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RESEARCH PAPER

Time Perspective in the Self-regulatory Mechanism of Meaning in Life

Xiaobing Zheng[1] · **Wenjing Wang**[1]

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Abstract
The purpose of this article was to investigate the relationship between meaning in life and time perspective among Chinese youngsters. Two studies were conducted. In Study 1, 323 participants were sampled and completed the Presence of Meaning in life Scale, short version of the Zimbardo Time Perspective Inventory as well as the Proactive Coping Scale. The results showed that time perspective mediated the relationship between meaning in life and proactive coping. In Study 2, 346 participants were sampled and completed the Meaningful Life Measure, the full Zimbardo Time Perspective Inventory, the Reappraisal Scale as well as the General Self Efficacy Scale. The results showed that meaning in life predicted time perspective and this relationship was partially mediated by cognitive reappraisal and self-efficacy. The findings demonstrated that time perspective played a role in the self-regulatory mechanism of meaning in life, involving both emotional and motivational processes. Self-regulatory processes in the relationship between meaning in life and time perspective were discussed.

Keywords Meaning in life · Time perspective · Emotion · Motivation · Self-regulation

1 Introduction

Meaning in life (MIL) is generally considered to encompass three facets: coherence, significance, and purpose (Martela & Steger, 2016). Research has identified MIL as a critical contributor to human functioning (Czekierda et al., 2017; Haugan, 2013), whereas the underlying mechanism behind the effects of MIL remains controversial and lacks empirical evidence (Hooker et al., 2018). In the present research, we focused on the self-regulatory mechanism of MIL in relation to time perspective (TP). We first examined whether TP

Xiaobing Zheng and Wenjing Wang: Department of Psychology, School of Philosophy, Wuhan University. They are also in Department of Social and Behavioural Sciences, City University of Hong Kong.

✉ Xiaobing Zheng
xzheng55-c@my.cityu.edu.hk

[1] School of Philosophy, Wuhan University, 299 Bayi Road, Wuchang District, Wuhan, Hubei, China

played a role in the adaptive function of MIL for coping. Further, we explored the self-regulatory processes underlying the relationship between MIL and TP.

1.1 Meaning in Life and Time Perspective

Zimbardo and Boyd (1999) defined TP as "the often nonconscious process whereby the continual flows of personal and social experiences are assigned to temporal categories, or time frames, that help to give order, coherence, and meaning to those events" (p.1271), and developed a five-dimensional structure of TP. Specifically, Past-Positive TP reflects a warm and sentimental attitude towards the past, whereas Past-Negative TP refers to a generally negative, aversive view of the past. Present-Fatalistic TP reflects a resignation to fate and a lack of goals, while Present-Hedonistic TP shows an orientation towards present pleasure. Future TP indicates an orientation towards future goals that are usually achievement-related. Previous studies have mostly treated TP as a trait-like individual character, predictive of outcomes in many areas, such as health-related behaviors (e.g., Adams & Nettle, 2009), academic performance (e.g., Phan, 2009), and career achievement (e.g., Taber, 2013). Nevertheless, research has disproportionately neglected to explore the potential predictors of TP (Dunkel & Weber, 2010).

Some studies have investigated the associations between MIL and TP. Steger et al. (2008) found that MIL was positively correlated with Past-Positive TP and negatively correlated with Past-Negative TP. Consistent results were observed in a study by Leshkovska and Shterjovska (2014), in which MIL was also found to be positively correlated with Present-Hedonistic and Future TPs. Sobol-Kwapinska (2009) found that Present-Fatalistic TP was related to a lower sense of purpose. However, none of these studies considered MIL as being predictive of TP, and the psychological processes behind the correlations are not transparent.

According to Zimbardo and Boyd (1999), TP can be dynamic and "multiply determined by many learned factors" (p. 1272). People strive to learn about principles, values, and goals in the period of adolescence and emerging adulthood (Boyd & Bee, 2012). Establishing personal views of MIL is a critical issue underlying developmental processes (Steger et al., 2012), probably impacting one's TP profile. Indeed, a global sense of meaning can provide cognitive frameworks for people to interpret their experiences in the past and motivate their actions in the future (Park, 2010). As Baumeister et al. (2013) stated, MIL allows people to think across time and involves understanding one's life beyond the present. Leontiev (2013) also pointed out that meaning regulates actions by helping individuals transcend the here-and-now situation and reach into the future. In this regard, TP may be predicted by MIL and act as a component in the adaptive function of MIL.

1.2 Meaning in Life, Time Perspective, and Proactive Coping

Increasingly, research evidence indicates that MIL is a protective factor for physical and mental health (Czekierda et al., 2017; Haugan, 2013), relating to health-promoting behaviors (Brassai et al., 2011), reduced stress (Park & Baumeister, 2017), and adaptive coping (Jim et al., 2006). Based on the substantial evidence, Hooker et al. (2018) proposed a model linking MIL to health, in which adaptive coping strategies are included as self-regulatory processes accounting for the effects of MIL. Nonetheless, the detailed self-regulatory mechanism behind the adaptive function of MIL remains unclear.

Coping refers to a process of dealing with life problems and stressful events (Lazarus, 1993). Distinctive from traditional types of coping that focus on stressful events encountered in the past or present, proactive coping refers to an autonomous and future-oriented coping strategy focusing on stressors that are yet to occur (Aspinwall & Taylor, 1997). According to Schwarzer and Taubert (2002), proactive coping involves multiple self-regulatory processes, including positive emotional strategies and tenacious goal pursuits. Studies of the relationship between MIL and proactive coping have provided preliminary evidence for the self-regulatory mechanism of MIL. In a diary study, Miao et al. (2017) found that MIL positively predicted proactive coping, and this relationship was mediated by positive affect. This result was later echoed by a photographic intervention study, in which future temporal focus was found to be another mediator between MIL and proactive coping (Miao and Gan 2019). However, the results demonstrated that despite the indirect effects via positive affect and future temporal focus, the direct effect of MIL on proactive coping remained significant, suggesting that the relationship between MIL and proactive coping involves other potential dimensions. Considering that future temporal focus is a component of TP (Shipp et al., 2009), different dimensions of TP may pertain to the processes accounting for the self-regulatory mechanism of MIL on proactive coping.

Some studies have indicated that Present-Hedonistic and Future TPs are positively correlated with proactive coping (Dwivedi & Rastogi, 2017; Zambianchi & Ricci Bitti, 2014), while Past-Negative and Present-Fatalistic TPs are negatively correlated with proactive coping (Anagnostopoulos & Griva, 2012). Thus, to test whether TP acts as a component in the self-regulatory mechanism of MIL, we first systematically investigated the mediation of TPs in the relationship between MIL and proactive coping in current research. Subsequently, we examined the specific processes behind the relationship between MIL and TP.

