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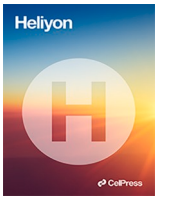

Research article

Delving into the role of creativity on meaning in life: A multiple mediation model☆

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ABSTRACT

How to enhance the sense of meaning in life is a topic deserving of extensive research. The impact of creativity on finding meaning in life, however, has not been thoroughly explored in empirical research. This paper studies the relationship between creativity and meaning in life, and the cognitive and emotional factors underlying this relationship. The participants of this study were 359 Chinese college students (38 males and 321 females; aged from 17 to 41 years) in learning English as a foreign language (EFL). Four instruments were utilized in the survey, namely, the Kaufman Domains of Creativity Scale (K-DOCS), the Positive Affect Scale, the General Self-Efficacy Scale (GSES), and the Meaning in Life Questionnaire (MLQ). The correlation analysis shows that creativity, positive affect, general self-efficacy, and meaning in life are all positively correlated. According to a bootstrap method to assess the significance of the indirect effect, general self-efficacy and positive affect play multiple mediating roles in the relationship between creativity and meaning in life via three mediating pathways: general self-efficacy alone, positive affect alone, and the effect of general self-efficacy on positive affect. The mediating effect accounts for nearly half (44.18%) of the total effect. This study examines the theoretical connection between creativity and meaning in life, and uncovers the psychological process that underlies this connection. On a practical level, these results indicate that stimulating Chinese college students to engage in creative activities in various fields can enhance their sense of meaning in life.

1. Introduction

Prior to enrolling in universities, Chinese students are subject to intense pressure to excel in academic competitions. They desired admission to a prestigious university, which is indicative of their own worth. According to Li et al. there are no significant differences in the presence of meaning between young Chinese and Western students, but Chinese adolescents demonstrate a greater yearning for meaning [1]. Therefore, how to aid Chinese students in finding new meanings in college becomes a critical issue that requires extensive research.

Meaning in life refers to the perception of the significance of an individual's existence [2,3], which is primarily comprised of three elements: coherence, purpose, and significance [2]. The publication of Viktor Frankl' volume, *Man's search for meaning*, marked the beginning of the psychological study of meaning in life. Frankl believed that, life has meaning for every individual, and searching for meaning is the key to leading a fulfilling existence [4]. In the science of meaning in life, it is treated as a subjective experience that

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varies from person to person [2], and a meaningful existence is now regarded as an important component or a source of well-being since the advent of positive psychology [5,6]. Individuals with higher meaning in life tend to go beyond inconsequential and transient happenings to interpret life experiences, form meaningful life goals, and channel life energy toward desired futures, viewing life as valuable. Meaning in life is influenced by many factors such as social connections, the self and positive affect [2]. Moreover, scholars have suggest proposed that perceptions of meaning in life and its influencing variables vary according to cultural origins [1,7,8].

Creativity is defined as the ability to generate novel and useful ideas or products [9]. It has a positive character, and how to be more creative is extensively studied [10,11]. Once creativity is seen as a predictor variable, different approaches can be taken to understand how creativity might assist individuals in achieving desired outcomes. For instance, some stress the importance of creativity in coping with trauma [12], or improving positive affect [13]and well-being [14,15].

Today, we live in a time when creative solutions are required to address various challenges. The role of creativity in personal crisis reaction and health enhancement, as well as its psychological mechanism, deserve in-depth investigation. However, whether and how creativity predicts meaning in life still have not been well examined in empirical research.

1.1. Creativity and meaning in life

Frankl [4] believed that the pursuit of creative values, such as engaging in valuable work, writing, or raising the next generation, is one of the important ways for individuals to discover meaning in life. In theory, Kaufman [10] underlined that creativity facilitates comprehension and reflection, boosts positive emotional experiences, and establishes creative accomplishment objectives.

An empirical study of older women revealed that participation in art and craft activities improved their subjective well-being and helped them find meaning in life [16]. A study by Allen et al. [17] also revealed that patients and their caregivers who received nostalgia and creative activity interventions had higher self-reported meaning in life levels than the control group. During the COVID-19 pandemic, people shared various creative videos on the Internet, scientists from different fields cooperated to develop vaccines, and politicians sought innovations in economic development and management systems, which explained the important role of creativity in finding new meanings at different levels [18].

The connection between creativity and meaning in life is more discussed in the context of the English culture. However, Zhang et al. [19] analyzed the sources of meaning among for Chinese university students using content analysis. They found that "change and creativity" is one of the sources for Chinese students. We speculate that the role of creative behavior in finding meaning in life for Chinese adolescent students may be comparable to consistent with that found in the English cultural context. The above theoretical analysis and empirical evidence provide the necessary foundation for verifying creativity can directly impact meaning in life (Hypothesis 1).

Creativity is acknowledged to be rich in connotations, which may be measured from several vantage points, including personality, cognitive process, products, and environment [20,21]. To comprehensively evaluate college students' everyday creativity in different domains and its effect on their meaning in life, we assess their creativity levels using the Kaufman Domains of Creativity Scale (K-DOCS) [22,23].

1.2. Positive affect as a mediator

Positive affect reflects "the extent to which a person feels enthusiastic, active, and alert" [24]. According to Kaufman's temporal model [10], engaging in creative activities in the present protects people from potential negative thoughts or anxiety, helps them feel good about life at that moment [25], and has a mutually beneficial effect in connecting with others [26], all of which serve to remind people of their value and meaning in the world. Therefore, the current creative ideas or activities may enhance a person's feeling of meaning in life by enhancing the sensation of positive affect.

When examining the relationship between creativity and positive affect, researchers have concentrated more on elucidating how affect influences creativity. However, Amabile et al. [27] pointed out that affect can be used as an antecedent of creativity, and can also be accompanied by or become the result of creative behaviors. Positive emotions such as joy, satisfaction, and pride are common reactions after creative thinking activities. According to recent studies, enjoyment is the primary driver of daily creative behaviors [28] and professional creative performance [29]. Through a longitudinal study, Tavares [13] revealed that employees with higher creativity are more likely to experience more positive affect three months after employment. Tan et al. [14] further investigated the causality between creativity and subjective well-being. Their study showed that the subjects who received the "creativity priming task" reported higher subjective well-being than the control group. In summary, people create for happiness and are delighted by the results of their creations.

