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Article

# Parental Warmth and Adolescents' Meaning in Life: Mediator of Perceived Control and Moderator of Relative Deprivation

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**ABSTRACT:** This study establishes a moderated mediation model that incorporates the roles of perceived control and relative deprivation. Specifically, we hypothesized that parental warmth positively predicts adolescents' meaning in life, with perceived control mediating this relationship. Furthermore, relative deprivation moderates both the direct effect of parental warmth on meaning in life and the indirect effect through perceived control. A total of 406 adolescents participated in this study. The results revealed that: (1) parental warmth positively related to adolescents' meaning in life; (2) perceived control significantly mediated the relationship between parental warmth and meaning in life; and (3) relative deprivation moderated the association between parental warmth and perceived control, such that higher levels of relative deprivation attenuated the positive effect of parental warmth on perceived control. These findings contribute to a deeper understanding of the psychological mechanisms linking parental warmth to adolescents' meaning in life and provide valuable insights for interventions aimed at fostering meaning development in youth.

**Keywords:** Parental warmth; Meaning in life; Perceived control; Relative deprivation; Adolescents



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## 1. Introduction

Meaning in life is a crucial factor influencing mental health and has become an increasingly important area of research [1–3]. It refers to the extent to which an individual perceives their life as purposeful, significant, and coherent [4]. Throughout the lifespan, having a sense of meaning in life is vital [5], and adolescence, as a critical transitional period for self-identity formation, is particularly significant. During this stage, meaning in life provides adolescents with a sense of direction and supports their identity development [6]. Furthermore, a strong sense of meaning in life can serve as a resource for resilience, acting as a protective factor that helps adolescents cope with negative life events, psychopathological symptoms, and self-disturbances [7]. Adolescents who report a higher sense of meaning in life are also more likely to experience greater life satisfaction [8]. These findings highlight the importance of meaning in life for psychological development, particularly in terms of adolescents' mental health.

While much research has focused on the consequences of meaning in life, there is a lack of studies examining the antecedents of adolescents' meaning in life. For instance, Ma and Zhang (2020) [2] suggested that the development of meaning in life begins with the establishment of attachment bonds with parents. Despite this, family-related antecedents, such as parental warmth, remain underexplored in the literature concerning adolescents' meaning in life [3]. Therefore, this study addressed a moderated mediation model to investigate the association between parental warmth and adolescents' meaning in life, as well as the underlying mechanisms.

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## 2. Literature Review

### 2.1. Association between Parental Warmth and Meaning in Life

Parental warmth refers to parents' support and care for their children, the expression of positive emotions and behaviors that convey recognition, and their sensitivity to children's needs, providing intimate feedback [9]. Ref. [10] emphasized that parental warmth plays a crucial role in individuals' psychological adjustment and the development of positive personality traits. Moreover, meaning in life is considered a positive personality trait and is defined as "the sense made of, and significance felt regarding, the nature of one's being and existence" [11]. According to the Meaning Maintenance Model [1,12], individuals tend to associate people, events, and places around them with their own thoughts, behaviors, attributions, abilities, and roles. From birth, humans automatically seek meaning in the continuous flow of incoming information. Interpersonal interactions serve as a crucial avenue through which individuals derive meaning.

Several studies have highlighted the influence of family, particularly parental factors, on the sense of meaning in life. For instance, empirical research has shown that positive family dynamics (e.g., family intimacy) and parenting practices (e.g., attachment patterns) are positively associated with meaning in life [13,14]. Similarly, ref. [3] demonstrated that the quality of the parent-child relationship is a strong factor positively influencing adolescents' sense of meaning in life. Given that parental warmth is a key component of parenting, it is likely to be associated with meaning in life as well. Warmth, support, and respect from parents are integral to a positive parent-child relationship, thereby enhancing the child's sense of meaning [15,16]. Furthermore, parental warmth helps individuals feel worthy of love and fosters a belief that others are trustworthy [17]. This foundation of trust can facilitate the development of stable relationships with others, including peers, and with the external world, making it easier for individuals to find meaning in life [2]. Based on these findings, the present study hypothesizes that *parental warmth is positively associated with adolescents' meaning in life* (H1).