1.3 Reappraisal and Self-Efficacy Between Meaning in Life and Time Perspective

MIL has been associated with a range of self-regulatory capacities (Hoyt et al., 2017; Simon & Durand-Bush, 2015). These psychological resources may provide many internal benefits responsible for the adaptive function of MIL (Czekierda et al., 2017). Therein, a habitual use of cognitive reappraisal and a general sense of self-efficacy may be included.

Cognitive reappraisal is an effective method of regulating emotional processes, through which the meaning of one event is cognitively changed so that the related emotion is also altered (Gross & John, 2003). Research has demonstrated that MIL is correlated with a greater use of reappraisal strategies (Gross & John, 2003; Park et al., 2008). Despite the possibility that cognitive reappraisal would increase a sense of MIL, these findings can indicate the reverse direction in conjunction with the psychological mechanism of reappraisal. As values are activated in the process of reappraisal (Greenglass & Fiksenbaum, 2009), through cognitive reappraisal, global MIL may infuse ordinary or even negative events with more positive meanings (Park, 2010). Indeed, Dulaney et al. (2018) argued that stressors might be reappraised as less threatening and even beneficial for one's personal growth in the context of MIL.

Research has also found a positive correlation between MIL and general self-efficacy (Blackburn & Owens, 2015; DeWitz et al., 2009). Self-efficacy, the belief in one's ability to accomplish goals, is considered one of the most central foundations in self-regulatory mechanisms and a determinant of human motivation (Bandura, 1993). Regardless of specific situations, general self-efficacy indicates one's self-efficacy across various areas (Jerusalem & Schwarzer, 1992). Self-efficacy has been identified as a need for meaning by

Baumeister (1991), suggesting that self-efficacy may enhance MIL. There are also some studies suggesting that MIL was predictive of self-efficacy (Jafary et al., 2011; Lee & Oh, 2017). Considering the governing role of self-efficacy in goal systems (Bandura, 1993), MIL likely promotes human functioning through self-efficacy (Czekierda et al., 2017). Indeed, the adaptive function of successfully reconstituting global life meaning following a cancer diagnosis has been associated with a greater sense of self-efficacy (Taylor, 1983).

Reappraisal and self-efficacy can be related to the development of TP. On the one hand, the cognitive reappraisal strategy may play a critical role in one's TP profile towards the past. As Strack et al. (1985) articulated, personal attitudes and judgments towards the past depend not only on the retrievals but also on the cognitive appraisals of one's experiences. Zimbardo and Boyd (2008) also stressed that the past is reconstructed in different perspectives regardless of being actually good or bad. Indeed, Past-Positive TP has been found to be positively correlated with cognitive reappraisal (Wang et al., 2015). Considering that reappraisal is an emotion regulation strategy, this is consistent with previous findings showing that Past-Positive TP is correlated with higher emotional management, while Past-Negative TP is correlated with lower cognitive control of emotion (Stolarski et al., 2011).

On the other hand, self-efficacy may be related to the development of Present-Hedonistic, Present-Fatalistic, and Future TPs, which, as mentioned before, are characterized by different goal orientations. Different points of view can be observed in the literature concerning the relationship between TP and self-efficacy. Some researchers suggested that particular tendencies in temporal experience, for example, a future-oriented perspective, would lead to higher levels of self-efficacy (Gutiérrez-Braojos, 2015). However, Epel et al. (1999) stated that "self-efficacy can shape time perspective" (p. 578). It also makes sense to assume that self-efficacy may influence one's propensities for TP (Kerpelman & Mosher, 2004). This contention especially fits the cases of goal-related TPs in that self-efficacy motivates people to set higher goals for themselves and make more persistent efforts towards such goals (Bandura, 1993; Donovan & Hafsteinsson, 2006). Indeed, general self-efficacy was found to be negatively correlated with Present-Fatalistic TP and positively correlated with Future TP (Zebardast et al., 2011).

Thus conceived, cognitive reappraisal and self-efficacy may be involved in the self-regulatory processes between MIL and TP. Specifically, in the context of a meaningful life, the past may be reappraised in a more positive way. As such, MIL may be positively related to Past-Positive TP and negatively related to Past-Negative TP through cognitive reappraisal. Moreover, when people experience higher MIL, they may perceive greater controllability over the present and future and thus, engage in actions directed by higher goals. As such, MIL may be positively related to Future TP and negatively related to Present-Fatalistic and Present-Hedonistic TPs through general self-efficacy.

2 Present Study

To better understand the self-regulatory mechanism of MIL, the present research was conducted to examine the relationship between MIL and TP among youngsters specifically. First, we attempted to test the feasibility of considering TP in the self-regulatory mechanism of MIL by testing the roles of TPs in the effects of MIL on proactive coping (Study 1). Second, we attempted to examine the specific self-regulatory processes involved in the relationship between MIL and TP (Study 2). We predicted that (1) each dimension of TP

would mediate the relationship between MIL and proactive coping, and (2) cognitive reappraisal and general self-efficacy would mediate the relationship between MIL and TP.

3 Research Methods

This research was conducted using a non-experimental cross-sectional survey design. We chose this design for several reasons. First, a cross-sectional method is less time-consuming than an experimental or longitudinal design. Second, MIL, TP, and self-regulation are relatively complicated concepts, so a structured survey would be necessary to measure them. Third, these concepts are abstract and difficult to manipulate in an experimental design. Two serial studies with the same survey design were conducted. Moreover, to make more convincing associations, different instruments were used to measure the same concepts in the two studies.

4 Study 1

In Study 1, we assessed the general experience of MIL, TP, and proactive coping. The main hypotheses were that the relationship between MIL and proactive coping would be mediated by (1) Past-Positive TP, with MIL positively predicting Past-Positive TP and Past-Positive TP positively predicting proactive coping, (2) Past-Negative TP, with MIL negatively predicting Past-Negative TP and Past-Negative TP negatively predicting proactive coping, (3) Present-Hedonistic TP, with MIL positively predicting Present-Hedonistic TP and Present-Hedonistic TP positively predicting proactive coping, (4) Present-Fatalistic TP, with MIL negatively predicting Present-Fatalistic TP and Present-Fatalistic TP negatively predicting proactive coping, and (5) Future TP, with MIL positively predicting Future TP and Future TP positively predicting proactive coping.

