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ARTICLE

Childhood Environmental Unpredictability and Psychopathy: Mediating Roles of Insecure Attachment and Life History Strategy

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ABSTRACT: Background: Childhood environmental unpredictability (CEU) is crucial to personal development, profoundly influence physical and psychological growth particularly, and psychopathy is recognized as a dark personality trait. The aim of this study is to investigate the effects of insecure attachment and life history strategy (LHS) on the relationship between CEU and psychopathy by establishing a sequential mediation model based on evolutionary life history theory and cognitive-affective personality system. **Methods:** A group of 532 undergraduates completed the measurements for CEU, insecure attachment, LHS, and psychopathy, and Bootstrap mediation test through SPSS 25.0 and PROCESS macro tool was used to examine the relationship among these variables. **Results:** The results revealed positive relations between CEU and insecure attachment ($\beta = 0.87$, $p < 0.001$), CEU and LHS ($\beta = 0.11$, $p < 0.001$), and CEU and psychopathy ($\beta = 0.14$, $p < 0.001$). Insecure attachment was also positively associated with LHS ($\beta = 0.62$, $p < 0.001$) and psychopathy ($\beta = 0.04$, $p < 0.001$). In addition, LHS was significantly associated with psychopathy ($\beta = 0.08$, $p < 0.001$). The relationship between CEU and psychopathy is mediated independently and sequentially by insecure attachment and LHS. **Conclusion:** The current research shows the relationship between CEU and psychopathy, as well as the mechanism of insecure attachment and life history strategy as mediators.

KEYWORDS: Childhood environmental unpredictability; psychopathy; insecure attachment; life history strategy; mediating effect

1 Introduction

In recent decades, China has experienced significant social transformation and change, among which urbanization has become one of the core factors that affect psychology and behavior [1]. Rapid urbanization has led to a rise in the migration of rural resident to cities, resulting in their children experiencing multiple "homes" with different geographical or familial structures. Moreover, economic system reform and social change have resulted in a widening gap between the rich and poor, directly contributing to instability and disharmony in the social environment. As a result, childhood environmental unpredictability (CEU) has been commonly found.

The relationship between CEU and psychopathy has been frequently discussed in the field of psychology; previous studies primarily explored the association between childhood adversity and mental health as a means of indirectly investigating this relationship [2–5], and predominately within Western

cultural contexts [6–8]. Given cultural differences, it is vital to investigate this relationship in Eastern culture. Additionally, prior studies primarily treated psychopathy as a mediator when analyzing its negative consequences, rather than examining it as a dependent variable to explore specific mechanisms [9,10]. Therefore, this research explored the relationship between CEU and psychopathy directly, as well as the specific mechanisms underlying the relationship.

1.1 Childhood Environmental Unpredictability and Psychopathy

CEU describes the unpredictability of resources, risks, and threats, regarding time or space, during the early stages of life [11,12]. CEU is positively correlated with risky and impulsive behaviors [13], substance use [14], and risky sexual activity [15]. Moreover, given a backdrop of instability and insecurity, behavioral problems tend to develop into patterns of enhanced aggression or disobeying social norms [16]. These are all features of psychopathy, which is a personality trait characterized by exploitation, impulsivity, callous affect, and antisociality [17]. Furthermore, environmental factors in the early developmental period might influence the formation of predictive heuristic decision-making, as observed in those with traits associated with psychopathy [18]. Individuals who experience an unstable childhood environment may activate manipulativeness, dormant selfishness, and lack of affect related to the Dark Triad personality, which includes psychopathy [8]. Additionally, CEU is also related to low agreeableness [19]. Thus, we propose hypothesis 1 (*H1*): CEU may positively associate with psychopathy.

1.2 The Independent Mediating Role of Insecure Attachment and Life History Strategy in the Influence of CEU on Psychopathy

Evolutionary life history theory is a conceptual structure to assist people in evaluating and allocating their available resources, energy, and time reasonably to facilitate their adaptation to their environment when trading off survival and growth [20], emphasizing that an individual's growth environment affects their survival and reproduction [21]. Notably, adaptive cognition (thinking patterns) forms the basis for resource allocation [22]. According to the cognitive-affective personality system (CAPS) [23], unique cognition and affect can be activated by features of situations, thus impacting behaviors. These cognitive-affective intermediary units engage with one other while establishing across different circumstances, resulting in specific behavioral patterns, which then constitute a unique personality structure. Therefore, based on evolutionary life history theory and CAPS, we predicted that insecure attachment and life history strategy (LHS) serve as mediators in the relationship between CEU and psychopathy.

