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Chan, H.-S. ORCID: <https://orcid.org/0000-0003-4661-8722>,
Tong, Y.-Y. ORCID: <https://orcid.org/0000-0002-0858-9070>,
Lee, S.-L. ORCID: <https://orcid.org/0000-0001-7158-3651> and
Chiu, C.-Y. ORCID: <https://orcid.org/0000-0002-3810-6666>
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Consistency of interest mediates the positive relationship between growth mindset and presence of meaning in life among Hong Kong adolescents: A cross-lagged panel study

Hiu-Sze Chan¹  | Yuk-Yue Tong²  | Sau-Lai Lee³  |
Chi-Yue Chiu³ 

¹Department of Sociology, the Chinese University of Hong Kong, Hong Kong, SAR, China

²School of Psychology and Clinical Language Sciences, University of Reading, UK

³Faculty of Social Science, the Chinese University of Hong Kong, Hong Kong, SAR, China

Correspondence

Hiu-Sze Chan, The Department of Sociology, The Chinese University of Hong Kong, Shatin, Hong Kong.
Email: vinchan@link.cuhk.edu.hk

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Abstract

Meaning in life protects individuals from mental distress during social upheaval. We posit that a growth mindset and consistency of interest positively predict meaning in life during social upheaval. The present research tested the hypothesis that among adolescence living in a period of social upheaval, the presence of a growth mindset (the belief in malleability of valued personal attributes) positively predicts persistent engagement in purpose-congruent interests (consistency of interest), which in turn positively predicts the feeling that life is meaningful (presence of meaning in life). To test this hypothesis and to clarify the temporal causal connections among growth mindset, consistency of interest, and presence of meaning in life, we conducted a 3-wave longitudinal cross-lagged panel study with 275 Hong Kong adolescents between late 2017 and early 2020, which covered a period of social upheaval. As hypothesized, having a growth mindset predicted meaning in life two years later through the mediating effect of consistency of interest. These findings extended past findings by identifying a new causal

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pathway for the temporal causal effects of a growth mindset on the presence of meaning in life over two years in a population and context with high vulnerability to mental distress. (193 words).

KEYWORDS

adolescents, consistency of interest, growth mindset, Hong Kong, meaning in life

INTRODUCTION

Meaning in life refers to the “cognitive and an emotional assessment of whether one's life has purpose and value” (Baumeister et al., 2013, p. 506). As a psychological construct, meaning in life has two components: presence of meaning and the motivation to search for meaning (Steger et al., 2006). People find meaning in life when their life experiences are coherent (comprehensible), purposeful (having clear future goals and a developmental path), and significant (capable of making a difference; Martela & Steger, 2016). People leading more meaningful lives are healthier; they spend fewer nights in the hospital (Kim et al., 2014) and their immune system is stronger (Cole, 2019).

The present research seeks to identify the psychological factors that positively predict the extent to which adolescents in Hong Kong could maintain a sense of meaning in life (presence of life meaning) during social upheaval. The rationale for the selection of this focus in the present research is as follows.

First, at uncertain times (e.g., during social upheaval), the unpredictability and uncontrollability of the external environment could give rise to psychological stress that hurts individuals' mental health. Hong Kong went through a turbulent summer in 2019 when the city was rocked by protests and civil unrest. A population-based prospective cohort study conducted in Hong Kong showed that the prevalence of probable depression increased from 1.9% in 2009 to 6.5% in 2014 during the Occupy Central Movement and 11.2% in 2019 during the 2019 social upheaval (Ni et al., 2020). Prevalence of suspected post-traumatic stress disorder was estimated to be 12.8% in 2019. An excess 12% mental health service was required to meet the increased mental health burden caused by the social upheaval.

Among adolescents in Hong Kong, high stress arising from 2019 political life events was related to high mental distress (Chang et al., 2021). The 2019 social upheaval in Hong Kong also provides an opportunity to study the psychological factors that protect adolescents from mental distress during a turbulent period. During the social protests, many young people suffered from “a sense of disappointment and hopelessness toward Hong Kong's future” (Lai-LaGrotteria, 2021, p. 14) as well as pessimism about their future (J.-B. Li, 2020; J.-B. Li et al., 2021; P. F. J. Li et al., 2019).

In this context, research showed that meaning in life was negatively associated with Hong Kong adolescents' pessimistic future outlook evoked by social upheaval (Ho et al., 2010) and was a major protector factor on their mental distress (Chang et al., 2021). However, few studies have investigated the psychological factors that would predict adolescents' meaning in life during a turbulent period in society (Chang et al., 2021), although some studies have examined adolescents' meaning in life during the COVID-19 pandemic (e.g., Masuyama et al., 2021).

We contend that a growth mindset and consistency of interest are two predictors of the presence of meaning in life. Growth mindset is the belief that one's valued attributes can develop (Dweck et al., 1995; Dweck & Leggett, 1988). In contrast, a fixed mindset is the belief that these attributes are immutable. Consistency of interest, as a key component of grit, refers to the extent to which people can sustain their interest in a pursuit and remain passionate about it despite recurring distractions (Duckworth et al., 2007; Jachimowicz et al., 2018).

Two other factors have motivated our choice to focus on the psychological correlates of meaning in life among adolescents in Hong Kong. First, in 2013, Oishi and Diener (2014) conducted a survey of meaning in life in 132 societies. Among these 132 societies, Hong Kong had the highest percentage of residents who reported having no important purpose or meaning (about 35%). This finding highlights the need to identify the psychological factors that can inform psychological intervention in an affluent city with a low level of meaning in life.