4.1 Participants

There were 323 Chinese high school students (168 girls, 153 boys, and two unidentified) who were chosen through convenience sampling and volunteered to participate in this study. The mean age of the participants was 16.32 years (three unidentified, SD = 0.80, range = 15–18). All participants were of Chinese Han ethnicity and from seven classes in a private high school. According to their teachers, all of them could speak proficient Chinese. Sixteen additional participants were excluded from data analyses for not completing all measures.

4.2 Instruments

Three self-report instruments of MIL, TP, and proactive coping were used in this study. All the instruments were Chinese versions, which have been published previously. MIL was measured with the Meaning in Life Questionnaire (Steger et al., 2006). This questionnaire consists of two subscales assessing people's search for meaning and perceived presence of MIL. In the current study, only the Presence of Meaning subscale was used. A Chinese version of this scale was published and found to be psychometrically sound for Chinese high

school students (Wang, 2013), with an internal consistency coefficient of 0.84. It involves five items (e.g., "I have a good sense of what makes my life meaningful") rated on a scale from 1 (*absolutely untrue*) to 7 (*absolutely true*), regarding the degree to which people feel that their life is meaningful.

TP was assessed with a short version of the Zimbardo Time Perspective Inventory (Zhang et al., 2013; Zimbardo & Boyd, 1999), with test–retest reliabilities ranging from 0.64 to 0.80. Past research has shown that this 15-item version has a comparative model fit with the full version in Chinese context (Wang et al., 2015). The inventory includes three items for Past-Positive subscale (e.g., "Happy memories of good times spring readily to mind"), three items for Past-Negative subscale (e.g., "I think about the bad things that have happened to me in the past"), three items for Present-Hedonistic subscale (e.g., "I make decisions on the spur of the moment"), three items for Present-Fatalistic subscale (e.g., "Often luck pays off better than hard work"), and three items for Future subscale (e.g., "I complete projects on time by making steady progress"). Each item was rated on a scale from 1 (*not at all true*) to 5 (*exactly true*), regarding the extent to which it describes the individuals' attitudes and behaviors towards time.

Proactive coping was measured with a Chinese version of the Proactive Coping Scale (Gan et al., 2007), for which the internal consistency was 0.80. It consists of 8 items (e.g., "I like challenges and beating the odds") rated on a scale from 1 (*not at all true*) to 4 (*completely true*), regarding the extent to which they describe the individuals' thoughts and behaviors.

Ratings of all the items in each scale were averaged to obtain a total score for the corresponding variable. The values of Cronbach's alpha for each of the scales in the present sample are presented in Table 1.

Table 1 Descriptive statistics and correlations of the variables in Study 1

Variable	1	2	3	4	5	6	7
1. Meaning in life							
2. Proactive coping	.46***						
3. Past-Positive	.11*	.19***					
4. Past-Negative	−.21***	−.24***	.01				
5. Present-Hedonistic	.03	.02	.02	.06			
6. Present-Fatalistic	−.15**	−.23***	.05	.27***	.17**		
7. Future	.37***	.48***	.18***	−.09	.002	−.09	
Age	.02	.12*	.10	−.01	−.003	−.01	.18**
Gender	−.02	−.17**	.11*	.06	−.01	.05	−.10
Min	1.00	1.43	1.00	1.00	1.00	1.00	1.00
Max	7.00	3.93	5.00	5.00	5.00	5.00	5.00
M	4.26	2.84	4.01	3.30	3.23	2.86	3.30
SD	1.35	0.47	1.00	1.11	0.89	0.85	0.89
Cronbach's α	0.80	0.77	0.77	0.77	0.50	0.46	0.69
Skewness	−0.13	−0.10	−0.97	−0.22	0.13	0.16	0.05
Kurtosis	−0.40	0.04	0.34	−0.72	−0.41	−0.19	−0.58

Gender was coded as 0 = male and 1 = female

*** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$

4.3 Procedure

Participants were informed of this study via our direct contact with the school. After they expressed an interest in participating in the study, we got in touch with them through their teachers. Two weeks before we gathered the data, a consent document in which the details of this study were described was sent to each participant. A phone number was provided, through which participants could ask researchers any question about the study. After written informed consent was obtained, data collection began. Participants anonymously completed the scales in a classroom environment. All procedures performed in this study were in accordance with the ethical standards of research involving human participants at Wuhan University.

4.4 Data Analysis

Statistical assumptions of normality of data distribution, linearity, and multicollinearity were tested (McDonald & Ho, 2002; Schreiber et al., 2006). Through $|z|$-scores and Mahalanobis distance ($p < 0.001$; Tabachnick & Fidell, 2013), no univariate or multivariate outliers were found. By the values of skewness and kurtosis (all between −1 and 1), all the scales were suggestive of approximately normal distributions (Kim, 2013). Multivariate normality assumption was checked and met with a Henze-Zirkler test ($p > 0.05$; Henze & Zirkler, 1990). Bivariate scatterplots (not displayed here) were used to preliminarily test the assumptions of linearity (Tabachnick & Fidell, 2013), showing mostly consistent results with the hypotheses. Overall, our data did not manifest multicollinearity. Variance inflation factors and tolerance values were in the normal range, $\text{VIF} \leq 1.23$ and $\text{Tol} \geq 0.81$.

We conducted statistical mediation analyses in order to determine whether the five dimensions of TP mediated the relationship between MIL and proactive coping. We used the bootstrap PROCESS macro (Model 4; Hayes, 2013) to reduce the standard error and narrow the confidence interval. Specifically, 5000 bootstrap samples were generated using random sampling with replacement from the data set, and a 95% confidence interval (bias-corrected) of the indirect effect was generated. When the 95% confidence intervals of indirect effect do not contain zero, the result suggests a significant mediation effect.

4.5 Results and Discussion

Descriptive statistics and correlations are presented in Table 1. As the results showed, MIL and proactive coping were significantly correlated with TPs, except for the Present-Hedonistic dimension. Proactive coping was also correlated with age and gender, with older and male participants reporting higher proactive coping than their younger and female counterparts. Older participants reported higher Future TP as well. Female participants reported higher Past-Positive TP than their male counterparts. Each variable was standardized for meditation analyses. The five dimensions of TP were entered simultaneously as the mediators of the relationship between MIL and proactive coping. As age and gender were found to be correlated with some study variables, both were included as covariates, and the five cases without full demographic information were excluded from the analysis. The overall model was significant, $F(8, 309) = 23.59$,