Childhood environments have a significant impact on the formation of attachment patterns. Children exposed to a predictable environment tend to establish secure attachment style, whereas those exposed to unpredictable and stressful environments are more prone to establish an insecure attachment style [24]. Moreover, the insecure attachment is classified into avoidant and anxious attachment patterns [25], and further hinders prosocial behavior development [26]. An avoidant attachment style results from resource scarcity and a high-risk environment, manifesting as a rejection of intimate relationships. Meanwhile, an anxious attachment style results from inconsistent parental care, manifesting as a fear of abandonment by partners and hence the establishment of intimate relationships with others "at all costs" or the constant pursuit of reassurance from partners [19,27]. According to attachment theory, the parent-child relationship greatly influences how intimate relationships form in later life stages. Internal working models of social-emotional relationships are formed through the establishment of attachment patterns during early stages of childhood, which guide behaviors, emotions, and cognitive patterns when establishing intimate relationships in adulthood. Careless parenting, especially in unpredictable environmental conditions, promotes a constant need for reassurance, a strong distrust of others, or the avoidance of intimate relationships in adulthood;

therefore, CEU and the development of insecure attachment show a positive association [27]. Moreover, insecurely attached children have been reported to show more psychopathic traits, such as callousness [28], impulsivity [29], and a lack of empathy [30,31], which were the focus of our study. A study of the attachment experiences of psychopaths found that an insecure attachment style was one of the crucial determinants in the development of psychopathy [32]. Thus, we propose hypothesis 2 (*H2*): insecure attachment may associate with psychopathy and mediate the relationship between CEU and psychopathy.

LHS, which is regarded as an essential part of evolutionary life history theory, involves the rational allocation of limited resources in the competition for survival and reproduction [33]. LHS is often described as either slow or fast [34]; people who embrace a slow LHS tend to focus on inhibitory control and risk avoidance [21], while those who adopt a fast LHS are inclined toward impulsiveness, a propensity for risk orientation, and aggression [35]. Evolutionary life history theory contends that childhood environment can be used to calibrate LHS [7]. Individuals raised in a stable environment typically perceive the future as secure and steady, providing enough time to complete life tasks and, hence, derive long-term benefits. Conversely, individuals raised in an unpredictable environment may view their future as unstable and dangerous. In addition, lower resource availability and hazardous environments are positively correlated with premature menarche and bearing more offspring [36], consistent with the features of a fast LHS. Thus, there is a significant positive link between CEU a fast LHS [37]. In addition, the characteristics of psychopathy share commonalities with the behavioral traits of a fast LHS [18]. Therefore, we propose hypothesis 3 (*H3*): LHS may relate to psychopathy and mediate the relationship between CEU and psychopathy.

1.3 The Sequential Mediating Role of Insecure Attachment and LHS in the Influence of CEU on Psychopathy

One's attachment pattern can be viewed as a behavioral strategy for adapting to the environment [38], which exerts an impact on the development of personality and ultimately effects survival and reproduction [39]. According to the evolutionary theory of socialization and lifespan interpersonal development, early parenting and derived attachment relationships shape the cognition of resource accessibility and predictability of environment, perceived reliability in others, as well as intimate relationships, thereby affecting reproductive strategies [40]. Those brought up within the context of unpredictability tend to experience inconsistent or impatient parenting [11], which promotes the formation of insecure attachment styles [37]. This leads such individuals to develop a fast LHS, marked by early reproduction and short-term mating orientation [37,39], to adapt to unstable environments and unreliable intimate relationships. Thus, attachment patterns may influence the development of LHS. Based on CAPS, cognitive-affective units encompass the ways individuals process the cognitive and emotional aspects of a situation. These units are activated by specific situational features, which subsequently lead to predictable behaviors. Life history strategy, for instance, functions as a cognitive-emotional mechanism, shaping an individual's future expectations, goal-setting, and life planning [41,42]. Likewise, attachment operates as a structure with cognition and affect that guides the processing of information about oneself, other people and relationships [43], along with emotional and behavioral regulation [44]. Therefore, life history strategy and attachment can both be regarded as cognitive-affective units. Furthermore, as the characteristics displayed by those with a fast LHS may positively associated with psychopathy [20], we propose hypothesis 4 (*H4*): CEU may indirectly align positively with psychopathy through insecure attachment and LHS.