Positive affect also interacts with a sense of meaning in life in their connection. On the one hand, a sense of meaning predicts a reduction in depressive symptoms [30] and an increase in positive affect (a crucial component of well-being) [30,31]. On the other hand, positive affect is also thought to play an important part in boosting an individual's perception of meaning in life [2]. For example, Lambert et al. [32] asked subjects to rank 12 different sources of meaning (achievements, self-worth, friends, religious beliefs and so on) according to their experience of meaning in life. They concluded that "Happiness" rated just second to "family". Multiple experimental studies also demonstrated that, there are various approaches for triggering positive affect that can enhance the perceptions of meaning in life [33–35]. In another longitudinal study, Moss, Yu and Mayr examined 13 weekly assessments for meaning in life and positive/negative affect [36]. The results of cross-lagged panel analyses also showed that positive affect may have a causal and unidirectional influence on one's sense of meaning in life. However, a meaningful life is not always pleasurable [2]. Research shows that these putatively more meaningful variables, including social relatedness, act as moderators of that relationship [37]. In other

words, it is conceivable to report high meaning in life while also being sad if one has strong social relationships, but it is also feasible to report high meaning in life simply by being in a good mood.

Positive affect also plays an important role in the way other factors influence the meaning in life. For Chinese participants, Pang et al. [38] studied the relationship between cognitive appraisal, positive affect and meaning in life when an individual recall past events. They confirmed that positive affect could promote meaning in life and play a mediating role in the impact of cognitive appraisal on meaning in life. Hence, creativity may stimulate positive affect and further increase the sense of meaning in life (Hypothesis 2).

1.3. General self-efficacy as a mediator

Self-efficacy, a key component of an individual's self-belief system, refers to the extent to which a person believes that he or she can achieve goals in a specific field [39,40], which typically includes general self-efficacy and domain-specific self-efficacy. Among them, general self-efficacy is the belief in one's competence to cope with a variety of challenging or novel situations [41].

Successful experiences are considered the most powerful way of to develop self-efficacy beliefs [39]. A recent meta-analysis study on creativity revealed a medium-sized relationship between successful creative performance and creative self-efficacy [42]. Additionally, Mathisen and Bronnick [43] showed how creativity training could influence creative self-efficacy through an experimental intervention study. In other domains, Regier and Savic [44] revealed that fostering mathematical creativity may provide students with more opportunities to build self-efficacy. Therefore, for people with creativity, repeated powerful success across multiple creative domains may foster extensive competency beliefs and a resilient, enduring, and generalized sense of self-efficacy, which theoretically, evolves from powerful success or experience mastered in various daily creativity domains [39]. Ghorbani et al. [45] explored the relationship between creativity and general self-efficacy among middle school students and found that fluency of creative thinking positively predicted general self-efficacy. To sum up, we speculate that creativity across multiple domains would positively affect the improvement of individuals' general self-efficacy.

According to social cognitive theory, cognitive belief systems play a central role in an individual's experience of adaptation and affect, and emphasize that individual's beliefs about efficacy affect their effort, persistence, and choices for a task [46–48]. People with high self-efficacy imagine more successful scenarios and provide positively guide their performance [39,49]. Therefore, general self-efficacy play an important role in the formulation, regulation, and realization of goals, and in enhancing the purpose of life [50]. Consistent with the definition of King and Hicks [2], we conceptualized meaning in life as a broader construct that contains purposes. In addition, research on the relationship between personality and meaning in life showed that, conscientiousness shapes meaning in life through general self-efficacy [51]. Accordingly, creativity may develop general self-efficacy, which further increases increase the sense of meaning in life (Hypothesis 3).

1.4. Self-efficacy and positive affect as serial mediators

People with high self-efficacy are more inclined to credit their talents for accomplishments, which promotes positive emotions such as pride and satisfaction, and to attribute failure on a lack of effort, which reduces negative emotions such as depression and helplessness [39,52,53]. A study on Chinese college students showed that general self-efficacy played a mediating role between personality and positive affect [54]. Additionally, the relationship between general self-efficacy and life satisfaction was completely mediated by positive affect. Recently, Tip et al. [55] explored the connection between self-efficacy and positive affect on resettled refugees through a longitudinal survey and showed that general self-efficacy promoted positive affect later. However, positive affect did not influence subsequent self-efficacy significantly.

Recently, Madrid and Patterson [56] divided the creative process into the generation and implementation of novel ideas, and explored their relationship with self-efficacy and positive affect. They confirmed that the implementation of creative ideas was positively related to employees' self-efficacy at work the next week, which was positively associated with positive affect the same week. Given that positive affect is a strong predictor of meaning in life [2], general self-efficacy may impact meaning in life through positive affect. We proposed a serial mediation model: creativity affects meaning in life through the influence of general self-efficacy on positive affect (Hypothesis 4).

In summary, this study aims to answer the following questions. First, is an individual's subjective experience of meaning in life

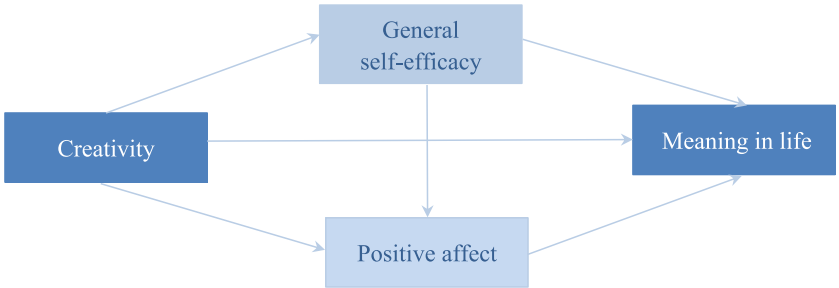

Fig. 1. A multiple mediation model.

beneficial from creativity? If so, what is the psychological process that underlies this connection? Overall, in this study, a multiple mediation model was constructed based on the temporal model of creativity and social cognitive theory (Fig. 1).