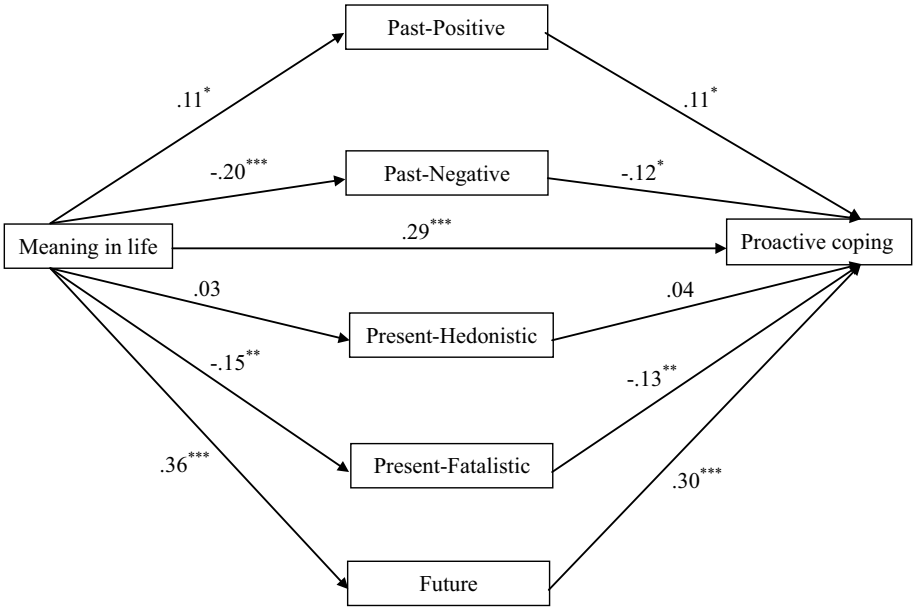

Fig. 1 Relationships between meaning in life, time perspective and proactive coping. *Notes* Standardized coefficients are presented. Model controlled for age and gender. *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$

$p < 0.001$, $R^2 = 0.39$, with age, gender, MIL and TP explaining 39% of the variance in proactive coping. Most of the paths were consistent with our hypotheses, except for those regarding Present-Hedonistic TP (see Fig. 1). As expected, MIL positively and significantly predicted Past-Positive and Future TPs, which in turn positively and significantly predicted proactive coping. MIL also negatively and significantly predicted Past-Negative and Present-Fatalistic TPs, which in turn negatively and significantly predicted proactive coping. However, the path coefficients regarding Present-Hedonistic TP were not significant.

Significant indirect effects of MIL on proactive coping via Past-Positive TP ($\beta = 0.01$, $SE = 0.01$, 95% CI [0.002, 0.04]), Past-Negative TP ($\beta = 0.02$, $SE = 0.01$, 95% CI [0.01, 0.06]), Present-Fatalistic TP ($\beta = 0.02$, $SE = 0.01$, 95% CI [0.005, 0.05]) and Future TP ($\beta = 0.11$, $SE = 0.02$, 95% CI [0.07, 0.17]) were found, lending specific support to the hypothesized mediation of the corresponding TP. However, the indirect effect via Present-Hedonistic TP ($\beta = 0.001$, $SE = 0.004$, 95% CI [-0.003, 0.02]) was not significant. Thus, the hypothesized mediation of Present-Hedonistic TP in the relationship between MIL and proactive coping was not found.

In Study 1, we found that TP mediated the relationship between MIL and proactive coping. As inferred from the results, adolescents with higher MIL are more likely to have positive attitudes towards their past, more control over their present, and more efficiency and thus, undertake more proactive efforts against future stressors. Considering that proactive coping pertains to self-regulation (Aspinwall & Taylor, 1997), our findings provide good support for the role of TP in the self-regulatory mechanism of MIL.

Unexpectedly, the correlation between Present-Hedonistic TP and MIL was not significant. This implies that MIL may not relate to Present-Hedonistic TP, or it may relate

to Present-Hedonistic TP in a complicated way. Contrary effects may be involved in particular self-regulatory processes from MIL to Present-Hedonistic TP.

5 Study 2

In Study 2, we examined the mediating paths from MIL to TP. Cognitive reappraisal and general self-efficacy were measured, along with MIL and TP. Different from Study 1, MIL was measured from three facets, i.e., coherence, significance, and purpose. Because of the relatively low reliability of the Present-Hedonistic and Present-Fatalistic scale in Study 1, a full Zimbardo Time Perspective Inventory was used to measure TP. The following hypotheses were tested: (1) cognitive reappraisal would mediate the relationship between MIL and Past-Positive TP, with MIL positively predicting cognitive reappraisal and cognitive reappraisal positively predicting Past-Positive TP; (2) cognitive reappraisal would mediate the relationship between MIL and Past-Negative TP, with MIL positively predicting cognitive reappraisal and cognitive reappraisal negatively predicting Past-Negative TP; (3) general self-efficacy would mediate the relationship between MIL and Present-Hedonistic TP, with MIL positively predicting general self-efficacy and general self-efficacy negatively predicting Present-Hedonistic TP; (4) general self-efficacy would mediate the relationship between MIL and Present-Fatalistic TP, with MIL positively predicting general self-efficacy and general self-efficacy negatively predicting Present-Fatalistic TP; (5) general self-efficacy would mediate the relationship between MIL and Future TP, with MIL positively predicting general self-efficacy and general self-efficacy positively predicting Future TP.

5.1 Participants

Participants were 346 Chinese students (171 girls, 175 boys) who were attending twelfth grade or their first year of college. They were chosen through convenience sampling, and none of them participated in Study 1. The mean age of the participants was 17.51 years (SD = 0.80, range = 15–21). All participants were of Chinese Han ethnicity and were from six classes in a public secondary school and one class in a public college. According to their teachers, all of them could speak proficient Chinese. Five additional participants were excluded from data analyses for not completing all measures.

5.2 Instruments

Four self-report instruments were used to measure MIL, TP, cognitive reappraisal, and general self-efficacy in this study. All the instruments were Chinese versions, either published previously or translated by us. The process of instrument translation was as follows: the first author translated the original English version into Chinese; then a doctoral psychology student translated the scale back into English; and finally, a Master's degree student in English compared the back-translated English version with the original English version, and subsequent refinements were made.

Meaning in life was assessed using the Meaningful Life Measure (Morgan & Farsides, 2009). It is comprised of five subscales, with internal consistency coefficients ranging between 0.85 and 0.88. According to Martela and Steger (2016), the subscales of principled life, valued life, and purposeful life can be regarded as corresponding to the sense

of coherence, significance, and purpose, respectively. Thus, after being translated into Chinese, only these three scales were used in the current study. Specifically, five items were used to measure the dimension of coherence (e.g., "I have a system or framework that allows me to truly understand my being alive"), four items were used to measure the dimension of significance (e.g., "My life is worthwhile"), and four items were used to measure the dimension of purpose (e.g., "In my life I have no goals or aims at all", reverse coded). Each item was rated from 1 (*strongly disagree*) to 7 (*strongly agree*), regarding the extent to which it describes the individuals' feelings.