1.4 The Current Study

This study explored the relations among CEU, insecure attachment, LHS, and psychopathy, and assessed whether insecure attachment and LHS play sequential mediating roles in the relationship between CEU and psychopathy. A hypothesized theoretical model was established based on the literature review. Our

hypotheses were that (1) CEU positively related to psychopathy, (2) insecure attachment plays independent mediating roles between CEU and psychopathy, (3) LHS plays independent mediating roles between CEU and psychopathy, and (4) insecure attachment and LHS play sequential mediating roles between CEU and psychopathy. Thus, the study offers a preliminary theoretical foundation for the advancement of relevant prevention and intervention measures and supplements the existing literature.

2 Methods

2.1 Participants

The sample comprised 532 Chinese undergraduates (392 female), aged 18–20 years (19.31 ± 1.09 yrs). Participants were given self-report surveys performed on electronic questionnaire to complete. Since socioeconomic status and number of children are associated with CEU and psychopathy [45,46], we adopt monthly disposable income (MDI; 32 less than ¥1000, 196 between ¥1000 and ¥1499, 169 between ¥1500 and ¥1999, and 135 more than ¥2000) and only-child status (403 non-only child, 129 only child) to operationalize these variables. This study received approval from the Ethics Committee of Guangdong Medical University (IRB number: YJYS2023057). Written consent was acquired from the participants. Participants were informed of their rights (e.g., freedom to withdraw from the study at any time), confidentiality and anonymity, and risks and benefits, and clicking the "continue" button implied their agreement to participate the study with an understanding of the stated information, and received ¥5 in remuneration after the survey.

2.2 Measures

2.2.1 CEU

CEU was evaluated using the eight items that assessed the level of exposure to unpredictability in childhood in Young et al. [47]. Participants completed the items (e.g., "My family life was generally inconsistent and unpredictable from day-to-day") using a 7-point scale (1 = not at all, 7 = extremely). Higher scores indicate a higher degree of instability and unpredictability in an individual's early childhood environment. The Cronbach's α was 0.88.

2.2.2 Psychopathy

The four items that measure psychopathy in Dark Triad Dirty Dozen scale [17] was used to evaluate psychopathy. The participants rated each item (e.g., "I tend to lack remorse") on a 7-point scale (1 = completely disagree, 7 = completely agree). Higher scores indicate higher levels of psychopathic traits. The Cronbach's α was 0.79.

2.2.3 Insecure Attachment

The Experiences in Close Relationships Scale [25] was used to measure insecure attachment. The scale comprises 36 items (e.g., "I prefer not to show a partner how I feel deep down"), grouped into attachment anxiety and avoidance, containing 18 items within each dimension. The items are rated on a 7-point scale (where 1 = not at all, 7 = completely). Higher scores indicate higher levels of insecure attachment. The Cronbach's α for the overall scale and two dimensions were 0.88, 0.89, and 0.86, respectively.

2.2.4 LHS

The Mini-K of the Arizona Life History Battery [48] was used to evaluate LHS. The original scale comprises 20 items, grouped into thoughtfulness, intimacy, and social connectedness, However, item 20

("I am closely connected to and involved in my religion") is not applicable in the Chinese culture and was therefore excluded, resulting in a 19-item scale. To improve comprehension, we applied reverse coding to the scores, which are rated on a 7-point scale (1 = completely agree, 7 = completely disagree). with higher scores indicating a faster LHS. The Cronbach's α for the overall scale and three dimensions were 0.89, 0.72, 0.80, and 0.90, respectively.

2.3 Data Analysis

Questionnaires that had short response times (less than 3 min) or a pattern of responding were excluded from data analysis, which resulted in 532 valid questionnaires. IBM SPSS 25.0 and the PROCESS macro tool prepared by Hayes et al. [49] were used for data processing. First, for each variable, separate correlation analysis and descriptive statistics were obtained. Thereafter, Model 6 within the PROCESS was used to carry out a mediation analysis, with bootstrap 95% confidence intervals (CI) of 5000 samples used to estimate the mediation effect.