### 2.2. The Mediating Role of Perceived Control

Perceived control often refers to the belief that one can regulate one's internal states and behaviors, influence the environment, and achieve desired outcomes [18]. Previous research has suggested that environmental uncertainty negatively impacts individuals' perceived control [19]. According to ecological systems theory, parenting, as a key component of the microsystem, plays a vital role in shaping an individual's developmental environment [20]. Parental warmth, as a positive parenting practice, provides adolescents with a stable and supportive environment, fulfilling their need for autonomy and aiding in identity development, which subsequently enhances perceived control [21]. Simultaneously, the relationship between parenting and perceived control has been well-documented. For instance, ref. [22] found that negative parenting practices were associated with lower levels of perceived control. Similarly, maternal involvement and autonomy support have been shown to positively influence children's perceived control [23]. Based on these findings, parental warmth is likely to be significantly associated with adolescents' perceived control.

The meaning-making model posits that individuals derive meaning in life through automatic and deliberate processes [24], and a sense of control can play a vital role during the processes. Perceived control, as a critical resource, contributes to the development of meaning [12] and is closely linked to a sense of purpose [25]. Individuals with high perceived control are better able to organize and structure their lives, fostering coherence and order, which enhances their perception of life as meaningful [26]. For example, ref. [27] found that control over oneself and external events positively correlates with various dimensions of meaning in life, such as achievement and relationships. Similarly, ref. [14] reported a positive association between self-control and the presence of meaning in life. Bauer, ref. [28] further suggested that perceived control reflects the autonomy emphasized in self-determination theory, significantly contributing to the construction of life's meaning. Based on this body of literature, the present study hypothesizes that *perceived control mediates the relationship between parental warmth and adolescents' meaning in life* (H2).

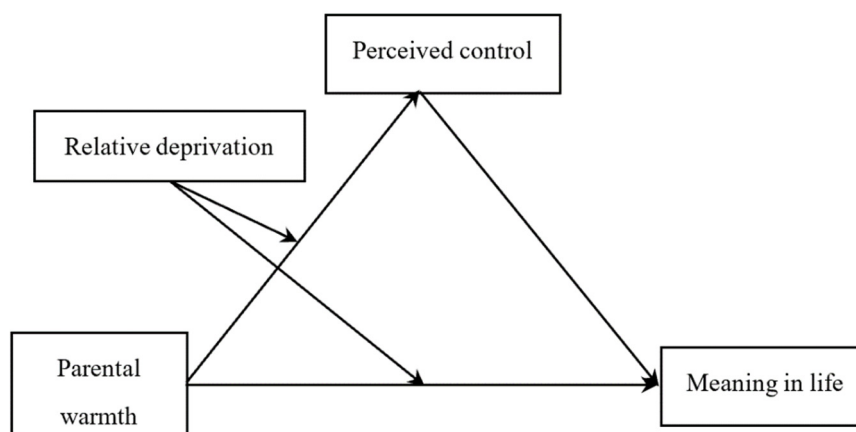
### 2.3. Moderating Role of Relative Deprivation

Adolescence is a unique and complex stage of development, characterized by questions about future goals and plans, which are closely related to the formation of meaning in life [6]. Ref. [29] found a strong association between parental warmth and deprivation during childhood. Relative deprivation, defined as a social condition where individuals perceive themselves as lacking desired possessions or states in comparison to the real or imagined conditions of others or societal standards, is often accompanied by negative emotions such as anger [30,31]. Economic deprivation, particularly financial deprivation, is frequently used to indicate relative deprivation in previous research [31,32].

Adolescents are especially sensitive to their external environment [6]. Those living in disadvantaged conditions, such as rural left-behind children or children from divorced families, are more likely to experience relative deprivation through comparisons with their peers [31]. Such negative feelings can diminish their sense of meaning in life [33]. Relative deprivation may also contribute to perceptions of unfairness and instability in the world [32], reducing an individual's sense of control over their environment. Furthermore, individuals experiencing high levels of relative deprivation may struggle to adjust their goals or beliefs, hindering their ability to construct a meaningful life [1]. Based on these findings, we hypothesize that *relative deprivation moderates the relationship between parental warmth and meaning in life, as well as the mediating effect of perceived control* (H3).

