leq 0.05$, **$p \leq 0.01$, and ***$p \leq 0.001$

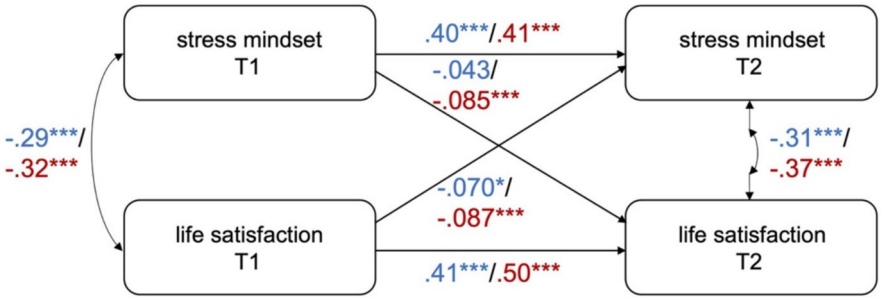

Fig. 3 CLPM results between stress mindset and life satisfaction among boys and girls. The values along the lines are the standardized coefficients of the relevant paths in boys (in blue) and girls (in red). *$p \leq 0.05$, **$p \leq 0.01$, and ***$p \leq 0.001$

tent with those of previous studies that focused on the effects of belief-in-change on psychopathology and well-being (Romero et al., 2014; Schroder et al., 2019a, 2019b; Tamir et al., 2007). This two-wave study expands the investigation to include both life satisfaction and mental health symptoms, consistently supporting belief-in-change as a protective factor for QoL. In addition, this study sharpens the theoretical model on the role of beliefs about emotional changes in QOL (Burnette et al., 2020).

4.2 A Two-Way Street: QoL Shapes Mindset

Significantly, the relationship between mindset and well-being is not unidirectional; higher life satisfaction and fewer mental health symptoms at baseline actively cultivate a stronger belief in the changeability of negative emotions over time. The findings supported the hypothesized bidirectional relationships. Our study sheds light on the understudied effect of QoL on negative emotion mindsets. Life satisfaction and mental health symptoms predicted mindsets of the corresponding emotional symptoms one year later with moderate to large effect sizes.

This observation may be understood in terms of the concepts of learned helplessness, self-reinforcing cycle of psychological distress, and hopelessness. First,

children and adolescents struggling with long-term mental health symptoms may develop learned helplessness and negative beliefs about their capacity for change (Mineka & Zinbarg, 2006; Seligman, 1972). Second, suffering from mental health symptoms may lead to a self-reinforcing cycle of psychological distress, in which negative beliefs and avoidance behaviors exacerbate symptoms and further diminish well-being (Schleider et al., 2015; Schroder et al., 2017). Finally, low QoL may lead to hopelessness and pessimism (Beck et al., 1974). Individuals who feel hopeless about change tend to develop and reinforce fixed mindsets (Dweck, 2006; Schroder et al., 2019a, b). These interconnected processes illustrate how low QoL can undermine belief in emotional change, thereby breeding fixed mindsets that further impede psychological well-being.

4.3 Specific Effect and Autoregression

In addition to the core hypotheses, we found that stress mindset had greater effect on stress levels than depression and anxiety mindsets had on their corresponding symptom levels. Conversely, anxiety and depression levels had greater effect on their corresponding mindsets than stress symptoms had on stress mindset. First, these findings reflect the domain-specificity of mindset (Schroder et al., 2016; Zhu et al., 2020a, b). Second, these findings highlight a nuanced dynamic in which a growth mindset about stress plays a proactive role in regulating stress levels, potentially because stress is often perceived as more situational and manageable. By contrast, anxiety and depression symptoms appear to exert a stronger influence on their related mindsets, suggesting that these emotional states may more deeply shape one's beliefs about their emotional changeability over time (Zhu et al., 2022). Finally, this bidirectional pattern implies that interventions targeting stress mindsets may effectively reduce stress symptoms directly, whereas addressing anxiety and depression symptoms may be crucial to shifting fixed mindsets associated with more entrenched emotional challenges.

The autoregression results were all significant with large effect sizes, confirming that the measures were relatively stable across time. The concurrent strong associations showed that the belief that negative emotional states can change was closely associated with life satisfaction and mental health. The reciprocal longitudinal relationships between QoL and emotion mindsets further consolidated their close relationships.

