

Structural Model of the Relationship Between Social Anxiety in University Students and Self-Criticism, Shame, with the Mediating Role of Emotion Regulation and Self-Esteem

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ABSTRACT

The present study aimed to investigate a structural model explaining social anxiety among university students based on self-criticism and shame, with the mediating roles of emotion regulation and self-esteem. This study employed a descriptive-correlational design using structural equation modeling (SEM). The statistical population consisted of university students in Tehran during the 2025–2026 academic year, from which 360 participants were selected through multistage cluster random sampling. Data were collected using standardized instruments including the Social Anxiety Scale, Levels of Self-Criticism Scale, Experience of Shame Scale, Difficulties in Emotion Regulation Scale, and Rosenberg Self-Esteem Scale. Descriptive statistics and Pearson correlation coefficients were calculated using SPSS-27, and SEM analyses were conducted using AMOS-24. Model fit was evaluated using indices such as χ^2/df , CFI, TLI, NFI, and RMSEA. Mediation effects were tested through bootstrapping procedures with 2000 resamples. The results indicated that self-criticism ($\beta = 0.31, p < 0.001$), shame ($\beta = 0.24, p < 0.001$), and emotion regulation difficulties ($\beta = 0.28, p < 0.001$) had significant positive direct effects on social anxiety, whereas self-esteem had a significant negative effect ($\beta = -0.26, p < 0.001$). Additionally, emotion regulation and self-esteem significantly mediated the relationships between self-criticism and social anxiety, as well as between shame and social anxiety ($p < 0.01$). The proposed structural model demonstrated good fit to the data ($\chi^2/df = 2.41, CFI = 0.94, TLI = 0.92, NFI = 0.91, RMSEA = 0.063$). The findings support a comprehensive model in which self-criticism and shame contribute to social anxiety both directly and indirectly through emotion regulation difficulties and reduced self-esteem, highlighting the importance of targeting these mechanisms in psychological interventions.

Keywords: Social Anxiety, Self-Criticism, Shame, Emotion Regulation, Self-Esteem, Structural Equation Modeling

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Introduction

Future-oriented thinking has been increasingly recognized as a central component of human cognition, enabling individuals to transcend immediate experience and mentally simulate, anticipate, and plan for future events. This capacity, often conceptualized within the broader framework of prospection, encompasses a range of interrelated processes including episodic future thinking, planning, prediction, and

delay of gratification (1, 2). From a functional perspective, future-oriented cognition allows individuals to prepare for upcoming challenges, regulate behavior in accordance with long-term goals, and make adaptive decisions that enhance well-being and survival (3, 4). In childhood, the development of this ability represents a critical milestone, as it underlies essential competencies such as self-control, goal-directed behavior, and social adaptation (5, 6).

Developmental research suggests that future-oriented thinking emerges gradually during early childhood and continues to refine throughout middle childhood and adolescence. This developmental trajectory is closely linked to the maturation of cognitive systems, particularly episodic memory and executive functions, which provide the mental architecture necessary for simulating future scenarios (7, 8). Executive functions, including working memory, inhibitory control, and cognitive flexibility, play a fundamental role in enabling children to hold future goals in mind, suppress immediate impulses, and flexibly adapt strategies to achieve desired outcomes (9). Neurodevelopmental evidence further indicates that these capacities are associated with the maturation of the prefrontal cortex and the functional connectivity of the default mode network, which supports mental time travel and self-referential processing (10, 11).

The significance of future-oriented thinking extends beyond cognitive functioning to encompass a wide range of psychological and behavioral outcomes. Empirical studies have demonstrated that children with stronger future-oriented abilities exhibit better academic performance, more effective self-regulation, and greater engagement in health-promoting behaviors (12, 13). Conversely, deficits in future thinking have been associated with increased vulnerability to mental health problems, including anxiety, depression, and impulsive behaviors (14). These findings highlight the importance of identifying the developmental antecedents and mechanisms that contribute to individual differences in future-oriented cognition.

One of the central cognitive mechanisms underlying future-oriented thinking is episodic future thinking, which refers to the ability to project oneself forward in time and mentally simulate specific future events. This process relies on the constructive recombination of past experiences to generate novel future scenarios (2). Episodic future thinking not only facilitates planning and decision-making but also plays a critical role in emotion regulation by allowing individuals to anticipate emotional outcomes and prepare adaptive responses (15). Research has shown that even young children are capable of engaging in episodic future thinking, and that this ability is associated with behaviors such as saving, delaying gratification, and goal-directed planning (16-18).