#### 2.4. Current Study

Compared to prior research, this study focuses specifically on parental warmth rather than broader constructs such as family factors or the overall quality of parenting behaviors. Additionally, it considers the roles of perceived control and relative deprivation in the relationship between parental warmth and meaning in life. Grounded in the ecological systems perspective, this study emphasizes the influence of both family and individual factors in shaping the development of meaning in life. The present study aims to examine: (a) whether parental warmth is associated with adolescents' meaning in life, (b) whether perceived control mediates the link between parental warmth and meaning in life, and (c) whether the indirect association between parental warmth and meaning in life, via perceived control, is moderated by relative deprivation (Figure 1). Therefore, this study developed a moderated mediation model to examine both the mediation process (*i.e.*, how parental warmth influences meaning in life) and the moderation effect (*i.e.*, for whom this relationship is stronger) between parental warmth and meaning in life among adolescents.



**Figure 1.** The moderated mediation model.

### 3. Method

#### 3.1. Participants

A total of 406 adolescents (Mage = 15.72 years, SD = 0.96, range = 14–18 years; 49.0% female) were conveniently recruited from a public high school (Grades 9 to 12) in Wuhan, China. Participants completed self-report questionnaires during a classroom session (Table 1). Each session lasted approximately 20 min. Ethical approval for the study was granted by the Ethics Committee of Central China Normal University(CCNU-IRB-202403023A), and written consent was obtained from each participant's parents before our research.

**Table 1.** Demographic information.

Variable	Levels	Frequency	Percentage (%)
Gender	Male	207	51
	Female	199	49
Grade	Grade ten	232	57.1
	Grade eleven	68	16.7
	Grade twelve	106	26.1
Annual family income	10,000 to 100,000 RMB	50	12.3
	100,000 to 200,000 RMB	142	35.0

	200,000 to 500,000 RMB	155	38.2
	Half a million to a million RMB	48	11.8
	Over a million RMB	11	2.7
Father's educational level	high school and below	118	29.1
	Associate degree	87	21.4
	Bachelor degree	153	37.7
	Master degree	39	9.6
	Doctor degree	8	2
Mother's educational level	high school and below	145	35.7
	Associate degree	98	24.1
	Bachelor degree	131	32.3
	Master degree	22	5.4
	Doctor degree	9	2.2

### 3.2. Measures

#### 3.2.1. Parental Warmth

The Parents Emotional Warmth Subscale in the Chinese version of the short-form Egna Minnen av Barndoms Uppfostran was revised by ref. [34]. It comprises 7 items (e.g., “*My father/mother always tries to encourage me and make me the best.*”). Each item was rated on a 4-point scale, ranging from 1 (never) to 4 (always). The parental emotional warmth score was computed by averaging each participant's ratings for both the father and mother across the items. A higher score reflects a stronger perceived level of parental emotional warmth. This subscale was applicable among Chinese adolescents (e.g., ref. [9]) and also demonstrated good reliability in the current study (Cronbach's  $\alpha = 0.92$ ).

#### 3.2.2. Perceived Control

The perceived control inventory was derived from the scale developed by ref. [35], which included seven items regarding participants' feeling of being able to control things in their lives (e.g., “*What happens to me in the future mostly depends on me.*”). This single-dimensional scale was translated into Chinese and validated by ref. [36] in adolescents. Each item was assessed using a 4-point Likert scale, ranging from 1 (not at all) to 4 (always). We calculated the average score by dividing the total score by the number of items. Higher average scores indicate greater perceived control. In the current study, the scale demonstrated acceptable reliability (Cronbach's  $\alpha = 0.75$ ).

#### 3.2.3. Relative Deprivation

It was measured with two items originally developed by ref. [37] and revised by ref. [31]. Participants were asked to assess the financial situation of their family overall. Items were “*Compared with other families, how do you think your family are doing financially?*” (1 = not at all well to 7 = very well) and “*Compared with other families, how satisfied are you with the financial situation of your family?*” (1 = not at all satisfied to 7 = very satisfied). We calculated the average score by dividing the total score by the number of items. A higher score indicates a higher level of relative deprivation. This scale shows good reliability and validity in Chinese adolescents [32], and also demonstrated acceptable reliability (Cronbach's  $\alpha = 0.78$ ) in this study.

#### 3.2.4. Meaning in Life

It was measured by using the Meaning in Life Questionnaire (MLQ) originally developed by ref. [38] and revised by ref. [39]. The MLQ comprises two dimensions with five items each: Presence of meaning (e.g., “*I understand my life's meaning*”) and search for meaning (e.g., “*I am always looking to find my life's purpose*”). The former measures the extent to which respondents perceive their lives as meaningful, while the latter evaluates the extent of their search for meaning. Each item was rated on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). We calculated the average score by dividing the total score by the number of items, with higher scores indicating higher levels of meaning in life. The MLQ has been widely used among Chinese adolescents (e.g., refs. [2,14]) and demonstrated good reliability in the present study (Cronbach's  $\alpha = 0.86$ ).