Time perspective was assessed using the full Zimbardo Time Perspective Inventory (Zimbardo & Boyd, 1999), for which the internal consistency coefficients ranged between 0.74 and 0.82. In this study, all the 56 items were translated by us, including nine items for Past-Positive TP (e.g., "Happy memories of good times spring readily to mind"), ten items for Past-Negative TP (e.g., "Painful past experiences keep being replayed in my mind"), fifteen items for Present-Hedonistic TP (e.g., "I make decisions on the spur of the moment"), nine items for Present-Fatalistic TP (e.g., "Often luck pays off better than hard work") and thirteen items for Future TP (e.g., "Meeting tomorrow's deadlines and doing necessary work comes from tonight's play"). Each item was rated on a scale from 1 (*not at all true*) to 5 (*exactly true*), regarding the extent to which it describes the individuals' attitudes and behaviors.

Cognitive reappraisal was assessed with the Emotion Regulation Questionnaire (Gross & John, 2003). It is a 10-item scale measuring the use of emotion regulation strategies. In the current study, only the Reappraisal Scale was used, which has been adapted to Chinese culture with an internal consistency coefficient of 0.85 (Wang et al., 2007). It involves six items (e.g., "I control my emotions by changing the way I think about the situation I'm in") rated on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*), regarding the extent to which they describe individuals' feelings and actions.

General self-efficacy was assessed with the General Self-Efficacy Scale (Jerusalem & Schwarzer, 1992), which measures personal coping with daily hassles. This scale has also been adapted to Chinese culture, with an internal consistency coefficient of 0.87 (Wang et al., 2001). It involves ten items (e.g., "I can always manage to solve difficult problems if I try hard enough") rated on a scale from 1 (*not at all true*) to 4 (*exactly true*), regarding the extent to which they describe individuals' attitudes and behaviors.

Ratings of all the items in each scale were averaged to obtain a total score for the corresponding scale. The values of Cronbach's alpha for each of the scales in the present sample are presented in Table 2.

5.3 Procedure

Except for the differences in instruments, the procedure in this study was the same as that in Study 1.

5.4 Data Analysis

Statistical assumptions of normality of data distribution, linearity, and multicolinearity were tested (McDonald & Ho, 2002; Schreiber et al., 2006). Through $|z|$-scores and Mahalanobis distance ($p < 0.001$; Tabachnick & Fidell, 2013), five univariate or multivariate outliers were found. All the outliers were deleted, leaving 441 cases for the analyses. By the values of skewness and kurtosis (all between -1 and 1), all the scales were suggestive

Table 2 Descriptive statistics and correlations of the variables in Study 2

Variable	1	2	3	4	5	6	7	8	9	10
1. Reappraisal										
2. Self-efficacy	.31***									
3. Coherence	.30***	.44***								
4. Significance	.28***	.24***	.36***							
5. Purpose	.21***	.33***	.48***	.41***						
6. Past-Positive	.25***	.10	.20***	.30***	.19***					
7. Past-Negative	.003	−.09	−.02	−.14*	−.17**	−.01				
8. Present-Hedonistic	.15**	.20***	.12*	−.05	−.04	.25***	.35***			
9. Present-Fatalistic	−.06	−.09	−.14*	−.26***	−.39***	.02	.53***	.43***		
10. Future	.32***	.37***	.41***	.30***	.45***	.14**	−.02	.06	−.30***	
Age	.10	.05	.14**	.07	.01	.08	.03	.06	.05	.07
Gender	.004	−.08	−.01	−.01	.09	−.02	.001	−.08	−.06	.08
Min	2.17	1.70	1.00	2.00	1.00	1.56	1.50	1.93	1.44	1.92
Max	7.00	3.80	7.00	7.00	7.00	5.00	5.00	4.73	4.67	4.62
M	5.05	2.86	4.60	5.85	4.88	3.56	3.33	3.23	2.92	3.21
SD	0.89	0.38	1.22	1.11	1.28	0.61	0.63	0.45	0.57	0.43
Cronbach's α	0.74	0.74	0.85	0.88	0.78	0.74	0.79	0.71	0.71	0.64
Skewness	0.03	−0.14	−0.33	−0.76	−0.37	−0.34	0.04	0.32	0.09	0.18
Kurtosis	0.10	−0.16	0.14	−0.20	−0.43	0.38	0.03	0.48	0.24	0.34

Gender was coded as 0 = male and 1 = female

*** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$

of approximately normal distributions (Kim, 2013). Multivariate normality assumption was checked and met by a Henze-Zirkler test ($p > 0.05$; Henze & Zirkler, 1990). Bivariate scatterplots (not displayed here) were used to preliminarily test the assumptions of linearity (Tabachnick & Fidell, 2013), showing mostly consistent results with the hypotheses. Overall, our data did not manifest multicollinearity. Variance inflation factors and tolerance values were in the normal range, VIF ≤ 1.55 and Tol ≥ 0.65.

To test the indirect effects of cognitive reappraisal and self-efficacy in the relationship between MIL and TP, path analyses were conducted using AMOS version 21.0 software (Arbuckle, 2012). We applied a maximum likelihood technique and a bootstrapping procedure (bias-corrected, 5000 samples). To evaluate the fit of the model to the data, several indices were calculated: the chi-square statistic (χ^2), χ^2/df ratio, Root Mean Square Error of Approximation (RMSEA), Standard Root Mean Square Residual (SRMR), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). Values of these indices indicated the potential for acceptable (χ^2/df ratio < 3, CFI and TLI ≥ 0.90, SRMR ≤ 0.10, RMSEA ≤ 0.08) and excellent fit (χ^2/df ratio < 2, CFI and TLI ≥ 0.95, SRMR ≤ 0.08, RMSEA ≤ 0.05) (Hu & Bentler, 1999; Kline, 2011).

5.5 Results and Discussion

Descriptive statistics and correlations are presented in Table 2. Consistent with the results in Study 1, most correlations between the dimensions of MIL and TP were significant. However, coherence was not significantly correlated with Past-Negative TP, whereas significance and purpose were not significantly correlated with Present-Hedonistic TP. As expected, the dimensions of MIL were significantly correlated with reappraisal and self-efficacy. Reappraisal was significantly correlated with Past-Positive TP as expected, but unexpectedly, not with Past-Negative TP. Self-efficacy was significantly correlated with Future and Present-Hedonistic TPs, but unexpectedly, not with Present-Fatalistic TP. However, contrary to the hypothesis, the correlation between self-efficacy and Present-Hedonistic TP was positive. As to the results regarding age and gender, only a significant correlation was observed between age and MIL, with older participants reporting higher levels of coherence.