Second, adolescence is a critical period in the development of meaning in life, which is linked to young people's concern for the world (Damon et al., 2003). During this developmental stage, being able to find meaning in life is important for mental wellbeing (Krok, 2018; Lin et al., 2021; Pfeifer & Berkman, 2018). However, the stress arising from social unrest in Hong Kong could evoke among adolescents negative beliefs about the world (Wong et al., 2024). Research that identifies the psychological factors that positively predict meaning in life during social unrest would have important implications for maintaining and promoting adolescents' mental health at uncertain times.

In the present study, we tested in a 3-wave longitudinal study whether the presence of a growth mindset positively predicts adolescents' meaning in life via the mediation of consistency of interest during a period of social upheaval. As mentioned, as a psychological construct, meaning in life has two components: Presence of meaning and the motivation to search for meaning (Steger et al., 2006). We focus on the presence of meaning in the present research because of our interest in testing whether growth mindset can protect adolescents from *erosion of meaning in life during social upheaval*, and because only the presence of meaning in life was associated with strong identification with present commitments (which is related to consistency of interest) (Negru-Subtirica et al., 2016). In addition, there is also evidence that presence of meaning in life has a stronger positive relationship with other well-being constructs, such as life satisfaction (J.-B. Li et al., 2021).

Growth mindset and presence of meaning in life

Theoretically, growth mindset supports the expectancy that one can grow by learning to meet challenges (Lee & Jang, 2018), a key component of meaning in life (Feldman & Snyder, 2005). Individuals who present a growth mindset tend to be mastery-oriented; they seek challenges and strive to improve their competence. In contrast, individuals who present a fixed mindset tend to judge whether they are competent or not based on their performance. They also tend not to take on challenging tasks to avoid exposing their shortcomings (Dweck & Leggett, 1988). Consistent with the theory, research has shown that among adolescents, the presence of a growth mindset is positively associated with the presence of meaning in life (e.g., Tang et al., 2022; Zhao et al., 2023a). Furthermore, laboratory experiments showed that a momentarily induced growth (vs. fixed) mindset could make adolescents feel that their life is more meaningful (Zhao et al., 2023b).

The mediating role of consistency of interest

We further posit that consistency of interest (or passion for longer-term goals) mediates the link between growth mindset and presence of meaning in life. There are two reasons why consistency of interest may mediate the growth mindset \rightarrow presence of meaning in a life relationship. First, according to the Self-Concordance Model (Sheldon & Elliot, 1999), the pursuit of goals consistent with one's interests may increase the salience of the purpose in life. Supporting this model, research has revealed a positive correlation between consistency of interest and presence of meaning in life (Negru-Subtirica et al., 2016; Von Culin et al., 2014). Furthermore, interventions designed to promote persistent pursuits of personally significant interests can increase meaning in life (Schippers & Ziegler, 2019).

Additionally, consistency of interest could play an important role in maintaining meaning in life *during social upheaval*. This is because, during social upheaval, unpredictable and uncontrollable life experiences may generate disruptions and distractions in the pursuit of one's interest. Consistency of interest, as a psychological capacity to sustain interest in a goal pursuit despite recurring disruptions and distractions (Duckworth et al., 2007; Jachimowicz et al., 2018), may therefore play an important role in maintaining meaning in life during social upheaval. Indeed, there is evidence that consistency of interest mitigates the level of psychological distress (Masuyama et al., 2021) and predicts lower levels of anxiety and stress during adversity (Zhang et al., 2018).

Second, growth mindset supports continual goal engagement and consistency of interest in challenging situations. Specifically, the presence of a growth mindset orients young people to believe that pursuing an interest would involve some setbacks and difficulties and hence prepares them to take adaptive strategies to overcome obstacles and maintain their interests (O'Keefe et al., 2018). Consistent with this idea, past research has found a positive association between growth mindset and grit, of which consistency of interest is a major component (Park et al., 2020). Past research has also shown that among adolescents, presence of meaning in life is positively related to grit (Datu et al., 2019). Finally, two studies have found that among Chinese students and nurses, the presence of a growth mindset had a significant indirect effect on meaning in life through the mediating effect of grit (Lan et al., 2019; Tang et al., 2022). However, these studies did not test the mediation role of consistency of interest. Furthermore, the cross-sectional nature of these studies does not afford conclusive causal inferences.

Both consistency of interest and perseverance of effort are the components of grit (Jachimowicz et al., 2018). In the present study, we focus on the mediation role of consistency of interest in the growth mindset \rightarrow presence of meaning in life relationship. This is because, according to the goal engagement literature, continual engagement in the goals that are congruent with their purpose in life renders life meaning salient, whereas purpose in life supports self-control and self-regulation (Lewis, 2020). From this perspective, although both consistency of interest and perseverance of effort are positively correlated with meaning in life, consistency of interests is a contributor to and perseverance of effort is a reflection of life meaning.

In summary, the present study examined the role of consistency of interest as a possible mediator of the growth mindset \rightarrow presence of meaning in life link, drawing on the goal engagement literature (Lewis, 2020). Finally, to extend the works conducted in the cross-sectional studies and laboratory experiments (e.g., Tang et al., 2022; Zhao et al., 2023a), the present study used a longitudinal design to test the long-term temporal causal effects of growth mindset and consistency of interest on presence of meaning in life in a naturalistic context, in which a

vulnerable adolescent population was exposed to abrupt socio-political changes and encountered unpredictable and uncontrollable life experiences. Our hypotheses are as follows:

- H1.** The presence of growth mindset is related to higher consistency of interest.
- H2.** Consistency of interest is associated with a stronger presence of meaning in life.
- H3.** Consistency of interest mediates the relationship between a growth mindset and the presence of meaning in life.