#### 3.2.5. Demographic Variables

Previous research has shown that age, gender, parental education levels, and family socioeconomic status are

associated with adolescents’ relative deprivation and meaning in life [1,31] . In this study, a self-report survey was administered to them. Parental education levels were assessed with two items: “For your mother, which option best describes her education level?” and “For your father, which option best describes his education level?” Responses were rated on a five-point scale: 1 “high school or below”, 2 “associate degree”, 3 “bachelor’s degree”, 4 “master’s degree”, and 5 “doctoral degree”. Family socioeconomic status was evaluated with a single item: “What is your annual family income?” Respondents selected from the following options: 1 “10,000 to 100,000 RMB”, 2 “100,000 to 200,000 RMB”, 3 “200,000 to 500,000 RMB”, 4 “500,000 to 1,000,000 RMB”, and 5 “more than 1,000,000 RMB”.

### 3.3. Data Analysis

Data was analyzed using SPSS 25.0. First, missing values (less than 2%) were performed using mean imputation [40]. Descriptive and correlation analyses were then performed on the data set. To test the mediated effect of perceived control (Model 4) and the moderated effect of relative deprivation (Model 8) in the associations between parental warmth, perceived control, and meaning in life, we employed the SPSS PROCESS macro process [41]. This process, widely used in previous studies, applies the bias-corrected percentile bootstrap method to test moderated mediation models (e.g., [32,42]). In all analyses, age, gender, parental education levels, and family socioeconomic status were treated as covariates. Parental education levels and family socioeconomic status were standardized prior to analysis.

Additionally, we implemented several procedural strategies during the study design and administration to minimize potential bias, including randomizing the order of test items, ensuring participant anonymity, and emphasizing the absence of correct or uniform answers. Moreover, Harman’s single-factor test was conducted to test potential common method bias [43]. The results indicated 14 factors with eigenvalues greater than 1, with the first factor accounting for 19.42% of the total variance. This suggests minimal concern for common method bias in the present study.

## 4. Results

### 4.1. Preliminary Analyses

Results of Pearson correlations (Table 2) showed that, parental warmth was positively associated with meaning in life ( $r = 0.23, p < 0.01$ ) and perceived control ( $r = 0.35, p < 0.01$ ). Additionally, the relative deprivation was negatively associated with parental warmth ( $r = -0.25, p < 0.01$ ) and meaning in life ( $r = -0.12, p < 0.01$ ). Finally, perceived control was positively associated with meaning in life ( $r = 0.34, p < 0.01$ ) and negatively associated with relative deprivation ( $r = -0.17, p < 0.01$ ).

**Table 2.** Descriptive statistics.

	1	2	3	4	5	6	7	8	9
1 Gender	-								
2 Age	0.02	-							
3 Father’s educational level	0.17 **	-0.09	-						
4 Mother’s educational level	0.14 **	-0.04	0.57 **	-					
5 Annual family income	-0.04	-0.01	0.20 **	0.21 **	-				
6 Parental warmth	0.14 **	-0.03	0.08	0.05	0.09	-			
7 Relative deprivation	-0.03	0.07	-0.23 **	-0.17 **	-0.37 **	-0.25 **	-		
8 Perceived control	-0.04	-0.04	0.02	0.03	0.03	0.35 **	-0.17 **	-	
9 Meaning in life	0.06	-0.01	0.03	0.10	-0.06	0.23 **	-0.12 **	0.34 **	-
<i>M</i>						40.70	8.19	20.61	49.91
<i>SD</i>						9.10	1.76	3.65	10.39

Note:  $N = 406$ ; \*\*  $p < 0.01$ .

### 4.2. Mediation Analysis

According to Model 4 in the SPSS macro compiled by ref. [41], the mediating effect of perceived control was tested, and gender, age, parents’ educational level, and annual family income were included in the regression equation as control variables. As shown in Table 3, parental warmth was positively associated with perceived control ( $\beta = 0.36, p < 0.001$ ) and positively associated with meaning in life ( $\beta = 0.27, p < 0.001$ ), and perceived control was also significantly and positively associated with meaning in life ( $\beta = 0.29, p < 0.001$ ). The association between parental warmth and life meaning remained significant even after controlling for perceived control.