2. Methods

2.1. Participants

To control for the effect of the foreign language learning experience, a total of 380 Chinese college students in learning English as a foreign language (EFL) were asked to complete the questionnaire. However, 21 participants (about 5.5%) did not provide valid responses (selected the same option for all items on at least one of the four scales). The final sample included 359 EF L university graduates and undergraduates aged from 17 to 41 years (M = 21.33, SD = 3.77), 38 males and 321 females. According to the documented information on each participant, they majored in liberal arts (149), science and engineering (182), and others (28).

Specifically, participants needed to complete a questionnaire, including four sections, and fill in demographic information (such as gender and age). Task completion took approximately 10 min. Each participant received a small gift (approximately worth ¥ 3 CNY) as compensation after the study.

2.2. Measurements

2.2.1. Creativity

We used the K-DOCS to assess the creativity of participants. This 50 items scale was designed for individuals to perceive their creativity in five domains: including artistic creativity (painting and appreciating), mechanical/scientific creativity (mechanical ability and interest in science and math), performance creativity (public presentation), scholarly creativity (creative analysis, debate, and scholarly pursuits), and self/everyday creativity (including interpersonal and intrapersonal creativity) [22]. For each item, the participants were asked to self-evaluate their creativity (from 1 = "much less creative", 5 = "much more creative"). Items included "Appreciating a beautiful painting" (artistic domain), "Helping to carry out or design a scientific experiment" (mechanical/scientific domain), "Spontaneously creating lyrics to a rap song" (performance domain), "Debating a controversial topic from my own perspective" (scholarly domain), and "Helping other people cope with a difficult situation" (self/everyday domain). The Chinese version of the K-DOCS has shown satisfactory reliability and validity in Chinese university students [57]. The average score of all items of the K-DOCS was used in the present study (Cronbach's $\alpha = 0.96$).

2.2.2. Positive affect

This 9-item subscale was one dimension of the Chinese version of Positive Affect and Negative Affect Scale (PANAS) in Chinese version [58], which originally developed by Watson et al. [24]. Sample items include "excited" and "enthusiastic". The participants responded to each item on a 5-point Likert scale (from 1 = "very slightly or not at all", 5 = "extremely"), according to their feelings and emotions during the past week. This subscale demonstrated satisfactory internal reliability ($\alpha = 0.87$) in this study.

2.2.3. General self-efficacy

The Chinese version of the General Self-Efficacy Scale (GSES) [59], originally developed by Schwarzer and Born [60], was used to assess the general self-efficacy of the participants. This scale consists of 10 items, and item examples include "I can solve difficult learning problems" and "I use self-questioning techniques to facilitate understanding." The participants responded to each item on a 4-point Likert scale (from 1 = "not at all true" to 4 = "very true"). The average score of all items of the GSES was used in the present study (Cronbach's $\alpha = 0.83$).

2.2.4. Meaning in life

We used the Chinese version of the Meaning in Life Questionnaire (MLQ) [61], originally developed by Steger et al. [3], to assess the meaning in life of the participants. It is a self-reported questionnaire consisting of two dimensions, including presence and search [3]. The questionnaire includes 10 items, such as "I have a good sense of what makes my life meaningful" (presence) and "I am looking for something that makes my life feel meaningful" (search). The participants responded to each item on a 7-point Likert scale (from 1 = "absolutely untrue" to 7 = "absolutely true"). The average score of all items of the MLQ was used in the present study (Cronbach's $\alpha = 0.84$).

2.3. Procedure

In this study, a survey method was used. Data collection commenced on December 1st, 2021 and lasted 7 days. We took a whole group sampling and after the class of students, and displayed the subject recruitment information on a large screen. After reading an information sheet and providing their written informed consent, participants were asked to complete the questionnaire independently by scanning a Quick Response code from their cell phones. All the participants were informed that participation in this study was completely voluntary and their personal information would be kept absolutely confidential.

All procedures performed in the study were in accordance with the ethical standards of the Ethics Committee of Anhui Normal University and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

2.4. Data analysis

All statistical analyses were performed using SPSS23.0. We used Harman's single-factor test was used to test for common method bias [62]. The results showed 17 factors with eigenvalues greater than 1. The largest factor explained 24.8% of the total variance, which was less than the critical value of 40%, indicating no obvious common method bias in this study. To determine the significance of the indirect effect, we used a bootstrapping procedure [63] with 5000 samplings to generate 95% confidence intervals (CIs). The indirect effect was significant if a CI did not contain zero. Standardized regression coefficients were reported in the mediation analyses.

3. Results

3.1. Descriptive statistics and correlation analysis between variables

Descriptive statistics for the variables are listed in Table 1. Table 2 shows the results of the correlation analysis, indicating significant positive correlation between creativity, general self-efficacy, positive affect, and meaning in life. Additionally creativity is substantially associated with both gender ($r = -0.15$, $p < 0.01$) and age ($r = -0.18$, $p <. 01$), with younger participants and male participants reporting higher levels of creativity. Therefore, we included age and gender as controlled variables in the following mediating effect analysis.

3.2. The mediating effects of general self-efficacy and positive affect

Hayes macro PROCESS 3.3 was used to examine the mediating role of general self-efficacy and positive affect in the association between creativity and meaning in life [63]. Table 3 illustrates the details of indirect effects and confidence intervals of the mediation analyses, with gender and age controlled.

The indirect effects of general self-efficacy and positive affect were significant, suggesting their capability of separately mediating the relationship between creativity and meaning in life. Moreover, the effect of creativity on meaning in life through the influence of general self-efficacy on positive affect was also significant, indicating a serial mediation relationship. That is, creativity may first lead to an increase in general self-efficacy, which elevates positive affect and finally results in a higher level of meaning in life. Finally, we calculated the effect size of each mediating effect. The overall mediating effect explained 44.18% of the variance in the total effect (see Table 4 for details).