METHOD

The present study was a 3-wave longitudinal study conducted between late 2017 and early 2020, which covered a period of social upheaval. The Occupy Central Movement, the first major political confrontation with the Hong Kong Government, took place in 2014. We started our data collection in late 2017. About 18 months after the data collection of Wave 1, in response to the introduction of Anti-Extradition Law Amendment Bill, the 2019–2020 Hong Kong mass protests started. Since March 15, 2019, conflicts between police and activists had become increasingly violent. Wave 2 data were collected shortly before the social upheaval and the last wave was conducted during the social upheaval. A longitudinal cross-lagged panel design (Kearney, 2017) was used to test the temporal relationship between growth mindset, consistency of interest, and presence of meaning in life. Ethical approval was obtained from the research ethics committee of the Chinese University of Hong Kong.

Participants and procedures

The participants were Chinese students from three high schools in Hong Kong. When the study started, the mean age of the participants was 13.29 ($SD = 1.61$). These three schools joined a teacher development program and volunteered to participate in the present research so that they could learn from the research results of their students' psychological development during the program period. When the program started, the students were in their seventh ($N = 289$) or tenth grade ($N = 140$). They completed a survey annually for three consecutive academic years. The data from Wave 1 and Wave 2 were collected before the social upheaval, from December 2017 to January 2018 and from December 2018 to January 2019, respectively. Wave 3 was conducted between December 2019 and January 2020, about nine months after the start of mass protests.

About one-third of the participants ($N = 154$; 35.9%) did not participate in the second or third survey. Some students did not have parental consent to join the second or third wave of the study (22.6%); some had moved to another school (6.1%); and some were absent on the day the surveys were administered in their schools (7.2%). Only the data of those who had completed all three surveys were included in the analysis ($N = 275$). The final sample consisted of 188 participants who joined the study in their seventh grade (mean age = 12.25, $SD = 0.67$), and 87 participants who joined in their tenth grade (mean age = 15.40, $SD = 0.66$). As shown in Table 1, there were no differences in the means of growth mindset, consistency of interest,

TABLE 1 Mean and standard deviation of growth mindset, consistency of interest, and presence of meaning in life in wave 1 (baseline measures) of the included and excluded participants.

| | Mean (SD) | | <i>t</i> (<i>p</i>) |
|-------------------------|-----------------------|-----------------------|-----------------------|
| | Included participants | Excluded participants | |
| Growth mindset | 3.75 (0.87) | 3.70 (0.95) | −0.56 (0.57) |
| Consistency of interest | 2.25 (0.57) | 2.30 (0.68) | 0.82 (0.41) |
| Meaning in life | 2.90 (0.74) | 2.97 (0.72) | 0.93 (0.35) |

and presence of meaning in life at Wave 1 (baseline measures) between the participants included in the analysis and those who were excluded. Half of the participants were female (50.2%). Parental consent and participant assent were obtained for the students' participation.

Measures

The survey included items measuring variables in positive psychology, including growth mindset, consistency of interest, presence of meaning in life, achievement goals, and emotions. In the present study, we only used data from the measures of growth mindset, consistency of interest, meaning in life, some pertinent control variables (see below), and demographic variables. A Chinese-English bilingual translated the original English measures into Chinese. Next, another Chinese-English bilingual reviewed the translated measures to ensure their translation equivalence. Finally, the secondary school teachers in the participating schools reviewed the measures to ensure the wording was comprehensible to their students.

The growth mindset measure (Dweck, 1999) consisted of 3 items, and a sample item was: “You can substantially change how intelligent you are.” Participants indicated their extent of agreement with each item on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The mean of these three items was used to form the growth mindset measure. Higher scores indicated stronger endorsement of growth mindset ($\alpha = .83, .83, \text{ and } .78$ at Wave 1, Wave 2, and Wave 3, respectively).

We measured the consistency of interest with a subscale of the Short Grit Scale (Grit – S; Duckworth & Quinn, 2009), which consisted of four items. A sample item was: “I often set a goal but later choose to pursue a different one” (reverse scored). Participants indicated their extent of agreement with each item on a 4-point Likert scale from 1 (*Completely disagree*) to 4 (*Completely agree*). The mean of the four items was used to form the consistency of interest measure. Higher scores reflected greater consistency of interest ($\alpha = .66, .66, \text{ and } .64$ at Wave 1, Wave 2, and Wave 3, respectively).

The Meaning in Life Questionnaire (MLQ; Steger et al., 2006) is a widely used measure of meaning in life. To avoid repetitions of the same idea across multiple items, only three of five items from the Presence of Meaning Subscale were used in the current study. A sample item was: “My life has a clear sense of purpose.” These three items were selected because the item-response theory analysis of our pilot data showed that these three items had the highest discriminant power. The participants used a 4-point Likert scale from 1 (*Absolutely untrue*) to 4 (*Absolutely true*) to indicate their agreement with each item. The mean of the three items formed the meaning in life measure. Participants who found their life meaningful would score high on this measure ($\alpha = .88$ in Wave 1, $.80$ in Wave 2, and $.79$ in Wave 3).