Emotion regulation represents another key component in the development of future-oriented thinking. Defined as the processes by which individuals monitor, evaluate, and modify their emotional responses, emotion regulation is essential for maintaining goal-directed behavior in the face of emotional challenges (19). In children, effective emotion regulation enables the management of impulses, the modulation of emotional intensity, and the alignment of behavior with long-term goals. Importantly, emotion regulation and executive functions are closely intertwined, sharing common cognitive and neural substrates (20). This overlap suggests that the ability to regulate emotions may directly support the development of future-oriented cognition by facilitating the anticipation of consequences and the control of immediate reactions.

Empirical evidence supports the notion that emotion regulation is strongly associated with future-oriented thinking. For instance, individuals who are better able to regulate their emotions are more likely to engage in proactive behaviors, anticipate future challenges, and adopt adaptive coping strategies (21).

Moreover, future thinking itself can serve as a regulatory mechanism, allowing individuals to reframe present difficulties in light of future goals and outcomes (4). This bidirectional relationship underscores the importance of considering emotion regulation as both an antecedent and a consequence of future-oriented cognition.

In addition to cognitive and emotional processes, relational factors, particularly attachment styles, play a crucial role in shaping children's future-oriented thinking. Attachment theory posits that early interactions with caregivers lead to the formation of internal working models that guide individuals' expectations, emotions, and behaviors in relationships (22). These internal models influence not only social functioning but also cognitive and emotional processes, including the ability to imagine and plan for the future. Secure attachment, characterized by consistent and responsive caregiving, provides a foundation of psychological safety that fosters exploration, learning, and adaptive self-regulation (23).

Research has consistently demonstrated that secure attachment is associated with better emotion regulation, higher self-control, and more adaptive coping strategies (24, 25). These capacities, in turn, are critical for the development of future-oriented thinking. Children with secure attachment are more likely to engage in constructive future simulations, set realistic goals, and persist in the face of challenges. In contrast, insecure attachment styles, including avoidant and ambivalent patterns, are often associated with difficulties in emotion regulation and maladaptive cognitive processes (26).

However, emerging evidence suggests that the relationship between attachment styles and cognitive functioning is more nuanced than previously assumed. For example, avoidant attachment, typically characterized by emotional distancing and self-reliance, may in some contexts facilitate certain aspects of cognitive control and future-oriented thinking. Individuals with avoidant tendencies may rely more heavily on cognitive strategies to manage emotions, which could enhance their ability to focus on long-term goals under low emotional load (27, 28). Similarly, studies have shown that attachment styles are linked to variations in episodic memory and future simulation, indicating that relational experiences shape the content and quality of future-oriented cognition (29).

The interplay between attachment, emotion regulation, and future-oriented thinking can also be understood within the broader framework of self-regulation. Self-regulation encompasses the integration of cognitive, emotional, and behavioral processes that enable individuals to achieve goals and adapt to changing environments (30). Attachment relationships play a foundational role in the development of self-regulation by providing external regulation that is gradually internalized by the child (31). Over time, children learn to regulate their own emotions and behaviors, which supports the development of future-oriented thinking and adaptive functioning.

Furthermore, contextual and environmental factors contribute to the development of these processes. Parenting practices, socio-cultural influences, and educational environments all shape children's cognitive and emotional development. For instance, parental behaviors that promote autonomy, provide emotional support, and encourage future-oriented discussions have been shown to enhance children's ability to think about the future (32). Similarly, individual differences in time perspective and self-control have been linked to variations in psychological well-being and engagement in adaptive behaviors (33). These findings suggest that future-oriented thinking is a product of complex interactions between individual and environmental factors.

Recent studies have also highlighted the role of motivational and cognitive mediators in the relationship between attachment and psychological outcomes. For example, growth mindset has been identified as a key mechanism linking attachment styles to mental health and adaptive functioning (34). Individuals with secure attachment are more likely to develop a growth-oriented perspective, which supports resilience, persistence, and future-oriented thinking. Similarly, self-differentiation and social support have been shown to mediate the impact of attachment on decision-making and goal-directed behavior (35). These findings underscore the importance of considering multiple pathways through which attachment influences future-oriented cognition.