4. Discussion

In this investigation, we explored the association between creativity, general self-efficacy, positive affect, and meaning in life among Chinese EFL college students. Consistent with previous research [16,17], this study has directly confirmed that creative behavior, as an important indicator of the level of individual creativity, has a significant predictive effect on meaning in life. Recent qualitative research has also displayed that the artistic creation experience of female groups makes them experience a stronger existential value and meaning in life [64].

The positive effect of creativity on meaning in life can be explained using the logotherapy theory [4] and the temporal model of creativity [10]. Frankl [4] believed that creativity was an important way for individuals to acquire meaning in life. Kaufman used the temporal model to explain the past, present, and future pathways of finding meaning with creativity [10]. Specifically, the past pathway of creativity is most connected to coherence facet of meaning in life, such creative activities (e.g., expressive writing) can be a way to understand and process one's past, which help people to integrate and reflect their "past" experience. The present pathway of creativity helps people manage their activities, moods, and peer relationships through creative behaviors or ideas in the moment, which can enhance people's enjoyment and remind their importance and worth in the world (i.e. significance facet of meaning in life). For the future pathway of creativity, prospective creative contribution connects the tradition and the future, so that people would realize the meaning of inheritance and plan their career life seriously, and make life with more clear purpose (the other facet of meaning in life). Therefore, college students who exhibit more creative behaviors are also more likely to have a strong subjective perception of their coherence, purpose, and significance in life, as well as the higher meaning in life.

Table 1
Descriptive statistics of all variables ($N = 359$).

	M	*SD*	Skewness	Kurtosis	Range
Age	21.33	3.77	–	–	17–41
Gender	0.89	0.31	–	–	0–1
Creativity	2.80	0.60	0.13	0.51	1–5
GSE	2.63	0.34	−0.10	1.28	1–4
PA	2.99	0.68	−0.26	0.45	1–5
ML	4.98	0.82	−0.28	1.03	1–7
ML_search	5.33	0.98	−0.43	0.35	1–7
ML_presence	4.63	1.00	−0.19	0.30	1–7

Note: Gender: 0 = male, 1 = female. GSE: general self-efficacy. PA: positive affect. ML: meaning in life.

Table 2
Correlations among study variables ($N = 359$).

	1	2	3	4	5
1. Creativity	–				
2. GSE	0.40***	–			
3. PA	0.31***	0.36***	–		
4. ML	0.28***	0.31***	0.26***	–	
5. ML_search	0.24***	0.18**	0.15**	0.82***	–
6. ML_presence	0.22***	0.33***	0.29***	0.83***	0.37***

Note: GSE: general self-efficacy. PA: positive affect. ML: meaning in life; *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$, as follows.

Table 3
A test of the mediation model between creativity and meaning in life.

Regression Equation		Overall Fit Index			Significance of Regression Coefficients			
Outcome Variable	Predictor Variable	*R*	R^2	*F*	β	95% CILower	95% CI Upper	*t*
Meaning in Life	gender	0.29	0.08	10.84***	14	−0.19	0.47	0.86
	age				0.08	−0.02	0.18	1.58
	creativity				0.30	0.19	0.40	5.67***
General Self-Efficacy (GSE)	gender	0.45	0.21	30.73***	−0.49	−0.79	−0.18	−3.12**
	age				0.15	0.06	0.25	3.21**
	creativity				0.40	0.31	0.50	8.26***
Positive Affect (PA)	gender	0.42	0.17	18.58***	−0.02	−0.33	0.30	−0.10
	age				0.11	0.01	0.21	2.25*
	GSE				0.26	0.15	0.36	4.70***
	creativity				0.23	0.12	0.34	4.21***
Meaning in Life	gender	0.39	0.15	12.30***	0.26	−0.06	0.59	1.62
	age				0.03	−0.07	0.13	−0.55
	GSE				0.21	0.10	0.32	3.65***
	PA				0.14	0.04	0.25	2.67***
	creativity				0.17	0.05	0.28	2.93**

Table 4
Bootstrapping indirect effects and 95% confidence intervals (CI) for the mediational model.

Indirect effect	Effect value	Boot SE	Boot CI Lower	Boot CI Upper	Relative effect
TOTAL	0.13	0.04	0.06	0.23	44.18%
Ind1: Creativity→GSE→ML	0.08	0.04	0.03	0.17	28.07%
Ind2: Creativity→ GSE→ PA→ML	0.01	0.01	0.003	0.04	4.99%
Ind3: Creativity→PA→ML	0.03	0.02	0.007	0.07	11.12%

Note: GSE: general self-efficacy. PA: positive affect. ML: meaning in life.

Using mediation analyses, we observed, as expected by the hypotheses, that positive affect and general self-efficacy can separately mediate the relationship between creativity and meaning in life, and the influence of general self-efficacy on positive affect can play a serial mediating role in this relationship.

4.1. The mediating role of positive affect

In this study, we discovered that positive affect played a mediating role between creativity and meaning in life, supporting the theoretical analysis of the temporal model of creativity [10]. This finding is consistent with the result of a prior study i.e., positive affect can play a mediating role between cognitive factors and meaning in life [38].

According to the affect-creativity cycle model [27] and the dynamic component model of creativity and innovation [65], positive affect can promote creativity by improving an individual's cognitive flexibility, and creativity also enriches an individual's positive emotional experience by advancing work [66]. Tavares [13] further argued that when people use their creativity to solve difficulties or reconcile contradictory facts, their positive emotional experiences are inevitably improved. In other words, the beneficial effect of positive affect on creativity is reasonable, but prior empirical research have neglected this effect pathway. Madrid and Patterson in their longitudinal study also revealed that, creative idea generation is associated with participants' positive affect during the same week [56].