An initial model was developed to test the hypothesized mediations of the relationship between MIL and TP by reappraisal and self-efficacy (see Fig. 2). For some endogenous variables that showed significant correlations in the above results, their error terms were included as correlated. To control the number of parameters, we separately entered the three dimensions of MIL into three models. Coherence was run in model 1, significance in model 2, and purpose in model 3.

In model 1, mediations of the relationship between coherence and TP by reappraisal and self-efficacy were examined. The result indicated that the data didn't fit the initial model well: χ^2 (14, n = 341) = 57.54, $p < 0.001$, χ^2/df ratio = 4.11; RMSEA = 0.10; SRMR = 0.07; CFI = 0.91; TLI = 0.83. Then direct paths from coherence to each dimension of TP were added to the model. The modified model realved a good fit to the data: χ^2

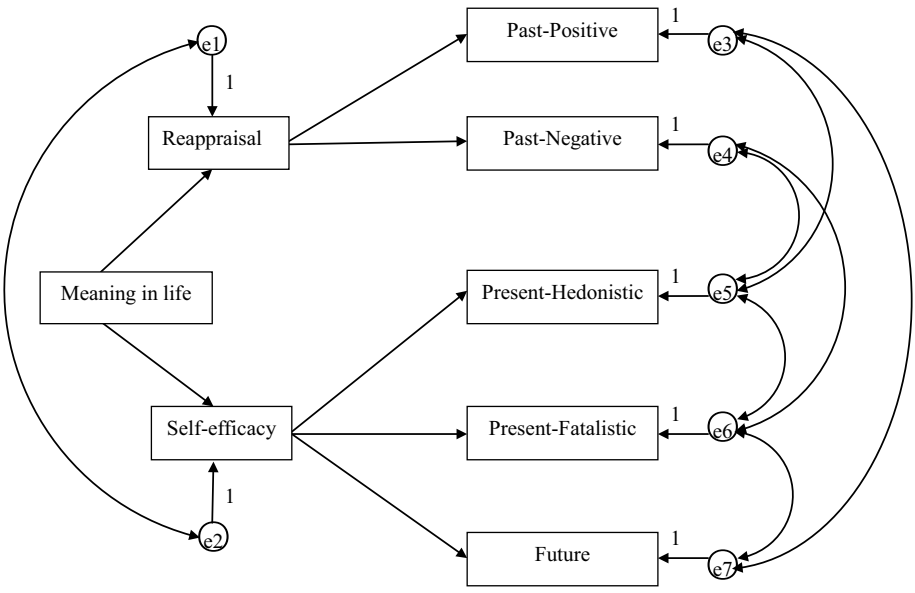

Fig. 2 Initial model to establish the mediations of cognitive reappraisal and self-efficacy in the relationship between meaning in life and time perspective

(9, n = 341) = 19.52, $p = 0.02$, χ^2/df ratio = 2.17; RMSEA = 0.06; SRMR = 0.03; CFI = 0.98; TLI = 0.94.

In model 2, mediations of the relationship between significance and TP by reappraisal and self-efficacy were examined. The result indicated that the data didn't fit the initial model well: χ^2 (14, n = 341) = 80.22, $p < 0.001$, χ^2/df ratio = 5.73; RMSEA = 0.12; SRMR = 0.09; CFI = 0.86; TLI = 0.72. Then direct paths from coherence to each dimension of TP were added to the model. The modified model realved a good fit to the data: χ^2 (9, n = 341) = 23.35, $p = 0.01$, χ^2/df ratio = 2.59; RMSEA = 0.07; SRMR = 0.04; CFI = 0.97; TLI = 0.91.

In model 3, mediations of the relationship between purpose and TP by reappraisal and self-efficacy were examined. The result indicated that the data didn't fit the initial model well: χ^2 (14, n = 341) = 114.63, $p < 0.001$, χ^2/df ratio = 8.19; RMSEA = 0.15; SRMR = 0.10; CFI = 0.81; TLI = 0.61. Then direct paths from coherence to each dimension of TP were added to the model. The modified model realved a good fit to the data: χ^2 (9, n = 341) = 24.36, $p = 0.004$, χ^2/df ratio = 2.71; RMSEA = 0.07; SRMR = 0.04; CFI = 0.97; TLI = 0.91.

Figure 3 shows the final models, in which the paths were partially consistent with the hypotheses. As expected, each dimension of MIL positively and significantly predicted reappraisal and self-efficacy, which in turn positively and significantly predicted Past-Positive and Future TP, respectively. However, although self-efficacy significantly predicted Present-Hedonistic, the path coefficient was unexpectedly positive. Moreover, the path from reappraisal to Past-Negative TP and the path from self-efficacy to Present-Fatalistic TP were not significant in all three models.

As the results from the bootstrapping procedure showed, the indirect effect of reappraisal between MIL and Past-Positive TP was significant (in model 1, β = 0.05, *SE* = 0.02, 95% CI [0.02, 0.10]; in model 2, β = 0.04, *SE* = 0.02, 95% CI [0.01, 0.08]; in model 3, β = 0.04, *SE* = 0.02, 95% CI [0.01, 0.08]), lending support to the hypothesized mediation of cognitive reappraisal in the relationship between MIL and Past-Positive TP. However, the indirect effect of reappraisal on the relationship between MIL and Past-Negative TP was not significant (in model 1, β = -0.005, *SE* = 0.02, 95% CI [-0.04, 0.03]; in model 2, β = -0.001, *SE* = 0.02, 95% CI [-0.03, 0.03]; in model 3, β = 0.0004, *SE* = 0.01, 95% CI [-0.02, 0.03]), indicating that the hypothesized mediation of cognitive reappraisal in the relationship between MIL and Past-Negative TP was not supported. Moreover, indirect effects of self-efficacy were significant in the paths from MIL to Present-Hedonistic TP (in model 1, β = 0.10, *SE* = 0.02, 95% CI [0.05, 0.15]; in model 2, β = 0.06, *SE* = 0.02, 95% CI [0.03, 0.10]; in model 3, β = 0.08, *SE* = 0.02, 95% CI [0.05, 0.13]) and Future TP (in model 1, β = 0.10, *SE* = 0.03, 95% CI [0.05, 0.16]; in model 2, β = 0.08, *SE* = 0.02, 95% CI [0.04, 0.13]; in model 3, β = 0.08, *SE* = 0.02, 95% CI [0.04, 0.13]). Thus, the mediation of self-efficacy in the relationship between MIL and Present-Hedonistic TP was significant but opposite the direction of our hypothesis. The hypothesized mediation of self-efficacy in the relationship between MIL and Future TP was supported. However, the indirect effect of self-efficacy was not significant in the path from MIL to Present-Fatalistic TP (in model 1, β = 0.004, *SE* = 0.03, 95% CI [-0.04, 0.06]; in model 2, β = -0.001, *SE* = 0.01, 95% CI [-0.03, 0.03]; in model 3, β = 0.02, *SE* = 0.02, 95% CI [-0.01, 0.06]), indicating that the hypothesized mediation of general self-efficacy in the relationship between MIL and Present-Fatalistic TP was not supported.