3 Results

3.1 Common Method Bias Test

The data in the current study were derived from questionnaire reports from the same individuals, an approach that is relatively prone to common method bias. Therefore, we used Harman's one-way test to test common method bias. The data revealed 13 factors with a characteristic root larger than 1 without rotation. The maximum factor variance was 18%, which fell below the critical value of 40%, revealing an absence of a common method bias effect among the variables measured in this research.

3.2 Demographic Differences across Variables

The demographic differences across variables are presented in Table 1. Males had a higher level of psychopathy (11.19 ± 5.46) than females (9.46 ± 4.58), $t = 3.593$, $p < 0.001$, and the only child had a higher level of psychopathy (10.9 ± 4.78) than non-only child (9.57 ± 4.86), $t = 2.73$, $p < 0.01$. Furthermore, the CEU ($F(3, 528) = 6.68$, $p < 0.001$, $\eta_p^2 = 0.04$), LHS ($F(3, 528) = 3.34$, $p < 0.05$, $\eta_p^2 = 0.02$), and insecure attachment ($F(3, 528) = 3.19$, $p < 0.05$, $\eta_p^2 = 0.02$) were all differed significantly according to the level of MDI, individuals with higher MDI were lower on self-reported CEU (*p-values* < 0.05), has a slower LHS (*p-values* < 0.05), and were less insecurely attached (*p-values* < 0.05).

Table 1: Demographic differences across variables

Demographic variables		CEU	LHS	Insecure attachment	Psychopathy
Gender	Males	19.21 ± 10.62	54.22 ± 18.16	129.30 ± 28.33	11.19 ± 5.46
	Females	18.11 ± 8.87	55.02 ± 15.88	133.01 ± 23.83	9.46 ± 4.58
	t	1.18	−0.49	−1.48	3.59***
Only-child status	Only	16.83 ± 8.85	52.84 ± 14.47	130.08 ± 26.86	10.9 ± 4.78
	Non-only	18.88 ± 9.45	55.46 ± 17.03	132.72 ± 24.45	9.57 ± 4.86
	t	−2.18*	−1.57	−1.04	2.73**

(Continued)

Table 1 (continued)

Demographic variables		CEU	LHS	Insecure attachment	Psychopathy
MDI	<1000	23.72 ± 11.81	61.94 ± 19.61	137.34 ± 28.98	11.31 ± 5.18
	1000–1499	18.98 ± 9.35	55.44 ± 15.55	134.05 ± 23.38	9.54 ± 4.82
	1500–1999	18.51 ± 8.86	54.92 ± 15.80	133.19 ± 22.59	9.64 ± 4.41
	>2000	16.09 ± 8.65	52.12 ± 17.33	126.59 ± 28.53	10.38 ± 5.34
	F	6.68***	3.34*	3.19*	1.87

Note: CEU = childhood environmental unpredictability, LHS = life history strategy, MDI = monthly disposable income, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

3.3 Descriptive Statistics and Correlations

The descriptive statistics and correlations are displayed in Table 2. The results indicated that CEU was positively related to psychopathy, insecure attachment and LHS ($r = 0.27$, $r = 0.33$, $r = 0.42$, respectively; *p-values* < 0.01), psychopathy was positively related to insecure attachment and LHS ($r = 0.30$; $r = 0.37$, respectively; *p-values* < 0.01), and insecure attachment was positively related to LHS ($r = 0.30$, $p < 0.01$).

Table 2: Descriptive statistics and correlations between variables (N = 532)

	M	*SD*	1	2	3	4
1. Age	19.31	1.09				
2. CEU	18.38	9.34	0.56			
3. Psychopathy	9.89	4.87	0.01	0.27**		
4. LHS	54.82	16.47	0.03	0.42**	0.37**	
5. Insecure attachment	132.08	25.06	−0.05	0.33**	0.30**	0.30**

Note: M: mean, SD: standard deviation; **$p < 0.01$.