Positive affect is a potent antecedent of meaning in life, which is in line with earlier research findings [33–35]. Even when additional theoretical sources of meaning, such as autonomy, self-esteem, competence, religious beliefs, and social belonging, are considered, research has shown that the state and trait positive affect predict meaning in life independently [2]. This indicates that a shared variance with other contributing factors cannot adequately account for the relationship between positive affect and meaning in

life. King and Hicks [2] have concluded that early measures for the meaning in life include enjoyment and joyful events. In other words, feeling good about oneself might be a significant aspect of meaning in life in these studies. There are also two main theoretical perspectives to explain that positive affect may enhance the experience of life as meaningful. On the one hand, due to its connection to goal progress, positive affect may be related to a greater sense of significance in life [34]. On the other hand, based on the self-determination theory, Martela et al. demonstrated that the association between positive affect and meaning in life in particular situations may also be explained by the satisfactions connected to being benevolent and satisfying psychological demands for autonomy, competence, and relatedness [67]. In this study, the positive affect induced by creative activities in multiple domains also played an equally important role in improving the perception of meaning in life.

4.2. The mediating role of general self-efficacy

Lightsey et al. [51] have found general self-efficacy plays a mediating role between conscientiousness and meaning in life. Similar to that study, the present study showed that general self-efficacy is also an important mediator of the effect of creativity on meaning in life. According to the social cognitive theory, creativity, as an important correlative variable of past successful experience, has a predictive effect on general self-efficacy [39]. Based on the self-determination theory, experimenting with creative ideas is also a complex and difficult activity that makes people feel efficient and satisfies their basic psychological need of competence [68]. The temporal model of creativity indicates that general self-efficacy can act on the purpose dimension of meaning in life [10]. According to the hierarchic model of meaning in life, purposes are the core of meaning, and without purposes, meaning cannot be produced [69]. This suggests that general self-efficacy may well have the same predictive effect on meaning in life. Therefore, it is plausible, both theoretically and empirically, that creativity may act on meaning in life through general self-efficacy.

Although general self-efficacy mainly affects the purpose dimension of meaning in life, the proportion of this indirect effect in the total effect is higher than that of the other two indirect effects. This suggests that although positive affect is an important predictor of meaning in life, general self-efficacy may play a more important role in the association between creativity and meaning in life. According to the social cognitive theory, past experience of success or failure is the most important predictor of self-efficacy [39]. The creative behaviors in this study involves multiple fields, and its overall performance is relatively closely related to general self-efficacy. In addition, factors related to self are the most important resources for Chinese college students to acquire meaning, which is different from the research results in the context of western culture [19]. Therefore, as a core variable in the self-belief system, general self-efficacy may play an important role in finding meaning for Chinese EFL college students.

4.3. The serial mediating effect of general self-efficacy and positive affect

According to a 10-week diary study, creative idea implementation is favorably associated with self-efficacy in the following week, which in turn is positively correlated with positive affect [56]. Another previous study showed that, general self-efficacy is positively connected with positive automatic thoughts and negative correlated with negative automatic thoughts [51]. Meanwhile, positive affect is closely related to more positive and less negative automatic thoughts, which is proved by cognitive theories regarding emotions [70]. This shows that people with high general self-efficacy tend to think more positively and less negatively, which makes them more likely to exhibit positive emotions.

Consistent with the previous research, this study verified that the influence of general self-efficacy on positive affect could play a serial mediating role in the association between creativity and meaning in life. Bandura expounded that, people with strong self-efficacy were more inclined to attribute accomplishments to their own competence, enhancing positive affect, and to blame insufficient effort for failure, reducing negative affect [39]. Furthermore, self-efficacy is likely to impact positive affect since feeling competent is an enjoyable psychological experience that is conveyed in pleasant emotions [68]. As a result, positive affect appears as a satisfying indicator that the basic psychological need for competence is being met by the general experience of self-efficacy. Given that positive affect is a significant predictor of meaning in life [2], general self-efficacy inevitably increases meaning in life through it.

5. Conclusions and implications

In the present study, we investigated the relationship between creativity and meaning in life, and the cognitive and emotional elements behind this relationship among Chinese EFL college students. In the present study conditions, we found that, creativity, general self-efficacy, positive affect, and meaning in life were all positively connected. General self–efficacy and positive affect played multiple mediating roles in the relationship between creativity and meaning in life via three different mediating pathways, including general self–efficacy alone, positive affect alone, and the effect of general self–efficacy on positive affect.

Frankl believed theoretically that one of the key ways for people to find meaning in life is through the pursuit of creative values [4], and Kaufman emphasized that creativity can enhance pleasant emotional experiences and set objectives for creative accomplishment [10]. The present study confirms the related theoretical speculations. On the one hand, creativity can have a direct impact on one's feeling of meaning in life; on the other hand, general self-efficacy and positive emotions are significant channels via which creativity affects one's sense of meaning in life, accounting for nearly half of the overall effect (44.18%).

This study displayed the theoretical connection between creativity and meaning in life in a different culture. Students in modern China face great pressure due to homogenous competition. On a practical level, research on creativity and meaning in life may provide some insights for Chinese parents and educators. To promote young people to grow in confidence and enthusiasm and "taste" the richness of meaning in life, we may be able to provide opportunities for them to experience diverse lifestyles, to try and explore new

things with an open mind, and to be creative in their activities.

6. Limitations and future directions

This study also has some limitations. First, using the self-assessment questionnaire for creative behavior, the creative ability of participants was not directly assessed by creative tasks. Additionally, we did not quantify the sense of meaning in life along the three dimensions as George and Park did [71]. In future research, other quantitative tools can be used to further explore the relationship between different aspects of creativity and the specific perception of meaning in life. Second, the surveyed subjects of this study are mainly from the same region in the context of Chinese culture. Therefore, further testing and verification are needed for the generalization of the research conclusions. In addition, there were more females than males in the sample of this study. Previous studies have found that males may have higher levels of creativity than females [72]. For this reason, gender was employed as a control variable in this study. In future studies, whether there are differences between groups or cultures in the model constructed in present study can be can further investigated. Third, because of the cross-sectional nature of our data, the causality of this multiple mediation hypothesis is yet undetermined. The causal order of the variables in our model can be further investigated in future studies using experimental manipulation or longitudinal data.

Ethics statement

The Ethics Committee of Anhui Normal University reviewed and approved research studies.

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Author contribution statement

Jiantao Han: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.
Yuwei Wang, Menghua Shi: Analyzed and interpreted the data; Wrote the paper.
Junni Qian: Performed the experiments; Wrote the paper.