To verify our assumption that our participants' meaning in life was linked to their experiences during the social upheaval, we also measured at Wave 3 the participants' appraisal of living in Hong Kong now and in the next 10 years. We used appraisal of living in Hong Kong as a proxy for experiences with the sociopolitical unrest because many secondary school students actively participated in the protests and it would be too sensitive to directly ask questions about their experiences in these social events. Our measure consisted of two items: "Do you agree that people in Hong Kong live a prosperous and satisfied life" and "Do you believe that people in Hong Kong will live a prosperous and satisfied life in the next 10 years". Participants indicated their extent of agreement with each item on a 6-point Likert scale from 1 (*Completely disagree*) to 6 (*Completely agree*). The mean of these two items was used to form a measure of confidence in Hong Kong, with higher scores reflecting greater confidence ($\alpha = .76$).

Gender, grade at Wave 1, school the participants belonged to, and whether the students used different media (paper or computerized forms) in the three waves were included as control variables in the analysis.

The data used in the present study are available in Open Science at <https://osf.io/2waj6/>.

Analysis

Cross-lagged panel model (CLPM) has been widely used to investigate reciprocal relationships between variables over time, controlling for autoregressive relationships (Kearney, 2017). This model can be applied to test the temporal causal relationship of variables in a longitudinal study. To test our hypothesis, we used the random-intercept cross-lagged panel model (RI-CLPM), which is a modified version of CLPM (Hamaker et al., 2015). In this model, the data are nested within the individual. The between-person variance can be controlled for and only within-person variance is retained in testing the lagged relationship. Besides the hypothesized path, all possible alternative paths (see Table 4) were tested to identify the model of best fit. The stability of the variables over time was controlled for in the models.

To elaborate, unconstrained baseline models and the models with constraints on both autoregressive paths and cross-lagged paths were compared to select the most parsimonious models. First, bivariate models were constructed to test the cross-lagged relationship between growth mindset and consistency of interest, and between consistency of interest and presence of meaning in life. If any cross-lagged paths from growth mindset to consistency of interest and from consistency of interest to presence of meaning in life were significant in the bivariate models, we would conduct a test of the mediation model that included all three variables. In this mediation model (see Figure 1), the indirect effect (the effect of growth mindset at Wave 1 on presence of meaning in life at Wave 3 through consistency of interest), the direct effect (the effect of growth mindset at Wave 1 on presence of meaning in life at Wave 3 that was not mediated by the consistency of interest), and the total effect (the sum of direct effect and indirect effect) would be evaluated. The bootstrapping method (number of bootstrapping samples = 1,000) was used to estimate the indirect effect.

The package 'lavaan' in the software R was used to evaluate the specific indirect effect, direct effect, and total effect. Two criteria were used to indicate a model with good fit: (1) the comparative fit index (CFI) was more than 0.90, and (2) the root mean square error of approximation (RMSEA) was less than 0.08 (Hooper et al., 2008; Hu & Bentler, 1999). The percentage of missing data in the dataset was 9.1%. Following Jakobsen et al.'s (2017) recommendation, we

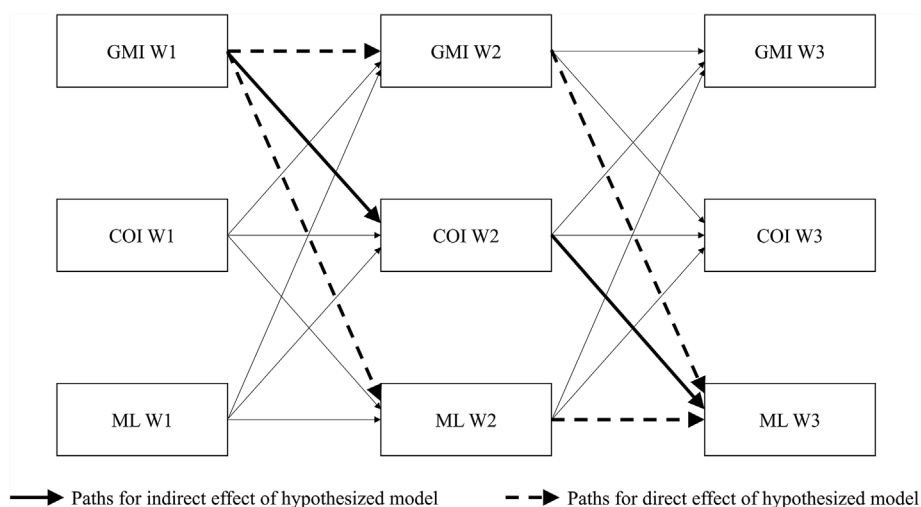


FIGURE 1 Consistency of interest (Wave 2) mediated the association of growth mindset (Wave 1) and meaning in life (Wave 3). *Note:* GMI = growth mindset in intelligence; COI = consistency of interest; ML = meaning in life; W1 = Wave 1, W2 = Wave 2, W3 = Wave 3.

applied the full information maximum likelihood (FIML) method, a method that uses all available data, including partially missing or fully observed data, to produce parameter estimates that maximize the likelihood function. We applied this method because of its superior performance compared to other traditional methods of handling missing data (Enders & Bandalos, 2001; Xiao & Bulut, 2020).

RESULTS

Association of sociopolitical perception and presence of meaning in life

The result was consistent with our assumption that our participants' presence of meaning in life was related to their experiences during the social upheaval. Specifically, we found a significant positive correlation between participants' presence of meaning in life and their perception of the extent to which Hong Kong people were living a prosperous and satisfied life now and would live a prosperous and satisfied life in the next 10 years ($r = .12, p < .05$) in Wave 3 (after the mass protests had started). The size of the correlation was small because of the indirect way we used to measure experiences with the sociopolitical disturbances.