3.4 Chain Mediation Analysis

As demographic factors result in notable variations in scores, the mediation model was analyzed with these factors as controls, and all variables were standardized. Table 3 displays regression analyses that depict the associations between the variables. The analyses found that CEU positively influences psychopathy (β = 0.28, $p < 0.001$) and insecure attachment (β = 0.32, $p < 0.001$); CEU and insecure attachment positively impacted LHS (β = 0.35, β = 0.17, respectively; *p-values* < 0.001); and insecure attachment and LHS significantly exert a positive effect on psychopathy (β = 0.21, β = 0.29, respectively; *p-values* < 0.001), while CEU did not significantly relate to psychopathy (β = 0.07, $p > 0.05$), implying that the correlation of CEU with psychopathy was completely mediated by insecure attachment and LHS.

The significance of the mediating effects and their differences were tested using a bootstrap method, whereas the significance tests of the indirect effects and their differences corresponded to the three indirect paths by which CEU affected psychopathy (Table 4). The total indirect effect value of insecure attachment and LHS was 0.206, which accounted for 74.37% of the total effect, while the bootstrap 95% CI did not contain 0, revealing that the two mediating variables significantly mediated the relationship between CEU and psychopathy. Particularly, the mediating effect included three pathways: Path 1 comprised CEU → insecure attachment → psychopathy, with an indirect effect value of 0.089 and 95% CI that did not include 0, implying that the indirect effect of this path was significant; Path 2 comprised CEU → LHS → psychopathy, with an

indirect effect value of 0.101 and 95% CI that did not include 0, revealing a substantial mediating effect for this path; and Path 3 comprised CEU → insecure attachment → LHS → psychopathy, with an indirect effect value of 0.016 and 95% CI that did not include 0, implying that the indirect effect of this path was significant.

Table 3: Regression analysis of the relationship between variables

Regression equation		Overall fit index			Regression coefficients		
Result variables	**Predictor variables**	***R***	***R*²**	***F***	**β**	***t***	**95% CI**
Psychopathy	Gender	0.344	0.11	16.78***	0.33	3.47***	[0.143, 0.515]
	Birth order				0.33	3.27**	[0.131, 0.523]
	MDI				0.03	0.54	[−0.069, 0.120]
	CEU				0.28	6.64***	[0.195, 0.359]
Insecure attachment	Gender	0.35	0.12	18.10***	−0.18	−1.93	[−0.368, 0.003]
	Birth order				0.005	0.05	[−0.191, 0.20]
	MDI				−0.07	−1.51	[−0.167, 0.022]
	CEU				0.32	7.14***	[0.243, 0.407]
LHS	Gender	0.45	0.20	26.65***	−0.06	−0.71	[−0.242, 0.113]
	Birth order				−0.04	−0.46	[−0.230, 0.142]
	MDI				−0.04	−0.78	[−0.126, 0.055]
	Insecure attachment				0.17	4.14***	[0.090, 0.253]
	CEU				0.35	8.40***	[0.269, 0.434]
Psychopathy	Gender	0.49	0.24	27.44***	0.4	4.47***	[0.221, 0.569]
	Birth order				0.34	3.65***	[0.156,0.521]
	MDI				0.05	1.22	[−0.033, 0.143]
	LHS				0.29	6.74***	[0.204, 0.371]
	Insecure attachment				0.21	5.13***	[0.131, 0.293]
	CEU				0.07	1.92	[−0.001, 0.091]

Note: Gender and birth order were dummy-coded as female = 0 and male = 1, only = 1 and non-only = 0. $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 4: Analysis of mediating effects of insecure attachment and LHS

	Effect size	**Bootstrap SE**	**Bootstrap CI**	**Relative mediation effect**
Total indirect effect	0.206	0.027	[0.134, 0.241]	74.37%
Indirect effects 1	0.089	0.016	[0.039, 0.102]	32.13%
Indirect effects 2	0.101	0.021	[0.063, 0.145]	36.46%
Indirect effects 3	0.016	0.005	[0.007, 0.027]	5.78%
Comparison 1	−0.032	0.027	[−0.086, 0.018]	
Comparison 2	0.053	0.017	[0.021, 0.085]	
Comparison 3	0.085	0.021	[0.048, 0.129]	

Note: Bootstrap SE and Bootstrap CI refer to the standard error and 95% confidence interval, respectively, of the indirect effect estimated by the bias-corrected percentile bootstrap method; all values are rounded to three decimal places.