In addition, the bootstrap 95% confidence interval for the direct effect of parental warmth on adolescents’ meaning

in life and the mediating effect of perceived control does not include 0 (Table 4), which indicates that parental warmth can not only directly affect adolescents’ meaning in life, but also indirectly affect the meaning in life through perceived control. The mediating effect size is 0.11, accounting for 45.83% of the total effect size.

**Table 3.** Mediation analysis of perceived control.

Regression Equation (N = 385)		Fit Indexes			Coefficient Significance	
Outcome Variable	Predicting Variable	R	R <sup>2</sup>	F	$\beta$	t
Meaning in life		0.27	0.07	5.15 ***		
	Gender				0.03	0.31
	Age				0	-0.03
	Annual family income				-0.10	-1.91
	Father’s education level				-0.04	-0.72
	Mother’s education level				0.12	2.12 *
	Parental warmth				0.24	4.81 ***
	Perceived control	0.36	0.13	10.04 ***		
Perceived control	Gender				-0.18	-1.86
	Age				-0.03	-0.69
	Annual family income				-0.01	-0.18
	Father’s education level				-0.01	-0.17
	Mother’s education level				0.03	0.49
	Parental warmth				0.36	7.62 ***
	Meaning in life	0.38	0.15	9.69 ***		
	Gender				0.08	0.87
Age				0.01	0.17	
Annual family income				-0.10	-1.94	
Father’s education level				-0.04	-0.70	
Mother’s education level				0.11	2.06 *	
Parental warmth				0.13	2.59 *	
Perceived control				0.29	5.86 ***	

Note: \*\*\*  $p < 0.001$ ; \*  $p < 0.05$ .

**Table 4.** Total effect, direct effect and mediating effect.

	Effect	BootSE	Bootstrap 95%		Percentage of the Total Effect
			LLCI	ULCI	
Total effect	0.24	0.05	0.14	0.33	
Direct effect	0.13	0.05	0.03	0.23	54.17%
Indirect effect	0.11	0.02	0.06	0.16	45.83%

Note: LLCI indexes Lower Level of the Confidence Interval, and ULCI indexes Upper Level of the Confidence Interval.

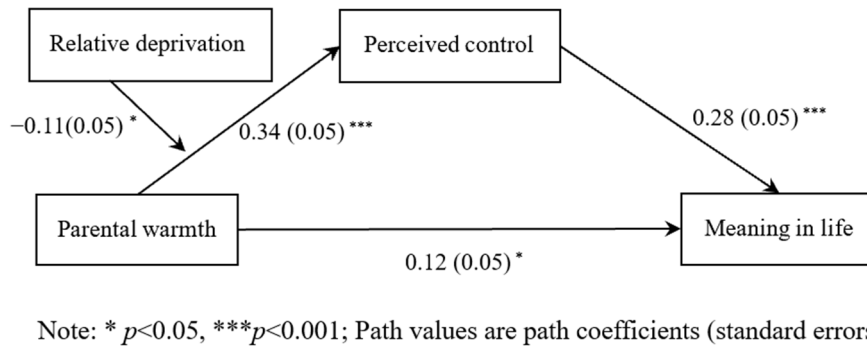
### 4.3. Moderated Mediation Analyses

After controlling for gender, age, parents’ education level, and annual family income, the results indicated that, the interaction effect of parental warmth and relative deprivation on perceived control was significant ( $\beta = -0.11, p < 0.05$ ), indicating that relative deprivation moderated the association between parental warmth and perceived control (Figure 2). However, the interaction effect between parental warmth and relative deprivation can not significantly relate to meaning in life ( $\beta = -0.02, p > 0.05$ ). That is, relative deprivation has no moderating effect on the relationship between parental warmth and meaning in life. In addition, the results of the conditional indirect effect analysis (based on the mean values of the moderator:  $M - 1SD, M$ , and  $M + 1SD$ ) were demonstrated in Table 5.