Descriptive statistics

The descriptive statistics and zero-order correlations among the measured variables are shown in Table 2. First, we examined the temporal stability coefficients of the measured variables. As shown in Table 2, the correlations of the same variable measured at different waves were significant, although the sizes of the correlations were moderate (growth mindset: $r = .32$ – $.49$; consistency of interest: $r = .25$ – $.41$; meaning in life: $r = .33$ – $.39$).

TABLE 2 Mean, standard deviation, and correlation of measured variables.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 1 Growth mindset W1 | | | | | | | | | | |
| 2 Growth mindset W2 | .39** | | | | | | | | | |
| 3 Growth mindset W3 | .32** | .49** | | | | | | | | |
| 4 Consistency of interest W1 | -.16** | .01 | -.09 | | | | | | | |
| 5 Consistency of interest W2 | .17** | .15* | .20** | .25** | | | | | | |
| 6 Consistency of interest W3 | -.01 | .12* | .14* | .35** | .41** | | | | | |
| 7 Meaning in life W1 | .36** | .21** | .16** | .00 | .20** | .17** | | | | |
| 8 Meaning in life W2 | .27** | .31** | .23** | -.01 | .18** | .23** | .37** | | | |
| 9 Meaning in life W3 | .25** | .25** | .43** | -.01 | .29** | .21** | .33** | .39** | | |
| 10 Appraisal of life in Hong Kong W3 | .16** | .16** | .12* | .00 | .13* | .04 | .14* | -.01 | .17** | |
| <i>M</i> | 3.75 | 3.45 | 3.40 | 2.25 | 2.33 | 2.25 | 2.90 | 2.81 | 2.84 | 3.47 |
| <i>SD</i> | 0.87 | 1.07 | 0.96 | 0.57 | 0.58 | 0.51 | 0.74 | 0.76 | 0.68 | 1.12 |

Abbreviations: W1, Wave 1; W2, Wave 2; W3, Wave 3.

p* < .05, and *p* < .01.

Cross-sectional correlations

Next, we examined the cross-sectional correlations. The cross-sectional correlations between growth mindset and presence of meaning in life were moderate ($r = .31-.43$). Growth mindset and consistency of interest were positively correlated at Wave 2 ($r = .15$) and Wave 3 ($r = .14$). In addition, consistency of interest was positively correlated with presence of meaning in life at Wave 2 ($r = .18$) and Wave 3 ($r = .21$). Unexpectedly, at Wave 1, consistency of interest was negatively correlated with growth mindset ($r = -.16$) and unrelated to presence of meaning in life ($r < .01$).

Cross-lagged panel model and mediation

Before conducting cross-lagged panel analysis, a post-hoc power analysis for structural equation models (Moshagen & Erdfelder, 2016) was conducted to check the statistical power of the model. With $N = 275$, degree of freedom = 39, and RMSEA = 0.06, the statistical power (0.95) in the present study was adequate.

The model fit indices and comparisons of unconstrained baseline models and constrained models are presented in Table 3. The χ^2 difference tests in all comparisons were significant. Thus, unconstrained baseline models should be used in all bivariate models and the mediation model (Werner & Schermelleh-Engel, 2010). Most of the unconstrained baseline models had an acceptable fit to the data.

In the bivariate model of growth mindset and consistency of interest, all cross-lagged paths were significant except the path from consistency of interest at Wave 1 to growth mindset at Wave 2 (Figure 2a). In the bivariate model of consistency of interest and presence of meaning in life, the path from the consistency of interest at Wave 2 to presence of meaning in life at Wave 3 was significant (Figure 2b). Other cross-lagged paths were nonsignificant.

Next, we constructed a mediation model to test the hypothesized mediation effect. The mediation model with standardized coefficients is shown in Figure 3. When controlling for their stability over time, the paths for indirect effect in the hypothesized mediation model were

TABLE 3 Fit indices and model comparisons

| Models | Model fit indices | | | | | Comparison | | |
|-----------------------------------------------------------------|-------------------|----|------|-------|---------|-----------------|-------------|-------|
| | χ^2 | Df | CFI | RMSEA | BIC | $\Delta \chi^2$ | Δdf | p |
| Bivariate model 1 (growth mindset and consistency of interest) | | | | | | | | |
| Baseline | 44.62 | 25 | 0.93 | 0.05 | 3533.40 | | | |
| Constrained | 63.98 | 32 | 0.89 | 0.06 | 3513.47 | 19.36 | 7 | .007 |
| Bivariate model 2 (consistency of interest and meaning in life) | | | | | | | | |
| Baseline | 62.33 | 25 | 0.87 | 0.07 | 3111.00 | | | |
| Constrained | 94.26 | 32 | 0.78 | 0.08 | 3103.64 | 31.93 | 7 | <.001 |
| Mediation model | | | | | | | | |
| Baseline | 82.13 | 39 | 0.92 | 0.06 | 5271.22 | | | |
| Constrained | 121.24 | 53 | 0.87 | 0.07 | 5231.75 | 39.12 | 14 | <.001 |

Abbreviations: BIC, Bayesian information criterion; CFI, comparative fit index; RMSEA, root mean square error of approximation.