In Study 2, we found that cognitive reappraisal and general self-efficacy mediated the relationship between MIL and TP. Specifically, the three facets of MIL, Coherence,

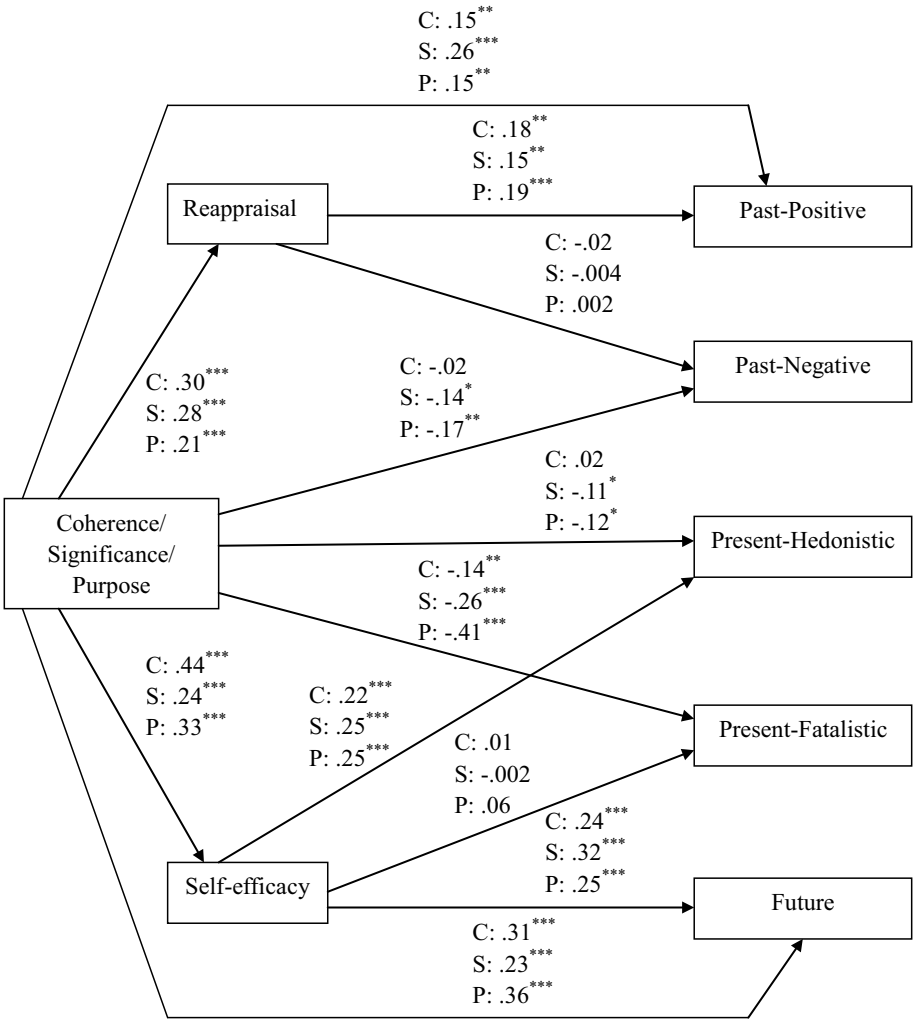

Fig. 3 Final models of the relationships between meaning in life, reappraisal, self-efficacy and time perspective. *Notes* C = Coherence, S = Significance, P = Purpose. Estimated standardized path coefficients are provided. For the clarity of presentation, error terms and their correlations are not shown. *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$

significance, and purpose, all positively predicted Past-Positive TP through cognitive reappraisal and positively predicted Present-Hedonistic and Future TPs through self-efficacy.

Although MIL positively predicted Past-Positive TP via reappraisal, the inverse relation with Past-Negative TP was not significant. Even the correlations between the two TPs towards the past were not significant, which was also observed in other studies (Anagnostopoulos & Griva, 2012; Przepiorka et al., 2020; Stolarski et al., 2011). In line with Carver et al. (2000), demonstrating that positive and negative experiences are relatively independent of each other, these results suggest that the relationships between MIL and the two TPs towards the past may involve different processes.

The indirect effects of purpose on Present-Hedonistic TP through self-efficacy are contrary to the direct effects, which somewhat explains the non-significant correlation between MIL and Present-Hedonistic TP in Study 1. Unexpectedly, general self-efficacy was found to positively predict Present-Hedonistic TP, and its relationship to Present-Fatalistic TP was not significant. Combining the results regarding Future TP, it seems that self-efficacy is only related to the development of goal-directed TPs, regardless of whether the corresponding goal is pleasure-oriented or achievement-oriented. Given that Present-Fatalistic TP represents an orientation lack of motivation, resources relating to goal attainment should be irrelevant to its development.

In sum, the results suggest that when people experience higher MIL, they are more likely to use the cognitive reappraisal strategy and perceive efficacy for goal attainment, thus holding positive and goal-directed attitudes towards life. As reappraisal and self-efficacy are important resources in self-regulatory processes on emotion and motivation, respectively, these findings provided further evidence for the self-regulatory mechanism of MIL.

6 General Discussion

The main purpose of this research was to examine the role of TP in the self-regulatory mechanism of MIL among Chinese youngsters. While conceptually replicating the effects of MIL on proactive coping, in Study 1, we found evidence for the mediating roles of TPs in this relationship. Addressing two self-regulatory processes in emotion and motivation, Study 2 found that MIL is related to TP via cognitive reappraisal and self-efficacy.