**Table 5.** The direct and mediating effects of relative deprivation at different levels.

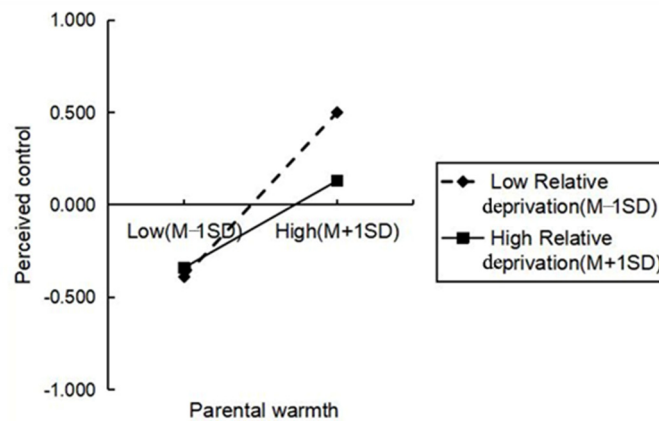
	Relative Deprivation	Effect	Boot SE	Bootstrap 95%	
				LLCI	ULCI
Direct effect	-1.00(M - 1SD)	0.13	0.03	0.07	0.18
	0.00(M)	0.12	0.02	0.06	0.14
	1.00(M + 1SD)	0.09	0.03	0.02	0.12
Mediating effect of perceived control	-1.00(M - 1SD)	0.45	0.07	0.31	0.58
	0.00(M)	0.34	0.05	0.24	0.43
	1.00(M + 1SD)	0.23	0.07	0.10	0.37

Note: LLCI indexes Lower Level of the Confidence Interval, and ULCI indexes Upper Level of the Confidence Interval.



**Figure 2.** The mediation of perceived control and the moderation of relative deprivation.

A simple slope test was adopted to analyze further the moderating effect of relative deprivation (Figure 3). For adolescents with low relative deprivation ( $M - 1SD$ ), parental warmth was positively associated with adolescents’ perceived control,  $\beta_1 = 0.45$ ,  $SE = 0.07$ , 95% CI = [0.31, 0.58]. Meanwhile, for adolescents with high relative deprivation ( $M + 1SD$ ), parental warmth is significantly associated with adolescents’ perceived control,  $\beta_2 = 0.23$ ,  $SE = 0.07$ , 95% CI = [0.10, 0.37], the relationship between parental warmth and perceived control was weaker.



**Figure 3.** Relative deprivation moderates the relation between parental warmth and perceived control.

**5. Discussion**

The current research indicated that parental warmth was not only directly associated with adolescents’ meaning in life but also related with it indirectly through the mediating role of perceived control. Positive parenting styles are known to create a safe and stable environment for child development [44] and are crucial predictors of adolescents’ academic achievement, mental health, and problem behaviors [45,46]. As a central component of positive parenting, parental warmth helps adolescents establish stable and secure interpersonal connections with their parents, thereby fostering the development of a sense of meaning in life. Additionally, parental emotional warmth provides adolescents with greater encouragement and positive support, stimulating a stronger desire for autonomous exploration. This, in turn, promotes adolescents’ reflection on and exploration of life’s meaning. These factors collectively contribute to adolescents’ pursuit of life meaning.

Perceived control, a cognitive factor, develops in part due to the stable and supportive environment fostered by warm parenting styles [42], aligning with the findings from [23]. Moreover, perceived control is positively associated with meaning in life, consistent with prior research [14,25,27,28]. According to the control process in the meaning-making model [24], individuals derive meaning in life through both automatic and deliberate processes, and a sense of control can play a vital role during the processes. Our findings suggest that parental warmth enhances adolescents’ perceived control, enabling them to manage life events and comprehend their significance effectively. Thus, the current study indicated that perceived control serves as a mediator in the relationship between parental warmth and adolescents’ sense of meaning in life.

This study also found that relative deprivation moderates the relationship between parental warmth and perceived control, which supported the view of a moderated mediation model between parental warmth and mean in life. Specifically, the effect of parental warmth on perceived control is more pronounced among adolescents with low levels

of relative deprivation. While parental warmth can provide adolescents with a stable and supportive environment [42], relative deprivation appears to weaken this positive effect [31]. Consistent with previous research, relative deprivation is a critical factor influencing perceived control [47]. It can be understood from the following two perspectives. On the one side, relative deprivation has been found to impair individuals' executive functions [48], thereby reducing their sense of control over their surrounding environment. On the other side, individuals with high levels of relative deprivation tend to exhibit deficits in emotional experience, regulation, and control [49]. These impairments may contribute to reduced sensitivity to parental emotional warmth and difficulties in empathy, ultimately weakening the positive influence of parental emotional warmth on individuals' sense of control.