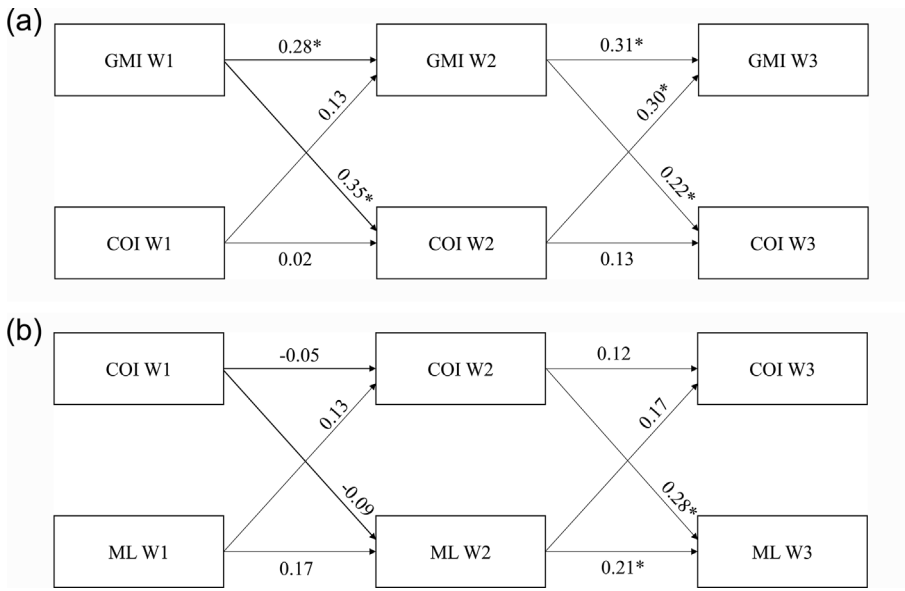


FIGURE 2 Standardized coefficients of bivariate models of (a) growth mindset and consistency of interest, and (b) consistency of interest and meaning in life. Note: GMI = growth mindset in intelligence; COI = consistency of interest; ML = meaning in life; W1 = Wave 1, W2 = Wave 2, W3 = Wave 3, * $p < .05$.

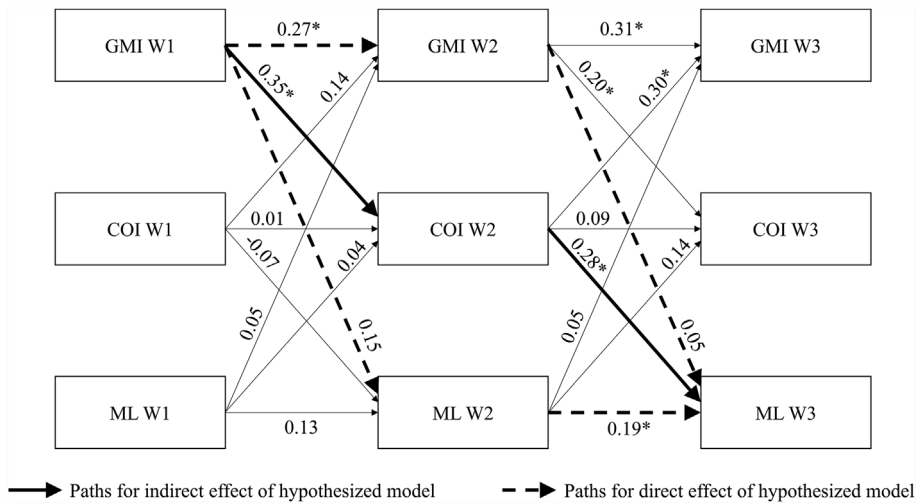


FIGURE 3 Standardized coefficients of mediation model. Note: GMI = growth mindset in intelligence; COI = consistency of interest; ML = meaning in life; W1 = Wave 1, W2 = Wave 2, W3 = Wave 3; * $p < .05$.

significant. In keeping with our mediation hypothesis, the growth mindset at Wave 1 predicted an increase in consistency of interest at Wave 2. Consistency of interest at Wave 2 predicted an increase in presence of meaning in life at Wave 3. Aside from the hypothesized paths, only the path whereby consistency of interest at Wave 2 predicted an increase of growth mindset at Wave 3, and the path whereby growth mindset at Wave 2 predicted an increase of consistency

TABLE 4 Total effect, direct effect, and indirect effect of the mediation model.

| | Standardized estimate (unstandardized estimate) | | |
|-----------------------------------|-------------------------------------------------|---------------|-----------------|
| | Total effect | Direct effect | Indirect effect |
| Hypothesized mediation pathway | | | |
| GMI → COI → ML | 0.14 (0.11)* | 0.04 (0.03) | 0.10 (0.07)* |
| Other possible mediation pathways | | | |
| GMI → ML → COI | 0.11 (0.06)* | 0.09 (0.05)* | 0.02 (0.01) |
| COI → GMI → ML | -0.002 (-0.003) | -0.01 (-0.01) | 0.01 (0.01) |
| COI → ML → GMI | 0.04 (0.09) | 0.05 (0.09) | -0.003 (0.01) |
| ML → GMI → COI | 0.03 (0.02) | 0.02 (0.01) | 0.01 (0.01) |
| ML → COI → GMI | 0.04 (0.05) | 0.02 (0.03) | 0.01 (0.02) |

Abbreviations: GMI, growth mindset in intelligence; COI, consistency of interest; ML, meaning in life.

* $p < .05$.

of interest at Wave 3 were significant. All other paths were nonsignificant. The two autoregressive paths of growth mindset and the path of presence of meaning in life from Wave 2 to Wave 3 were significant, while all autoregressive paths of consistency of interest and the path of presence of meaning in life from Wave 1 to Wave 2 were not significant.

As illustrated in Table 4, the mediation model supported the hypothesized mediation effect. Consistent with our hypothesis, growth mindset at Wave 1 had a significant indirect effect on meaning in life at Wave 3 through consistency of interest at Wave 2 ($\beta = 0.10$, $b = 0.07$, $SE = 0.04$, $p = 0.049$). The direct effect was not significant. The indirect effects of other possible mediation pathways were also tested and none of them were significant.