Despite the growing body of research in this area, several gaps remain in our understanding of how attachment styles and emotion regulation jointly contribute to the development of future-oriented thinking in children. Much of the existing literature has examined these factors in isolation, without fully exploring their interactive effects. Additionally, there is limited empirical evidence focusing specifically on middle childhood, a developmental period characterized by significant advances in cognitive and emotional capacities. Addressing these gaps is essential for developing comprehensive models of future-oriented cognition and for designing effective interventions to support children's development.

Given the critical role of future-oriented thinking in children's adaptive functioning and long-term outcomes, it is imperative to identify the key factors that facilitate its development. Integrating insights from attachment theory, emotion regulation research, and cognitive development provides a comprehensive framework for understanding this complex process. Such an approach not only advances theoretical knowledge but also has practical implications for educational and clinical interventions aimed at enhancing children's cognitive and emotional capacities.

Accordingly, the present study aims to investigate the role of attachment styles and emotion regulation in predicting future-oriented thinking in children.

Methods and Materials

Study Design and Participants

The present study employed a causal-comparative design. The statistical population included all children aged 6 to 12 years and their parents. Using convenience sampling, 85 participants were selected. Based on the scores obtained from the Future-Oriented Thinking Questionnaire, participants were classified into three levels: high, median, and low. Subsequently, two groups with high and low levels of future-oriented thinking (31 participants in total) were selected as the comparison groups. Sample size was calculated using G*Power software version 3.1 and confirmed with a statistical power of 0.98. Data were collected through online questionnaires administered on the Porsline platform. The order of questionnaire presentation included demographic information, the Future-Oriented Thinking Scale, the Emotion Regulation questionnaire, and the Attachment Style questionnaire. Informed consent was obtained from participants prior to questionnaire administration. Inclusion criteria were: child age between 6 and 12 years, typical development, parents' ability to read and write, and willingness to participate. Exclusion criteria included psychiatric disorders, experience of stressful events during the previous six months, and incomplete questionnaire responses.

Data Collection

Children's Future Thinking Questionnaire (CFTQ): This scale was developed by Mazachowsky and Mahy (2020) and consists of 44 items across five dimensions: prospective memory, episodic foresight, planning, delay of gratification, and saving behavior. Responses are recorded on a 6-point Likert scale. The face and content validity of this instrument were confirmed by Sadeghi et al. (1401/2022), and its reliability was reported with a Cronbach's alpha of 0.89. In the present study, reliability, assessed using Cronbach's alpha, was 0.838.

Emotion Regulation Checklist (ERC): This questionnaire was developed by Shields et al. (1997) and includes 24 items across two components: *Emotion Regulation* and *Lability/Negativity*. Responses are given on a 4-point scale (1 to 4). The Cronbach's alpha for the total scale has been reported as 0.959, and in the Persian version adapted by Pezeshki et al. (1401/2022), it was 0.86. In the present study, the overall reliability, assessed by Cronbach's alpha, was 0.86.

Attachment Questionnaire for Children (AQC): The parent-report version of this questionnaire was developed by Finzi-Dottan et al. (2000) and consists of 15 items measuring three attachment styles: secure, avoidant, and ambivalent. Each style is assessed by 5 items, and responses are recorded on a 5-point scale (1 to 5). In the original study, Cronbach's alpha coefficients for the three attachment styles ranged from 0.75 to 0.82. In the present study, reliability coefficients calculated using Cronbach's alpha were 0.645 for secure attachment, 0.642 for avoidant attachment, and 0.832 for ambivalent-anxious attachment.

Data Analysis

Data were analyzed using SPSS version 30 and the independent-samples *t* test.

Findings and Results

The demographic findings showed that among the 85 participating children, 47 (55.3%) were boys and 38 (44.7%) were girls. Regarding birth order, 30 children (35.3%) were second-born, 29 (34.1%) were only children, 18 (21.2%) were first-born, and 8 (9.4%) were the third child in the family. In addition, 58 mothers (68.2%) were homemakers and 27 (31.8%) were employed.

Table 1. Descriptive indices, skewness, kurtosis, and reliability (Cronbach's alpha) of the main study variables

Variable	Mean	SD	Min	Max	Skewness	Kurtosis	Cronbach's Alpha	Number of Items
Future-oriented thinking	155.62	21.61	97	200	-0.20	-0.29	0.838	37
Emotion regulation	24.74	6.13	11	40	0.15	-0.45	0.860	10
Emotional lability/negativity	24.65	5.93	13	36	0.01	-0.81	0.844	9
Secure attachment style	21.32	2.25	12	25	-0.83	-0.04	0.645	5
Avoidant attachment style	25.62	5.16	12	35	-0.51	-0.28	0.641	7
Ambivalent-anxious attachment style	19.32	6.43	6	30	-0.27	-0.78	0.832	6

The assumptions for statistical analysis, including normality of data distribution and homogeneity of variances, were examined and confirmed. Table 1 presents the descriptive indices, skewness, kurtosis, and reliability of the main study instruments. The values of skewness and kurtosis were within the acceptable range, and the reliability of the scales was also satisfactory.

