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Maternal Trauma History, Reflective Functioning, and Parental Sensitivity as Predictors of Emotional Dysregulation in Children: An Applied Learning Approach

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A B S T R A C T

Objective: The aim of this study was to examine whether maternal trauma history, reflective functioning, and parental sensitivity significantly predict emotional dysregulation in children using an integrated model combining traditional statistical methods and applied learning approaches.

Methods and Materials: This cross-sectional correlational study was conducted on 240 mother–child dyads in Tehran selected through multistage cluster sampling. Inclusion criteria included mothers with children aged 6–12 years and absence of severe neurodevelopmental disorders in children. Data were collected using standardized instruments, including the Childhood Trauma Questionnaire, Reflective Functioning Questionnaire, Maternal Behavior Q-Sort, and Emotion Regulation Checklist. Data analysis was performed using SPSS-27 for descriptive statistics, correlation, and multiple regression analysis, alongside machine learning techniques (random forest and gradient boosting) implemented in Python to enhance predictive modeling. Model performance was evaluated using R^2, mean squared error, and cross-validation procedures.

Findings: Results indicated that maternal trauma history significantly and positively predicted child emotional dysregulation ($\beta = 0.36$, $p < 0.001$). Reflective functioning uncertainty was also a significant positive predictor ($\beta = 0.24$, $p < 0.001$), whereas reflective functioning certainty showed a significant negative effect ($\beta = -0.19$, $p = 0.001$). Parental sensitivity emerged as the strongest negative predictor ($\beta = -0.44$, $p < 0.001$). The regression model explained 52% of the variance in emotional dysregulation ($R^2 = 0.52$, $p < 0.001$). Among machine learning models, gradient boosting demonstrated superior predictive performance ($R^2 = 0.67$), outperforming both random forest and linear regression models.

Conclusion: The findings highlight the critical role of maternal trauma, reflective functioning, and parental sensitivity in shaping children's emotional regulation, with parental sensitivity serving as the most influential protective factor. The integration of applied learning approaches provides enhanced predictive accuracy and supports the complexity of intergenerational processes, suggesting that interventions targeting maternal mentalization and caregiving behaviors may effectively reduce emotional dysregulation in children.

Keywords: *maternal trauma, reflective functioning, parental sensitivity, emotional dysregulation, children, intergenerational transmission*

1. Introduction

Emotional regulation in childhood has emerged as a central construct in developmental psychopathology, reflecting the child's capacity to modulate emotional arousal, maintain adaptive functioning, and respond flexibly to environmental demands. Dysregulation of emotion is increasingly recognized as a transdiagnostic risk factor underlying a wide range of psychological disorders, including anxiety, depression, behavioral disorders, and trauma-related conditions (Paulus et al., 2021; Zitzmann et al., 2023). Contemporary theoretical models emphasize that emotional regulation is not an isolated individual trait but rather develops within relational and environmental contexts, particularly within early caregiving relationships. Within this framework, parental characteristics—especially maternal psychological functioning—play a critical role in shaping children's emotional development (Rodrigues, 2024; Wang et al., 2022).

Among the most influential maternal factors is trauma history, which has been extensively linked to disruptions in parenting processes and child outcomes. Trauma, defined as exposure to events involving threat, harm, or overwhelming stress, can produce enduring changes in cognitive, emotional, and neurobiological functioning (Paivio & Pascual-Leone, 2023). Research demonstrates that maternal experiences of childhood adversity, including abuse and neglect, are associated with long-term alterations in stress responsivity, attachment representations, and emotional regulation capacities (Lapointe et al., 2025; Tomoda et al., 2024). These alterations, in turn, may compromise caregiving behaviors and contribute to the intergenerational transmission of trauma-related vulnerabilities (Harden et al., 2026; Riser et al., 2025). Indeed, studies have consistently shown that maternal trauma is associated with increased risk for maladaptive parenting practices, heightened psychological distress, and impaired responsiveness to children's emotional needs (Fatehi et al., 2021; Lotto et al., 2021).