4.4 Sex Differences in the Relationship between Emotion Mindset and QoL

Subgroup analyses suggest that the bidirectional interplay between negative emotion mindsets and QoL differs by sex, which is novel in the scientific literature. All bidirectional relationships exist among girls, indicating that mindsets of each negative emotion can influence and are influenced by corresponding mental health symptoms and life satisfaction. By contrast, life satisfaction among boys influences mindsets but not vice versa, whereas a bidirectional relationship only exist between mindsets and mental health. The current study has uncovered the specific sex differences. These differences may be associated with sex differences in cognitive process of negative emotions and coping strategies. Girls are more vulnerable to negative emo-

tions (Mak et al., 2009); thus, girls with a stronger belief in the changeability of negative emotions may adopt more adaptive coping strategies and exhibit less negative emotions and higher life satisfaction (Kneeland et al., 2016; Schroder et al., 2015; Zhu & Wong, 2022). Boys are more likely to use problem-focused or avoidant coping rather than emotion-focused coping, which may make their beliefs about negative emotions less relevant to their overall life satisfaction (Nolen-Hoeksema, 2012; Tamres et al., 2002). Boys are often socialized to suppress or minimize emotional expression and are less likely to engage in introspective or emotion-focused coping (Rose & Rudolph, 2006), which also weakens the relationship between mindset and life satisfaction. Although this longitudinal study extended the current literature on sex differences in mindset and QoL, more research is required to clarify the distinct mechanisms by which mindset functions among sexes.

4.5 Implications

The results have important theoretical and practical implications for promoting QoL among adolescents. Rather than limiting our focus to how mindsets shape QoL, this study has found that adolescents' QoL, in turn, reshapes their beliefs about the changeability of negative emotions. The bidirectional influences of adolescents' QoL and belief-in-change help explain the mechanism of the vicious cycle in mental health literature. By highlighting the importance of adolescents' QoL on their development and the reciprocal importance of belief-in-change, this study sheds light on the mechanism of mutual reinforcement between emotion mindsets and well-being. Thus, this study is an important addition to the literature by uncovering the longitudinal association between QoL and mindsets of Chinese children and adolescents and complementing the understanding of the mechanism.

Belief-in-change could be an intervention focus for promoting QoL among adolescents. While the cross-lagged associations imply a potential vicious circle for individuals who suffer from low life satisfaction and mental health symptoms, it also sheds light on the potential intervention of nurturing growth mindset to foster virtuous circle for QoL. Adolescents, particularly girls, may experience frequent emotional fluctuations and are vulnerable to mental health symptoms; thus, cultivating a mindset that negative emotional states can change may ease their worry and prompt positive coping strategies that improve their overall life satisfaction. Some interventions designed to address mindsets have shown promising efficacy (see (Jiang et al., 2022) for a review). Thus, promoting belief-in-change, specifically for negative emotional states, could strengthen the efficacy and effectiveness of QoL interventions. Moreover, pre-assessing beliefs about change and explicitly focusing on enhancing the belief that emotions are malleable could also enhance engagement with and efficacy of subsequent cognitive interventions and coping training. As this study was conducted during the COVID-19 pandemic, it served as additional evidence that highlighted the importance of strengthening individual resilience through developing a more positive emotion mindset (Shek et al., 2023).

The present study highlights belief-in-change as a promising factor for promoting QoL among children and adolescents. Mindset is a modifiable factor that can be incorporated into interventions. A mindset intervention not only has the potential to

relieve adolescents' mental health symptoms but is also likely to help improve their satisfaction with life, particularly among girls. Furthermore, these results suggest that adolescents' mindsets can be shaped through QoL. Children and adolescents who are experiencing mental health symptoms and low life satisfaction may develop fixed mindsets about their emotional distress, which may in turn further reduce their QoL. Providing additional support and resources, particularly those that foster belief in change, shall be helpful for adolescents in need.

4.6 Limitations

This study is a pioneer in this field; however, it has some limitations. First, the measures were self-reported. Although we adopted attention-checking items to screen out inattentive responses, the self-reported responses might have been influenced by social desirability. Future studies could use more objective measures such as peer assessment. Second, as we focused on the general adolescent population, the findings of this study might not apply to clinical populations. Third, although a two-wave CLPM identified the longitudinal relationships to some extent, it was not possible to separate between- and within-person variances; thus, we could not distinguish between over-time effects within individuals and between-person effects. Future studies should collect more waves of data and use other analyses such as the random-intercept CLPM. Finally, the study was conducted in a Chinese population. Although research conducted in Western cultures has also highlighted the effects of mindsets, further studies are helpful to consolidate the bidirectional relationship between belief-in-change and QoL across cultures.

5 Conclusion

This longitudinal study reveals the reciprocal relationship between negative emotion mindsets and QoL in children and adolescents, which is novel in the scientific literature. While believing in the changeability of negative emotions predicts greater life satisfaction and fewer mental health symptoms over time, higher QoL also strengthens these adaptive beliefs. Theoretically, the results draw vital attention to the role of QoL in shaping young individuals' beliefs about emotional change, underscoring the need to support both mindset and well-being to spark a positive cycle for QoL. Practically, because mindset is a modifiable factor, these findings highlight the transformative potential of interventions that foster a growth mindset about emotions.

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Data Availability The datasets are available from the corresponding author upon reasonable request.

Declarations

Ethics Approval Ethics approval was obtained from the Human Subjects Ethics Sub-Committee of the Hong Kong Polytechnic University (Ref: HSEARS20210414004-02).

Consent to Participate Parental and respondents' consent were both acquired before the study.

Competing interests The authors declare that they have no competing interests.

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