Table 2. Pearson parametric correlation coefficients among the study variables

Variable	1	2	3	4	5	6	7
1. Future-oriented thinking	1						
2. Emotion regulation	0.375**	1					
3. Emotional lability/negativity	-0.162	-0.475**	1				
5. Secure attachment style	0.437**	0.240*	>0.001	0.276**	1		
6. Avoidant attachment style	0.446**	0.111	-0.212	0.167	0.447**	1	
7. Ambivalent-anxious attachment style	0.090	0.003	0.340**	0.060	0.433**	0.137	1

Table 2 presents the Pearson correlation coefficients among the study variables. Future-oriented thinking showed a positive and significant correlation with emotion regulation and with secure and avoidant attachment styles, whereas it had no significant relationship with ambivalent attachment style or emotional lability. These findings indicate the important role of emotional characteristics and attachment styles in future-oriented thinking.

Table 3. Results of the independent-samples t-test for future-oriented thinking according to attachment style and emotion regulation

Variable	Levene's F	Sig.	Variance Assumption	Mean Difference	Std. Error Difference	df	t	p
Secure attachment style	4.383	0.045	Equal variances assumed	-3.53	1.10	29	-3.22	0.003
			Equal variances not assumed	-3.53	1.14	22.29	-3.11	0.005
Avoidant attachment style	0.138	0.713	Equal variances assumed	-6.45	1.54	29	-4.18	<0.001
			Equal variances not assumed	-6.45	1.55	27.52	-4.16	<0.001
Ambivalent-anxious attachment style	0.115	0.737	Equal variances assumed	0.32	2.37	29	0.13	0.895
			Equal variances not assumed	0.32	2.38	27.15	0.13	0.896
Emotion regulation	2.933	0.097	Equal variances assumed	-6.49	2.11	29	-3.08	0.005
			Equal variances not assumed	-6.49	2.00	25.94	-3.24	0.003
Emotional lability	0.222	0.641	Equal variances assumed	4.74	1.96	29	2.41	0.022
			Equal variances not assumed	4.74	1.98	26.75	2.39	0.024

Table 3 presents the results of the independent-samples *t* test comparing the two groups with high and low levels of future-oriented thinking. Children with high future-oriented thinking obtained higher scores in emotion regulation and in secure and avoidant attachment styles, whereas the group with low future-oriented thinking showed higher scores in emotional lability or negative behaviors. No significant difference was observed for ambivalent attachment style.

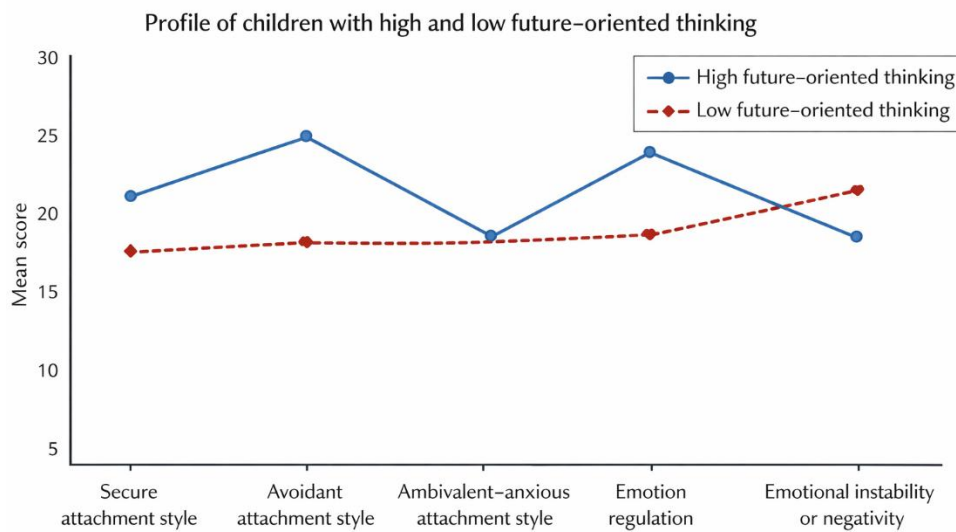


Figure 1. Profile of children with high and low future-oriented thinking

The findings obtained from examining the profile of children with high and low future-oriented thinking showed that children with high future-oriented thinking had higher scores in avoidant and secure attachment styles and also performed better in the emotion regulation component compared with the group with low future-oriented thinking.