A two-by-two test assessing the significance of the distinction between the indirect effects within different pathways found that the 95% CI for comparison 1 (the distinction between indirect effects 1 and indirect effects 2) contained 0, showing a non-significant distinction between indirect effect 1 and indirect effect 2. Moreover, the 95% CI for comparison 2 and comparison 3 excluded 0, demonstrating that indirect effect 1 and indirect effect 2 were significantly greater than indirect effect 3. As depicted in Fig. 1, CEU had a specific effect on psychopathy.

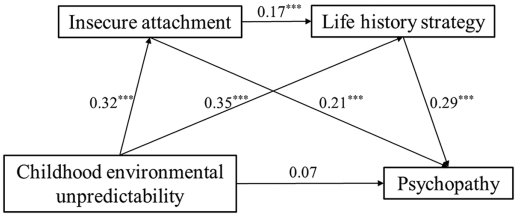

Figure 1: The sequential mediation models. Note: Path values are the path coefficients, ***$p < 0.001$

4 Discussion

CEU plays a critical role in personality development [50]. In this study, a survey was conducted to investigate the relation between and reveal the mechanism of CEU's impact on psychopathy, as well as identify the mediating roles of insecure attachment and LHS. The findings demonstrated that CEU is positively correlated to insecure attachment and LHS, and, therefore, impacts psychopathy. Mediating effects analyses revealed that insecure attachment and LHS act as multifaceted mediators of the association between CEU and psychopathy. This mediating role is realized via three indirect pathways: through the independent roles of insecure attachment and LHS, and through the combined role of insecure attachment and LHS.

4.1 The Relationship between CEU and Psychopathy

Evolutionary life history theory states that in the initial five to seven years of life, the environment has a significant impact on shaping individual development [37]. An unpredictable growth environment is associated with an intuitive cognitive style that prefers immediate rewards and allocates less time and effort to cognitive tasks [36]. Therefore, unpredictable early experience leads to higher rate of mortality and risk-taking behaviors [51,52]. This study found that CEU has a positive relationship on psychopathy, which aligns with previous studies. In addition, previous studies have indicated that individuals who are raised in unpredictably changing surroundings often form a "defect strategy," described as an overcompensation mechanism for their childhood difficulties; that is, to compensate for the deficiencies in resources or emotional support in childhood, these individuals may exhibit low levels of agreeableness, empathy, and morality as a way to obtain more resources [53–55], which are traits closely related to psychopathy. Furthermore, CEU enhances the motivation to pursue higher social status, which positively related to dark personality, including psychopathy [7]. Therefore, there is a positive linkage between CEU and psychopathy.

4.2 The Independent Mediating Role of Insecure Attachment and LHS in the Influence of CEU on Psychopathy

The study found that insecure attachment and LHS mediate the association between CEU and psychopathy independently, thereby extending previous research on psychopathy. This discovery also supports

CAPS, which suggests that insecure attachment and fast LHS, functioning as cognitive-affective units, are influenced by unpredictable situational characteristic, thereby shaping adverse personality systems.

Good parenting is positively associated with a stable environment [16], whereas unpredictable parenting and minimal commitment to raising children are positively associated with an unstable environment characterized by a lack of a sense of security, which leads to an insecure attachment style [40]. Once an attachment style is formed, the individual's thoughts, emotions, and behaviors in intimate relationships throughout their lives are fundamentally shaped [56]. Insecure attachment may foster cognitive schemas of others as being unreliable or of the self as being unworthy, thereby affecting how individuals process and express emotions [57]. Consequently, individuals may display an anxious or avoidant attachment style during adulthood to avoid being hurt within intimate relationships. This is supported by previous studies, which have shown that the uncertainty experienced during early life is associated with the formation of anxious or avoidant attachment styles [58]. Schimmenti et al. [59] used mixed quantitative-qualitative methodology to explore the relationship between attachment and psychopathy among offenders and found that attachment style was a relevant variable, affecting the onset of psychopathic traits. Negative childhood experiences, such as parental divorce, neglect, and inconsistent care, may deeply damage a child's developing brain and attachment style, thereby positively impacting the development of callous-unemotional traits [60]. Studies have found that insecurely attached children often exhibit poor social skills, limited empathy, and intense aggression [24]. Furthermore, they tend to be anxious or depressed, and experience difficulties in developing close interpersonal relationships as they get older [58]. These characteristics resemble those observed in psychopathy [24]. Thus, the independent mediating role of insecure attachment in this study is also an indicator of its indirect effects on the correlation between CEU and psychopathy.