The contribution of the present research is twofold. First, it identifies MIL as a predictor of TP. Previous work has widely considered TP as predicting various psychosocial outcomes, leaving a research gap concerning the origins of this individual difference. In view of the importance of goals and values for developmental processes (Steger et al., 2012), we assumed that MIL might make a difference in late adolescents' profiles of TP. By showing the predictive role of MIL on TP, the present findings suggest that MIL can be a cognitive context on which one's TP is based, and in turn, TP can influence physical and mental functioning. Second, it provides empirical evidence for the underlying mechanism behind the adaptive function of MIL. In line with Hooker et al. (2018), in this research, we assumed that MIL promotes human functioning through a series of self-regulatory processes. TP combines multiple processes, including cognition, emotion, and motivation, naturally relating to self-regulatory strategies in daily life (Zimbardo & Boyd, 1999). By connecting MIL with TP, our research extends previous studies on the self-regulatory mechanism of MIL.

Study 1 proposed and observed that TP mediated the relationship between MIL and proactive coping. Specifically, MIL was related to proactive coping through positively predicting Past-Positive and Future TPs and negatively predicting Past-Negative and Present-Fatalistic TPs. These findings echoed previous research with two anchors. First, the associations between MIL and TPs towards the past resonated with previous research demonstrating the effects of MIL on positive affect (Yalçın & Malkoç, 2015). Some studies argued that MIL might promote proactive coping through positive affect (Miao and Gan 2019; Miao et al., 2017). Considering that higher Past-Positive and lower Past-Negative TPs may predispose people to experience more happiness and less depression (Zimbardo & Boyd, 1999), Study 1 provided support for the adaptive function of MIL in an emotional level.

Second, the associations between MIL and goal-related TPs lined with previous research linking MIL to goal pursuits (McKnight & Kashdan, 2009). Miao and Gan (2019) demonstrated that MIL may promote proactive coping by increasing attention on future goals. People with higher Future TP are more likely to place attention on their long-term goals and make efforts to attain them (Bembenutty & Karabenick, 2004), whereas people with higher Present-Fatalistic TP are less motivated by goals (Zimbardo & Boyd, 1999). Thus, Study 1 provided good support for the adaptive function of MIL in a motivational level.

Extending Study 1, we examined the self-regulatory processes underlying the correlations between MIL and TP in Study 2. The results showed that cognitive reappraisal mediated the relationship between MIL and Past-Positive TP, which might explain how MIL is related to resilience and benefits recovery from stressful stimuli (Smith et al., 2009). The appraisals of negative experiences decide the extent to which people can suffer from them (Beck & Haigh, 2014). In the context of MIL, life events may be infused with meanings for the big picture of life, and thus may be associated with less emotional distress. Therefore, by showing that reappraisal strategies may render adolescents with higher MIL to embrace a positive attitude towards the past, our findings provided further evidence for the self-regulatory mechanism of MIL on emotion.

Study 2 also showed that general self-efficacy mediated the effects of MIL on Present-Hedonistic and Future TPs. Self-efficacy reflects the manageability of the environment (Bandura, 1993), which is inherently related to a sense of coherence in MIL (Grevenstein et al., 2016). In accordance with the critical role of self-efficacy for goal attainment (Donovan & Hafsteinsson, 2006), our findings suggest that self-efficacy may account for the adaptive function of MIL in organizing actions. Adolescents with higher MIL are more likely to perceive higher general self-efficacy and thus develop Present-Hedonistic and Future TPs, a combination of which can contribute to an optimal goal-oriented state of human functioning (Boniwell & Zimbardo, 2004). Thus, the findings provided further evidence for the self-regulatory mechanism of MIL on motivation.

It ought to be noted that the direct effects of MIL on TP are still significant apart from the indirect effects via cognitive reappraisal and self-efficacy. Moreover, the indirect effects of either cognitive reappraisal or self-efficacy are not significant in the relationships between MIL and Past-Negative or Present-Fatalistic TP. These findings suggest that there might be other self-regulatory processes in the relationship between MIL and TP. For instance, indulgence, resignations, and negative emotions mostly interfere with the fulfillment of purpose, requiring the use of self-control (Muraven et al., 2008). Therefore, self-control might explain the remaining negative correlations of MIL with Past-Negative, Present-Hedonistic, and Present-Fatalistic TPs.

7 Limitations and Future Directions

As very few studies considered TP in the self-regulatory mechanism of MIL, the findings of the current research should be treated as preliminary work. When interpreting the results of this study, several limitations should be noted. First, all the variables were measured with quantitative and cross-sectional data. Therefore, any conclusion regarding development and directionality is tentative. For instance, although regarded as a part of the adaptive function of MIL in the present research, present pleasure has also been considered as a part or source of MIL (Hicks & King, 2009), suggesting that Present-Hedonistic TP may affect MIL. In fact, instead of being predicted, some studies regarded TP as being

predictive of MIL (e.g., Leshkovska & Shterjovska, 2014) and self-efficacy (e.g., Gutiérrez-Braojos, 2015). Similarly, instead of being predictive, there are also studies considering MIL as being predicted by cognitive reappraisal (e.g., Park et al., 2008) and self-efficacy (e.g., DeWitz et al., 2009). Thus, experimental, longitudinal, and qualitative research concerning the relationship between MIL and TP will lead to richer findings.

Second, the items measuring the three dimensions of MIL were extracted from the five-factor construct of MIL (Morgan & Farsides, 2009), which may restrict the reliability of the results. Thus, inspections of the model with a reliable three-factor instrument are recommended in future research. Third, our sample is relatively small and targets youngsters. To generalize the findings, researchers may need to conduct similar studies with other populations in the future.

Last but not least, other important factors in self-regulatory mechanisms, such as self-control and resilience, were not considered in the present research. As self-regulation is a synthetic concept involving complicated qualities in emotion, motivation, and cognition (Hooker et al., 2018), other aspects of self-regulation should be explored in future research on the relationship between MIL and TP. In general, more research concerning the relationship between MIL and TP will help examine our conjectures and further extend the self-regulatory mechanism of MIL.

8 Conclusion

The present research sought to provide a rationale for viewing TP as being very important to the self-regulatory mechanism of MIL. TP involves multiple self-regulatory processes that influence physical and psychological health (Zimbardo & Boyd, 1999). This research provides evidence for the self-regulatory function of MIL, and preliminary results suggest that TP may serve to reflect the effects of MIL on human functioning. MIL is positively related to proactive coping through TP. Furthermore, people who experience higher MIL may be more likely to use the cognitive reappraisal strategy, have self-efficacy and thus embrace a more positive and dynamic attitude towards the past, present, and future. Hence, finding MIL can be beneficial, and conducting life meaning education among youngsters can be important.

Declarations

Conflict of Interest The authors declare that there are no conflicts of interest.

Ethical Approval The project was submitted to the Ethics Committee at Wuhan University, and the approval was officially provided.

Informed Consent Informed consent in written form was obtained from all participants included in the study and parents or other legally authorized representatives of the minor participants.

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