Discussion and Conclusion

The present study aimed to examine the role of attachment styles and emotion regulation in children's future-oriented thinking by comparing groups with high and low levels of this cognitive capacity. The findings indicated that children with higher levels of future-oriented thinking demonstrated significantly better emotion regulation abilities and higher scores in both secure and avoidant attachment styles, whereas children with lower levels of future-oriented thinking exhibited greater emotional lability and negativity. No significant differences were observed in ambivalent attachment style between the two groups. These results provide important insights into the complex interplay between cognitive, emotional, and relational processes in the development of future-oriented cognition.

The positive association between secure attachment and future-oriented thinking observed in this study is consistent with theoretical and empirical literature emphasizing the foundational role of early attachment relationships in shaping cognitive and emotional development. Secure attachment provides children with a stable psychological base that fosters exploration, curiosity, and adaptive engagement with the environment, all of which are essential for developing the capacity to anticipate and plan for future events (22, 23). Children with secure attachment are more likely to develop coherent internal working models that support effective interpretation of experiences and facilitate mental simulations of future scenarios. This finding aligns with evidence suggesting that secure attachment enhances self-regulation and psychological resilience, both of which are critical for goal-directed behavior and future planning (24, 25). Furthermore, the role of secure attachment in promoting adaptive cognitive-emotional functioning may be mediated by mechanisms such

as growth mindset and social support, which have been shown to facilitate future-oriented decision-making and psychological well-being (34, 35).

The findings also revealed a significant positive relationship between avoidant attachment and future-oriented thinking, which may initially appear counterintuitive given the traditional association of avoidant attachment with emotional suppression and interpersonal difficulties. However, this result can be interpreted within a more nuanced framework that considers the potential adaptive aspects of avoidant strategies in specific contexts. Individuals with avoidant attachment often rely on cognitive control strategies and emotional distancing, which may enhance their ability to focus on long-term goals and suppress immediate emotional distractions (27). In low emotional-intensity situations, such cognitive strategies may facilitate planning and future-oriented thinking by reducing the interference of affective processes. This interpretation is supported by research indicating that avoidant attachment is associated with selective attention and inhibitory control, which can contribute to goal-directed behavior under certain conditions (28). Additionally, avoidant individuals may engage in future-oriented cognition as a means of maintaining autonomy and control, which aligns with findings linking attachment styles to variations in episodic memory and future simulation processes (29).

In contrast, the lack of a significant relationship between ambivalent attachment and future-oriented thinking suggests that this attachment pattern may not provide a stable foundation for the development of future-oriented cognition. Ambivalent attachment is typically characterized by emotional inconsistency, anxiety, and heightened sensitivity to interpersonal dynamics, which may disrupt the cognitive coherence required for effective planning and anticipation. The emotional volatility associated with this attachment style may interfere with the ability to maintain stable representations of future goals and outcomes, thereby limiting the development of future-oriented thinking. This finding is consistent with the broader literature indicating that insecure attachment patterns, particularly those involving emotional dysregulation, are associated with less adaptive cognitive and behavioral outcomes (26).

The results regarding emotion regulation further underscore its critical role in the development of future-oriented thinking. Children with higher levels of future-oriented thinking demonstrated significantly better emotion regulation abilities, suggesting that the capacity to manage emotional responses is closely linked to the ability to anticipate and plan for future events. This relationship can be explained by the shared cognitive mechanisms underlying both processes, particularly executive functions such as inhibitory control and working memory (8, 9). Effective emotion regulation enables children to suppress impulsive reactions, maintain focus on long-term goals, and adapt their behavior in response to changing circumstances. These skills are essential for engaging in future-oriented cognition, which requires the integration of past experiences, present contexts, and anticipated outcomes.