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e16566.

References

[1] J.B. Li, S. Salcuni, E. Delvecchio, Meaning in life, self-control and psychological distress among adolescents: a cross-national study, Psychiatr. Res. 272 (2019) 122–129, https://doi.org/10.1016/j.psychres.2018.12.033.
[2] L.A. King, J.A. Hicks, The science of meaning in life, Annu. Rev. Psychol. 72 (1) (2021) 561–584, https://doi.org/10.1146/annurev-psych-072420-122921.
[3] M.F. Steger, P. Frazier, S. Oishi, M. Kaler, The meaning in life questionnaire: assessing the presence of and search for meaning in life, J. Counsel. Psychol. 53 (1) (2006) 80–93, https://doi.org/10.1037/0022-0167.53.1.80.
[4] V.E. Frankl, Man's Search for Meaning, Beacon Press, Boston, MA, 2006. Original work published 1946).
[5] M. Seligman, Flourish: A Visionary New Understanding of Happiness and Well-Being, Free Press, New York, USA, 2011.
[6] Y.L. Wang, A. Derakhshan, L.J. Zhang, Researching and practicing positive psychology in second/foreign language learning and teaching: the past, current status and future directions, Front. Psychol. 12 (2021), 731721, https://doi.org/10.3389/fpsyg.2021.731721.
[7] M.F. Steger, Y. Kawabata, S. Shimai, K. Otake, The meaningful life in Japan and the United States: levels and correlates of meaning in life, J. Res. Pers. 42 (3) (2008) 660–678, https://doi.org/10.1016/j.jrp.2007.09.003.
[8] E.A. Yu, E.C. Chang, J.H.J. Kim, Asian American culturally relevant values as predictors of meaning in life in Asian and European American college students: evidence for cultural differences? Asian Am. J. Psychol. 7 (3) (2016) 159–166, https://doi.org/10.1037/aap0000042.
[9] R.J. Sternberg, T.I. Lubart, Investing in creativity, Am. Psychol. 51 (7) (1996) 677–688, https://doi.org/10.1037/0003-066X.51.7.677.
[10] J.C. Kaufman, Finding meaning with creativity in the past, present, and future, Perspect. Psychol. Sci. 13 (6) (2018) 734–749, https://doi.org/10.1177/1745691618771981.
[11] J.C. Kaufman, K.F. Arrington, P.J. Barnett, M. Holinger, X. Liu, L. Xie, Creativity is our gig: focusing on the positive and practical, Translat. Issues in Psychol. Sci. 8 (1) (2022) 137–152, https://doi.org/10.1037/tps0000298.

[12] H. Orkibi, N. Ram-Vlasov, Linking trauma to posttraumatic growth and mental health through emotional and cognitive creativity, Psychol. Aesthet. Creativ. the Arts 13 (4) (2019) 416–430, https://doi.org/10.1037/aca0000193.

[13] S.M. Tavares, How does creativity at work influence employee's positive affect at work? European, J. Work and Organiz. Psychol. 25 (4) (2016) 525–539, https://doi.org/10.1080/1359432X.2016.1186012.

[14] C. Tan, C. Chuah, S. Lee, C. Tan, Being creative makes you happier: the positive effect of creativity on subjective well-being, Int. J. Environ. Res. Publ. Health 18 (14) (2021) 7244, https://doi.org/10.3390/ijerph18147244.

[15] M. Tang, S. Hofreiter, R. Reiter-Palmon, X. Bai, V. Murugavel, Creativity as a means to well-being in times of COVID-19 pandemic: results of a cross-cultural study, Front. Psychol. 12 (2021), 601389, https://doi.org/10.3389/fpsyg.2021.601389.

[16] J.L.M. Liddle, L. Parkinson, D.W. Sibbritt, Purpose and pleasure in late life: conceptualising older women's participation in art and craft activities, J. Aging Stud. 27 (4) (2013) 330–338, https://doi.org/10.1016/j.jaging.2013.08.002.

[17] R.S. Allen, G.M. Harris, L.D. Burgio, C.B. Azuero, L.A. Miller, H.J. Shin, P. Parmelee, Can senior volunteers deliver reminiscence and creative activity interventions? Results of the legacy intervention family enactment randomized controlled trial, J. Pain Symptom Manag. 48 (4) (2014) 590–601, https://doi.org/10.1016/j.jpainsymman.2013.11.012.

[18] H. Kapoor, J.C. Kaufman, Meaning-making through creativity during COVID-19, Front. Psychol. 11 (2020), 595990, https://doi.org/10.3389/fpsyg.2020.595990.

[19] H. Zhang, Z. Sang, D.K.S. Chan, F. Teng, M. Liu, S. Yu, Y. Tian, Sources of meaning in life among Chinese university students, J. Happiness Stud. 17 (4) (2016) 1473–1492, https://doi.org/10.1007/s10902-015-9653-5.

[20] J.A. Plucker, M.C. Makel, Assessment of creativity, in: J.C. Kaufman, R.J. Sternberg (Eds.), The Cambridge Handbook of Creativity, Cambridge University Press, New York, NY, 2010, pp. 48–73.

[21] J. Han, W. Liu, W. Pang, Rater effects in creativity assessment, Adv. Psychol. Sci. 27 (1) (2019) 171–180, https://doi.org/10.3724/SP.J.1042.2019.00171.

[22] J.C. Kaufman, R. Reiter-Palmon, P. Tinio, Counting the muses: development of the kaufman domains of creativity scale (K-DOCS), Psychol. Aesthet. Creativ. the Arts 6 (4) (2012) 298–308, https://doi.org/10.1037/a0029751.

[23] K.G. Miroshnik, O.V. Shcherbakova, J.C. Kaufman, Kaufman domains of creativity scale: relationship to occupation and measurement invariance across gender, Creativ. Res. J. 34 (2) (2022) 159–177, https://doi.org/10.1080/10400419.2021.1953823.