LHS acts as an intermediary between CEU and psychopathy. The life history model of security protection hypothesis states that individuals allocate resources and energy rationally, and thus may adopt a fast LHS to ensure their safety when exposed to negative childhood environments [19]. Evolutionary life history theory suggests that a critical developmental phase, a "sensitive window," may exist, wherein children primarily evaluate the quality, nature, and difficulties of their living environment through their parents [14]. However, children who are raised in unstable environments may receive less attention, care, and parental investment [61]. Consequently, such children may be less cooperative and trustworthy, engage in more risky behaviors aimed at elevating their status, and view adult intimate relationships as temporary [7,39]. Furthermore, CEU was found to increase mortality rates, making individuals more present-oriented, and, therefore, more willing to become involved in high-risk activities to achieve instant satisfaction-attitudes consistent with a fast LHS [61]. Similarly, a fast LHS is linked to a higher risk of mortality and higher rates of social avoidance and inhibition, consistent with Neuroticism in the Five Factor Model [62]. Thus, according to the research, the independent mediating role of LHS is an indicator of indirect effects in the correlation between CEU and psychopathy.

4.3 The Chain Mediation Effect of Insecure Attachment and LHS

The findings showed that the relationship between CEU and psychopathy was chain-mediated by insecure attachment and LHS. Specifically, CEU was associated with an insecure attachment style, which indirectly affected the formation of a fast LHS and, ultimately, psychopathy. According to the life history model of attachment, in the early stages of life, individuals develop an understanding of the safety and predictability of their surroundings, even future reproductive environments, through interactions with their parents [63]. Callous and unreliable caregiving facilitate the emergence of adverse internal working models, thereby fostering insecure attachment, which strengthens the perception of a dangerous and uncertain world, leading individuals to pursue a fast LHS to better cope with their surroundings [35,39,40]. Moreover, this

model also shows a strong positive correlation between early attachment styles and adult behaviors [29]. Hence, attachment patterns might be perceived as a mechanism for selecting adaptive mating strategies [39]. Avoidantly attached individuals tend to engage in fewer committed relationships, thus choosing short-term mating strategies [64]. Similarly, anxiously attached individuals are more likely to show an overwhelming desire for love, leading to unstable and short-term relationships [65]. These are all manifestations of a fast LHS. Furthermore, a faster LHS with low responsibility and engaging in multiple partnerships is associated with proneness to developing psychopathic traits [8], such as antisocial behavior and aggression [66]. Thus, it can be seen that uncertain surroundings and irrational cognitive-emotional patterns consistently strengthen adverse personality systems internally and externally [23]. Therefore, the chain mediation of insecure attachment and LHS is an influential indicator of the correlation between CEU and psychopathy.

4.4 Limitations and Further Directions

Although this study has important theoretical implications, it also has some potential limitations. First, data were obtained through self-report, which might have potentially been impacted by social desirability bias. In the future, multiple assessment methods should be used to reduce this effect. Second, this study only included undergraduates, but the psychopathic trait is distributed across society. Future studies should broaden the age spectrum of participants. Third, existing research suggests that other affective and cognitive mechanisms may serve as more prominent mediators in similar relationships [67]. To be specific, emotional regulation difficulties have been shown to mediate the relationship between childhood trauma and psychosis [68]. Furthermore, self-concept clarity and self-esteem also act as mediators in such relationships [69,70]. Therefore, future research might explore incorporating variables such as affective processes or cognitive pathways into the model to further examine their potential mediating role in the link between CEU and psychopathy. Last, the study adopted a cross-sectional design, which restricted the provision of data about the enduring association between CEU and psychopathy. Subsequent studies could examine the relationship more comprehensively by collecting data through longitudinal studies.

5 Conclusion

This study provides evidence of mediators in the relation between CEU and psychopathy for Chines students. CEU was found to indirectly influence psychopathy by means of the mediating function of insecure attachment and LHS, as well as by utilizing the chain mediation of insecure attachment and LHS. The results increase our understanding of CEU and offer a theoretical foundation and practical implications for developing relevant prevention and intervention measures to address the development of psychopathy.

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Availability of Data and Materials: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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