Moreover, the relationship between emotion regulation and future-oriented thinking appears to be bidirectional. On one hand, effective emotion regulation facilitates future-oriented cognition by reducing the disruptive effects of negative emotions and enabling sustained goal-directed behavior. On the other hand, future-oriented thinking itself may serve as a regulatory strategy by allowing individuals to reframe present challenges in light of future goals and outcomes (4). This dynamic interaction is supported by findings showing that episodic future thinking enhances proactive behavior and supports emotional control, particularly when individuals anticipate the consequences of their actions (21). Additionally, research has

demonstrated that imagining future scenarios can promote self-regulatory behaviors such as saving and delaying gratification, further highlighting the interdependence of these processes (16, 17).

The higher levels of emotional lability observed in the low future-oriented thinking group further emphasize the importance of emotional stability in supporting cognitive development. Emotional lability, characterized by rapid and intense fluctuations in emotional states, may hinder the ability to maintain consistent goals and engage in sustained planning. Children who experience frequent emotional disruptions may struggle to allocate cognitive resources to future-oriented tasks, leading to difficulties in anticipating consequences and regulating behavior. This finding aligns with research indicating that negative affect and emotional instability can impair future-oriented cognition by biasing attention toward immediate concerns and reducing the capacity for long-term planning (15).

The present findings also highlight the broader role of self-regulation as an integrative construct linking attachment, emotion regulation, and future-oriented thinking. Self-regulation encompasses the coordination of cognitive, emotional, and behavioral processes that enable individuals to achieve goals and adapt to environmental demands (30). Attachment relationships play a crucial role in the development of self-regulation by providing external regulatory support that is gradually internalized by the child (31). Over time, children develop the capacity to regulate their own emotions and behaviors, which supports the emergence of future-oriented cognition. This developmental process is further influenced by environmental factors such as parenting practices and social contexts, which shape the opportunities for learning and practicing self-regulatory skills (32).

In addition, the findings can be interpreted within the framework of mental time travel, which involves the ability to mentally project oneself into the past and future. This capacity is supported by the integration of memory, executive functions, and socio-emotional processes, and is associated with the functional connectivity of the brain's default mode network (10). The development of mental time travel is influenced by both biological maturation and environmental experiences, including attachment relationships and emotional interactions. Thus, the observed relationships between attachment styles, emotion regulation, and future-oriented thinking reflect the complex interplay of multiple developmental systems.

Overall, the results of this study suggest that future-oriented thinking in children is not solely a cognitive ability but rather a multidimensional construct shaped by emotional and relational factors. The interplay between attachment styles and emotion regulation appears to play a critical role in determining individual differences in this capacity. Secure attachment and effective emotion regulation provide a supportive foundation for the development of future-oriented cognition, while emotional instability and insecure attachment patterns may hinder this process. At the same time, the potential adaptive role of avoidant attachment highlights the importance of considering contextual and individual differences in understanding these relationships.

The limitations of the present study should be acknowledged. The sample size was relatively small, which may limit the generalizability of the findings to broader populations. Additionally, the use of convenience sampling may have introduced selection bias, as participants may not be representative of the general population of children. The reliance on parent-report measures for assessing attachment and emotion regulation may also have introduced subjective bias and reduced the accuracy of the data. Furthermore, the cross-sectional design of the study precludes causal inferences regarding the relationships among the

variables. Other potentially influential factors, such as intelligence, socioeconomic status, and cultural context, were not controlled for and may have affected the results.

Future research should address these limitations by employing larger and more diverse samples to enhance the generalizability of the findings. Longitudinal designs are needed to examine the developmental trajectories of attachment, emotion regulation, and future-oriented thinking and to establish causal relationships among these variables. Additionally, future studies should incorporate multi-method approaches, including behavioral tasks and observational measures, to provide a more comprehensive assessment of these constructs. Investigating the role of mediating and moderating variables, such as executive functions, parenting practices, and cultural influences, would further contribute to a deeper understanding of the mechanisms underlying future-oriented cognition.

From a practical perspective, the findings of this study have important implications for educational and clinical interventions aimed at promoting children's development. Programs designed to enhance secure attachment relationships, particularly through parent training and family-based interventions, may provide a strong foundation for the development of future-oriented thinking. Interventions that focus on improving emotion regulation skills, such as teaching coping strategies and mindfulness techniques, may also support children's ability to plan and anticipate future outcomes. In educational settings, incorporating activities that encourage goal setting, planning, and future-oriented thinking can help children develop these critical skills. Overall, a comprehensive approach that addresses cognitive, emotional, and relational factors is essential for fostering adaptive development and promoting long-term well-being in children.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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