[24] D. Watson, L.A. Clark, A. Tellegen, Development and validation of brief measures of positive and negative affect: the PANAS scales, J. Pers. Soc. Psychol. 54 (6) (1988) 1063–1070, https://doi.org/10.1037//0022-3514.54.6.1063.

[25] M. Csikszentmihalyi, Creativity: Flow and the Psychology of Discovery and Invention, HarperCollins, New York, NY, 1996.

[26] V.P. Glăveanu, Creativity as a sociocultural act, J. Creativ. Behav. 49 (2015) 165–180, https://doi.org/10.1002/jocb.94.

[27] T.M. Amabile, S.G. Barsade, J.S. Mueller, B.M. Staw, Affect and creativity at work, Adm. Sci. Q. 50 (3) (2005) 367–403. https://www.jstor.org/stable/30037208.

[28] M. Benedek, R. Bruckdorfer, E. Jauk, Motives for creativity: exploring the what and why of everyday creativity, J. Creativ. Behav. 54 (3) (2020) 610–625, https://doi.org/10.1002/jocb.396.

[29] M. Forgeard, Prosocial Motivation and Creativity in the Arts and Sciences: Qualitative and Quantitative Evidence, Psychology of Aesthetics, Creativity, and the Arts, Advance online publication, 2022, https://doi.org/10.1037/aca0000435.

[30] C.L. Park, C.L. Knott, R.M. Williams, E.M. Clark, B.R. Williams, E. Schulz, Meaning in life predicts decreased depressive symptoms and increased positive affect over time but does not buffer stress effects in a national sample of African-Americans, J. Happiness Stud. 21 (2020) 3037–3049, https://doi.org/10.1007/s10902-019-00212-9.

[31] L. Hamama, Y. Hamama-Raz, Meaning in life, self-control, positive and negative affect exploring gender differences among adolescents, Youth Soc. 53 (5) (2021) 699–722, https://doi.org/10.1177/0044118X19883736.

[32] N.M. Lambert, T.F. Stillman, R.F. Baumeister, F.D. Fincham, J.A. Hicks, S.M. Graham, Family as a salient source of meaning in young adulthood, J. Posit. Psychol. 5 (5) (2010) 367–376, https://doi.org/10.1080/17439760.2010.516616.

[33] J.A. Hicks, D.C. Cicero, J. Trent, C.M. Burton, L.A. King, Positive affect, intuition, and feelings of meaning, J. Pers. Soc. Psychol. 98 (6) (2010) 967–979, https://doi.org/10.1037/a0019377.

[34] L.A. King, J.A. Hicks, J.L. Krull, A.K. Del Gaiso, Positive affect and the experience of meaning in life, J. Pers. Soc. Psychol. 90 (1) (2006) 179–196, https://doi.org/10.1037/0022-3514.90.1.179.

[35] S.J. Ward, L.A. King, Poor but happy? Income, happiness, and experienced and expected meaning in life, Soc. Psychol. Personal. Sci. 7 (5) (2016) 463–470, https://doi.org/10.1177/1948550615627865.

[36] M.E. Moss, S.B. Yu, U. Mayr, The within-person dynamics of affect, meaning in life, and perceived stress, J. Posit. Psychol. Adv. online Public. (2022), https://doi.org/10.1080/17439760.2022.2093785.

[37] J.A. Hicks, L.A. King, Positive mood and social relatedness as information about meaning in life, J. Posit. Psychol. 4 (6) (2009) 471–482, https://doi.org/10.1080/17439760903271108.

[38] Z. Pang, S. Zhuang, Y. Wang, Y. Gan, Cognitive appraisal and meaning inlife in recalling of past events: the emotion as a mediator, Acta Sci. Nauralium Univ. Pekin. 55 (5) (2019) 977–986, https://doi.org/10.13209/j.0479-8023.2019.069.

[39] A. Bandura, Self-efficacy: the Exercise of Control, Freeman, New York, NY, 1997.

[40] M. van Dinther, F. Dochy, M. Segers, Factors affecting students' self-efficacy in higher education, Educ. Res. Rev. 6 (2) (2011) 95–108, https://doi.org/10.1016/j.edurev.2010.10.003.

[41] A. Luszczynska, B. Gutiérrez Doña, R. Schwarzer, General self-efficacy in various domains of human functioning: evidence from five countries, Int. J. Psychol. 40 (2) (2005) 80–89, https://doi.org/10.1080/00207590444000041.

[42] J. Haase, E.V. Hoff, P.H.P. Hanel, Å. Innes-Ker, A meta-analysis of the relation between creative self-efficacy and different creativity measurements, Creativ. Res. J. 30 (1) (2018) 1–16, https://doi.org/10.1080/10400419.2018.1411436.

[43] G.E. Mathisen, K.S. Bronnick, Creative self-efficacy: an intervention study, International, J. Educ. Res. 48 (1) (2009) 21–29, https://doi.org/10.1016/j.ijer.2009.02.009.

[44] P. Regier, M. Savic, How teaching to foster mathematical creativity may impact student self-efficacy for proving, J. Math. Behav. 57 (2020), 100720, https://doi.org/10.1016/j.jmathb.2019.100720.

[45] M. Ghorbani, H. Kazemi, M. Shafaghi, H. Massah, An Assessment of relation between self-efficacy and Cognitive/Emotive creativity, Global J. Guid. Couns. 2 (2012) 8–13. http://archives.un-pub.eu/index.php/gjgc/article/view/1699/1148.

[46] A. Bandura, Self-efficacy: toward a unifying theory of behavioral change, Psychol. Rev. 84 (2) (1977) 191–215, https://doi.org/10.1037/0033-295X.84.2.191.

[47] A. Bandura, Social Foundations of Thought and Action: A Social Cognitive Theory, Prentice-Hall, Inc, 1986.

[48] J.S. Stephen, A.J. Rockinson-Szapkiw, C. Dubay, Persistence model of non-traditional online learners: self-efficacy, self-regulation, and self-direction, Am. J. Dist. Educ. 34 (4) (2020) 306–321, https://doi.org/10.1080/08923647.2020.1745619.