Consistent with previous studies, adolescents who experience relative deprivation are more likely to report reduced perceived control [48], which, in turn, leads to mental health challenges [50]. Furthermore, relative deprivation is particularly harmful during adolescence, as it not only depletes essential resources but also increases the risk of deviant behaviors [51]. Therefore, relative deprivation serves as a risk factor for the development of meaning in life during adolescence.

Moreover, this study did not support the idea that relative deprivation moderates the relationship between parental warmth and adolescents' meaning in life. One possible explanation is that, compared to relative deprivation, parenting styles have a stronger influence on an individual's meaning in life [52]. As a result, relative deprivation is not sufficient to weaken or strengthen this strong positive relationship. Moreover, relative deprivation primarily affects an individual's subjective evaluation of their quality of life, such as perceived deficiencies in wealth and status [53]. In contrast, meaning in life is more strongly shaped by intrinsic values, a sense of purpose, and existential reflection [38]. Therefore, relative deprivation did not significantly moderate the association between parental warmth and meaning in life. But it should be noted that relative deprivation can elicit significant negative emotions [31,51], and may also have a detrimental impact on adolescents' meaning in life.

This study illuminates the mechanisms through which parental warmth influences adolescents' meaning in life, contributing to a broader theoretical understanding of its development and guiding future research in this field. Practically, these findings offer valuable insights for parents, families, and educators, emphasizing the importance of parental warmth and the active cultivation of adolescents' perceived control. Schools, in particular, play a crucial role in this process. For instance, ref. [54] found that dropping out of school hinders the development of perceived control, underscoring the significance of classroom-based interventions in enhancing students' sense of control.

## 6. Limitations and Future Directions

This study has several limitations. First, we did not collect information on respondents' parental occupations due to the sensitivity of adolescence. However, previous research suggests that socioeconomic status (SES) is typically assessed using a combination of family income, parental occupation, and education level [55]. Future studies should aim to incorporate this broader index for a more comprehensive evaluation of SES. Second, the sample in this study was restricted to high school students from Wuhan in China, which limits the external validity and generalizability of the findings. Therefore, caution is warranted when applying these results to other cultural or demographic contexts. Future research should aim to expand the sample size and scope by including more diverse and representative populations to assess the robustness and generalizability of these findings further. Third, the cross-sectional design of this study precludes any conclusions about causal relationships. To better establish causality, future research should employ longitudinal or experimental designs that allow for a more rigorous examination of the temporal and causal pathways identified in this study. Fourth, this study used a two-item scale to assess relative deprivation. Although this scale has been validated in prior research [31,32], future studies could benefit from employing more comprehensive measures, such as combining relative and absolute deprivation assessments. Moreover, relative deprivation encompasses various domains, including economic status, rights, freedom, and resources. Future research should consider incorporating these multiple dimensions into the conceptual framework and explore how different aspects of relative deprivation may uniquely influence adolescents' sense of meaning in life. Finally, meaning in life consists of two dimensions: the presence of meaning and the search for meaning [38]. However, the present study treats it as a whole construct and does not examine its associations with parental warmth at the dimensional level. Future research should investigate the links between parental warmth and each dimension of meaning in life using longitudinal designs to provide a more comprehensive assessment and facilitate comparisons.



## 7. Conclusions

- (1) parental warmth was positively correlated with adolescents' meaning in life;
- (2) perceived control mediated the relationship between parental warmth and adolescents' meaning in life;
- (3) The association between parental warmth and perceived control was moderated by relative deprivation. The beneficial effect of parental warmth on perceived control may be weaker among adolescents experiencing greater relative deprivation.

## Statement of the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the authors used ChatGPT3.0 in order to correct the errors in grammars and expressions. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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## Author Contributions

Conceptualizations, Validation, Investigation, Funding Acquisition, Writing—Review & Editing, and supervision, F.K.; Formal Analysis, Writing—Original Draft Preparation, Writing—Review & Editing, W.S.; Formal Analysis, Visualization, Writing—Review & Editing, Y.Z.

## Ethics Statement

Ethical approval for the study was granted by the Ethics Committee of Central China Normal University (CCNU-IRB-202403023A) on the 20 March 2024.

## Informed Consent Statement

The written consent was obtained from each participant's parents before our research.

## Data Availability Statement

The code used for analyzing data are available from the corresponding author on reasonable request.

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## Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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