DISCUSSION

The present study tested and found support for the positive predictive relationship of growth mindset and presence of meaning in life through consistency of interest among adolescents going through a period of widespread unrest, protests, and conflicts. A 3-wave longitudinal study that spanned two years was conducted in Hong Kong to test a serial mediation model that treated growth mindset as the antecedent, consistency of interest as the mediator, and presence of meaning in life as the outcome variable. Growth mindset and consistency of interest measured before the onset of social upheaval positively predicted the young participants' presence of meaning in life in the midst of major societal disruptions and conflicts two years later.

Past laboratory experiments have shown that a situationally induced growth mindset has a momentary causal effect on adolescents' meaning in life (Zhao et al., 2023a). The use of cross-lagged panel modeling in the present study allowed us to extend this finding. The findings in the present study provide evidence of the long-term temporal causal relationship between growth mindset, consistency of interest, and meaning in life. Growth mindset predicted presence of meaning in life after two years, suggesting that growth mindset also has a *sustainable* protective effect on adolescents' meaning in life at significant historical moments. Our findings also extended past cross-sectional studies on the relationships among growth mindset, consistency of interest and presence of meaning in life (Hill et al., 2016; Lan et al., 2019; Salles

et al., 2014; Zeng et al., 2016) by testing all permutations of these variables, controlling for the stability of the measured constructs and the reverse causal pathways.

The endorsement of growth mindset may bring both short-term and long-term benefits to individuals. Thus, nurturing a growth mindset may help individuals maintain their meaning in life when they encounter setbacks in the future. Thus, we recommend future research that tests the long-term effect of growth mindset intervention on meaning in life through maintaining individuals' consistency of interest.

Continual engagement in the pursuit of personally significant interests

By connecting to the goal engagement literature (Lewis, 2020), the present study further clarifies the psychological mechanism that mediates the growth mindset relationship with meaning in life. Specifically, past studies have shown that the presence of a growth mindset orients young people to believe that pursuing an interest would involve some setbacks and difficulties and prepares them to take adaptive strategies to overcome obstacles and maintain their interests (O'Keefe et al., 2018). In addition, according to the Self-Concordance Model (Sheldon & Elliot, 1999), the pursuit of goals consistent with one's interests may increase the salience of the purpose in life. After adolescents had been led to reflect upon their interests and guided to formulate plans to persistently pursue manageable goals that align with their interests, they reported higher meaning in life (Schippers & Ziegler, 2019). Therefore, being able to maintain continual goal engagement in challenging situations (consistency of interest) may give rise to meaning in life, as shown in the current and past studies (e.g., Zhao et al., 2023a).

The role of growth mindset and consistency of interest in meaning in life

The cross-sectional correlations among the three measured variables shown in Table 3 are largely consistent with past findings. First, growth mindset and consistency of interest were positively correlated at Wave 2 and Wave 3. Second, consistency of interest and presence of meaning in life were positively correlated at Wave 2 and Wave 3. Third, growth mindset and presence of meaning in life were positively correlated at all three waves. The cross-sectional associations between growth mindset and consistency of interest and between consistency of interest and presence of meaning in life were stronger in Wave 2 and Wave 3 than in Wave 1. Nonetheless, at Wave 1, consistency of interest had an unexpected negative correlation with growth mindset and nonsignificant relationship with presence of meaning in life. One explanation for this result is that in Wave 1, the participants were younger and were still exploring their interests and searching for life-meaning. They also did not strongly identify with their present commitments (Negru-Subtirica et al., 2016). Hence, at this stage, the psychological coherence of growth mindset, consistency of interest, and meaning in life had not been established yet. At Wave 2 and Wave 3, the participants grew older and found meaning in life through persistent pursuits of committed goals. Thus, growth mindset, consistency of interest, and presence of meaning in life are more coherently organized in older adolescents' psychology (Chiu & Liu, 2013). This possibility merits future research.

The interpretation of the cross-sectional correlations needs to be supplemented by the cross-lagged panel results. The cross-lagged panel model depicted in Figure 1 controlled for the

stability of these constructs and the reverse paths. Consistent with H1, which states that growth mindset predicts consistency of interest longitudinally, the effect of growth mindset at Wave 1 on consistency of interest at Wave 2 was significant, and so was the effect of growth mindset at Wave 2 on consistency of interest at Wave 3.

H2 states that consistency of interest would predict presence of meaning in life longitudinally. Consistent with this hypothesis, the pathway from consistency of interest at Wave 2 to presence of meaning in life at Wave 3 was significant. In contrast, presence of meaning in life did not predict subsequent consistency of interest at all waves.

Previous longitudinal studies have found mixed results on the causal direction of grit (consisting of both consistency of interest and perseverance) and meaning in life. For example, Salles et al. (2014) found that grit predicted meaning in life. However, in another longitudinal study, Hill et al. (2016) reported that meaning in life predicted grit. In these studies, grit was measured by both consistency of interest and perseverance. As mentioned in the Introduction, consistency of interest refers to the extent to which one can maintain present commitment, which has been shown to be related to finding meaning in life (Negru-Subtirica et al., 2016). In contrast, according to the goal engagement literature (Sheldon & Elliot, 1999), self-regulatory competencies, including perseverance, are supported by a purpose in life. In the present study, we found evidence that consistency of interest predicts the future presence of meaning. It is possible that presence of meaning supports perseverance. One limitation of the present study is that we did not measure perseverance. Future research examining the relationship between meaning in life and grit needs to test the associations of life meaning with the two grit components separately. A hypothesis that merits future research is: consistency of interest \rightarrow presence of meaning in life \rightarrow perseverance.