[49] S.L. Wright, M.A. Jenkins-Guarnieri, J.L. Murdock, Career development among first-year college students: college self-efficacy, student persistence, and academic success, J. Career Dev. 40 (4) (2013) 292–310, https://doi.org/10.1177/0894845312455509.

[50] S.J. DeWitz, M.L. Woolsey, W.B. Walsh, College student retention: an exploration of the relationship between self-efficacy beliefs and purpose in life among college students, J. Coll. Student Dev. 50 (1) (2009) 19–34, https://doi.org/10.1353/csd.0.0049.

[51] O.R. Lightsey Jr., G. Boyraz, A. Ervin, E.B. Rarey, G. Gharibian Gharghani, D. Maxwell, Generalized self-efficacy, positive cognitions, and negative cognitions as mediators of the relationship between conscientiousness and meaning in life,Canadian, J. Behav. Sci. 46 (3) (2014) 436–445, https://doi.org/10.1037/a0034022.

[52] D. Putwain, P. Sander, D. Larkin, Academic self-efficacy in study-related skills and behaviours: relations with learning-related emotions and academic success, Br. J. Educ. Psychol. 83 (4) (2013) 633–650, https://doi.org/10.1111/j.2044-8279.2012.02084.x.

[53] Y. Han, Y. Wang, Investigating the correlation among Chinese EFL Teachers' self-efficacy, reflection, and work engagement, Front. Psychol. 12 (2021), 763234, https://doi.org/10.3389/fpsyg.2021.763234.
[54] R. Zhang, Positive affect and self-efficacy as mediators between personality and life satisfaction in Chinese college freshmen, J. Happiness Stud. 17 (5) (2016) 2007–2021, https://doi.org/10.1007/s10902-015-9682-0.
[55] L.K. Tip, R. Brown, L. Morrice, M. Collyer, M.J. Easterbrook, Believing is achieving: a longitudinal study of self-efficacy and positive affect in resettled refugees, J. Ethnic Migrat. Stud. 46 (15) (2020) 3174–3190, https://doi.org/10.1080/1369183X.2020.1737513.
[56] H.P. Madrid, M.G. Patterson, An examination of the relationship between idea generation versus idea implementation and subsequent self-efficacy and positive affect, J. Bus. Psychol. (2022), https://doi.org/10.1007/s10869-022-09820-4.
[57] C. Tu, F. Fan, Verification and preliminary application of Chinese version of kaufman domains of creativity scale, Stud. Psychol. Behav. 13 (6) (2015) 811–816, https://doi.org/10.3969/j.issn.1672-0628.2015.06.014.
[58] L. Qiu, X. Zheng, Y. Wang, Revision of the positive and negative affect scale, Chinese J. Appl. Psychol. 14 (3) (2008) 249–254.
[59] C. Wang, Z. Hu, Y. Liu, Evidences for reliability and validity of the Chinese version of general self-efficacy scale, Chinese J. Appl. Psychol. 7 (1) (2001) 37–40.
[60] R. Schwarzer, A. Born, Optimistic self-beliefs: assessment of general perceived self-efficacy in thirteen cultures, World Psychology 3 (1997) 177–190, https://doi.org/10.1111/j.1464-0597.1997.tb01096.x.
[61] M. Wang, X. Dai, Reliability and validity of the Chinese version of the meaning in life questionnaire, Chin. J. Clin. Psychol. 15 (5) (2008) 459–461, https://doi.org/10.16128/j.cnki.1005-3611.2008.05.020.
[62] P.M. Podsakoff, S.B. MacKenzie, J.-Y. Lee, N.P. Podsakoff, Common method biases in behavioral research: a critical review of the literature and recommended remedies, J. Appl. Psychol. 88 (5) (2003) 879–903, https://doi.org/10.1037/0021-9010.88.5.879.
[63] A.F. Hayes, Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach, second ed., Guilford Press, New York, 2018.
[64] R.C. Reilly, V. Lee, K. Laux, A. Robitaille, Creating doorways: finding meaning and growth through art therapy in the face of life-threatening illness, Publ. Health 198 (2021) 245–251, https://doi.org/10.1016/j.puhe.2021.07.004.
[65] T.M. Amabile, M.G. Pratt, The dynamic componential model of creativity and innovation in organizations: making progress, making meaning, Res. Organ. Behav. 36 (2016) 157–183, https://doi.org/10.1016/j.riob.2016.10.001.
[66] A. Derakhshan, V. Greenier, J. Fathi, Exploring the interplay between a loving pedagogy, creativity, and work engagement among EFL/ESL teachers: a multinational study, Curr. Psychol. (2022), https://doi.org/10.1007/s12144-022-03371-w.
[67] F. Martela, R.M. Ryan, M.F. Steger, Meaningfulness as satisfaction of autonomy, competence, relatedness, and beneficence comparing the four satisfactions and positive affect as predictor, J. Happiness Stud. 19 (2018) 1261–1282, https://doi.org/10.1007/s10902-017-9869-7.
[68] E.L. Deci, A.H. Olafsen, R.M. Ryan, Self-determination theory in work organizations: the state of a science, Annual Review of Organizat. Psychol. Organizat. Behavior 4 (1) (2017) 19–43, https://doi.org/10.1146/annurev-orgpsych-032516-113108.
[69] T. Schnell, The sources of meaning and meaning in life questionnaire (SoMe): relations to demographics and well-being, J. Posit. Psychol. 4 (6) (2009) 483–499, https://doi.org/10.1080/17439760903271074.
[70] J.S. Beck, Cognitive Behavior Therapy: Basics and beyond, third ed., The Guilford Press, New York, NY, 2020.
[71] L.S. George, C.L. Park, The multidimensional existential meaning scale: a tripartite approach to measuring meaning in life, J. Posit. Psychol. 12 (6) (2017) 613–627, https://doi.org/10.1080/17439760.2016.1209546.
[72] W. Hu, P. Adey, J. Shen, C. Lin, The comparisons of the development of creativity between English and Chinese adolescents, Acta Psychol. Sin. 36 (6) (2004) 718–731. https://journal.psych.ac.cn/xlxb/CN/Y2004/V36/I06/718.