Finally, the direct effect of growth mindset on the presence of meaning in life was not significant. As noted in the Introduction, in past cross-sectional studies, evidence for the direct effect of growth mindset on meaning in life is mixed (e.g., Lan et al., 2019; Zeng et al., 2016). Nonetheless, as illustrated in Figure 3, the indirect effect of growth mindset on meaning in life through consistency of interest was significant. These results support H3. This result also resonates with the BEATs model proposed by Dweck (2017). According to this model, beliefs such as growth mindset influence goal-directed behaviors (e.g., the tendency to sustain one's interest), which in turn influence online experiences (e.g., presence of meaning in life). Thus, although growth mindset (a belief) itself does not directly induce meaning in life, it helps to sustain their interests, which in turn confers a sense of meaningful life.

Temporal stability of growth mindset, consistency of interest and meaning in life

These results also clarified the temporal stability and theoretical relationships of growth mindset, consistency of interest, and presence of meaning in life. The temporal stability of these variables was low compared to that reported in past research (Dweck et al., 1995; Hill et al., 2016; Park et al., 2020; Steger & Kashdan, 2007). In the cross-lagged panel model depicted in Figure 1, the autoregressive paths of growth mindset were not significant. The autoregressive paths of consistency of interest and meaning in life from Wave 1 to Wave 2 were also not significant. Under normal circumstances, individuals tend to have relatively stable levels of growth mindset, consistency of interest, and meaning in life. However, the non-significant autoregressive paths show that these psychological attributes may change when there were

widespread, prolonged, and profound changes in people's experiences during turbulent times. For example, social upheaval in Hong Kong may lead to disappointment in the future (Lai-LaGrotteria, 2021; J.-B. Li, 2020). Consistent with this idea, as shown in Table 1, the mean endorsement of growth mindset dropped from 3.75 (SD = 0.87) in Wave 1 to 3.45 (SD = 1.07) in Wave 2 and 3.40 (SD = 0.96) in Wave 3 ($F = 18.06, p < .001$). This finding is a reminder that growth mindset, consistency of interest, and presence of meaning in life are context-sensitive attributes, not fixed traits. That these attributes are malleable increases our confidence in the efficacy of growth mindset interventions to maintain young people's meaning in life by strengthening their consistency of interest when changes in the socio-political environment are unlikely in the short run.

LIMITATIONS AND FUTURE RESEARCH

The present study has several limitations. First, junior secondary school students outnumbered senior secondary school students in our sample. As explained above, the sampling bias might have caused the lack of coherence of the measured variables in Wave 1. Second, we used only a subset of the items in growth mindset scale and the meaning in life questionnaire in order to shorten the survey. Fortunately, the reliabilities of the shortened measures were acceptable.

Third, the current research concerns whether growth mindset and consistency of interest positively predict adolescents' meaning in life during turbulent times. Given this focus, we measured the presence dimension of meaning in life only. Whether growth mindset and consistency of interest also predicts adolescents' motivation to search for meaning is also an interesting and important question that merits future research.

Fourth, we did not measure the participants' socioeconomic status (SES) and hence could not control for this variable in our analysis. In a previous study, lower SES adolescents were less likely to endorse the growth mindset (Claro et al., 2016), and drawing participants' attention to money would strengthen the positive association of SES and meaning in life (Ward & Kim, 2023). Future research can examine whether priming adolescents with the growth mindset can weaken the SES gap in the presence of life meaning.

Fifth, although we found that growth mindset and consistency of interest are protective psychological factors for adolescents' meaning in life during the social upheaval, we had not investigated how teachers and parents can help develop adolescents' growth mindset and strengthen their present commitments. Future studies examining these relationships would generate important insights for eudaimonic intervention at uncertain times for adolescents.

Finally, a recent study has shown that self-efficacy mediates the growth mindset-presence of meaning in life relationship (Zhao et al., 2023a). Because this discovery was published after we had collected our data, we did not include self-efficacy as a mediator in the present research. We welcome future studies that compare the explanatory power of self-efficacy and consistency of interest as mediators in the growth mindset-presence of meaning link.

CONCLUSION

The present research shows that the presence of growth mindset is a useful psychological quality that predicts youths' meaning in life at turbulent times. It does so partly by helping these youths sustain their interests. Our study provides new insights into how growth mindset,

consistency of interest, and presence of meaning in life—three major constructs in positive psychology—can be integrated into a coherent explanatory theory with practical value. We invite future experimental studies to test the causal mechanisms proposed in this theory as well as field studies that leverage these mechanisms for practical eudaimonic interventions among adolescents at uncertain times.

CONFLICT OF INTEREST STATEMENT

The authors have no competing interests to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Open Science at <https://osf.io/2waj6/>.

ETHICS STATEMENT

This study was conducted in accordance with the ethical guidelines of the Survey and Behavioural Research Ethics Committee in the Chinese University of Hong Kong. All participants provided informed consent prior to their participation.

ORCID

Hiu-Sze Chan  <https://orcid.org/0000-0003-4661-8722>

Yuk-Yue Tong  <https://orcid.org/0000-0002-0858-9070>

Sau-Lai Lee  <https://orcid.org/0000-0001-7158-3651>

Chi-Yue Chiu  <https://orcid.org/0000-0002-3810-6666>

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