The intergenerational transmission of trauma operates through multiple pathways, including biological, psychological, and relational mechanisms. Neurobiological evidence suggests that early trauma can alter brain structures involved in emotion processing and regulation, such as the amygdala and prefrontal cortex, which may influence caregiving behaviors later in life (Tomoda et al., 2024). At the psychological level, trauma can disrupt internal working models of attachment, leading to difficulties in interpreting and responding to children's emotional signals (Mattheß et al., 2023; Olsavsky et al., 2023). At the relational level, trauma-exposed mothers may exhibit reduced sensitivity, increased irritability, and inconsistent caregiving, all of which are associated with adverse child outcomes (Cotter et al., 2024; Glaus et al., 2022). These findings underscore the importance of examining maternal trauma not only as a historical variable but as an active determinant of parenting processes and child emotional development.

A key construct that mediates the relationship between maternal trauma and parenting behavior is reflective functioning, also referred to as mentalization. Reflective functioning involves the capacity to understand one's own and others' behavior in terms of underlying mental states, such as thoughts, feelings, and intentions. This capacity is fundamental to sensitive caregiving, as it enables parents to accurately interpret and respond to their children's emotional cues (Dollberg & Hanetz-Gamliel, 2023; Ensink et al., 2021). Research indicates that maternal trauma is often associated with impairments in reflective functioning, particularly in the form of uncertainty or confusion about mental states (Paris et al., 2023; Ribaudo et al., 2022). Such impairments can lead to misinterpretations of children's behavior, emotional disengagement, or intrusive responses, thereby undermining the child's emotional regulation development.

Empirical studies have demonstrated that reflective functioning plays a crucial mediating role in the intergenerational transmission of trauma. For instance, mothers with higher levels of reflective functioning are better able to buffer the negative effects of their own trauma

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on their children's emotional and behavioral outcomes (Finzi-Dottan & Gewirtz-Meydan, 2024; Hanetz-Gamliel & Dollberg, 2022). Conversely, low reflective functioning has been associated with increased parenting stress, reduced sensitivity, and greater child psychopathology (Paris, 2025; Spearman et al., 2023). These findings highlight reflective functioning as a modifiable target for intervention, with the potential to disrupt maladaptive intergenerational patterns and promote adaptive child development.

Parental sensitivity represents another critical factor linking maternal characteristics to child emotional outcomes. Sensitivity refers to the caregiver's ability to perceive, interpret, and respond appropriately to the child's signals in a timely and consistent manner. Sensitive parenting provides a secure base for the child, facilitating the development of emotional regulation, attachment security, and social competence (Idsøe et al., 2021; Swales et al., 2022). In contrast, insensitive or inconsistent caregiving is associated with increased emotional dysregulation, behavioral problems, and vulnerability to stress (Langevin et al., 2023; Powers et al., 2022). Maternal trauma has been shown to negatively impact parental sensitivity, often through its effects on emotional regulation and reflective functioning (Glaus et al., 2022; Langevin et al., 2022).

The interaction between reflective functioning and parental sensitivity is particularly important in understanding child emotional regulation. Reflective functioning provides the cognitive-emotional framework through which parents interpret their children's behavior, while sensitivity reflects the behavioral manifestation of this understanding. Together, these constructs form a dynamic system that shapes the child's emotional experiences and regulatory capacities (Mattheß et al., 2023; Zitzmann et al., 2023). Disruptions in either component can compromise the quality of parent–child interactions and contribute to maladaptive developmental trajectories.

Recent research has also emphasized the role of contextual and cultural factors in shaping the relationships among trauma, parenting, and child outcomes. Cultural norms, social support systems, and socioeconomic conditions can influence both the expression of trauma and the availability of protective resources (Tohme et al., 2025). For example, mothers living in high-stress environments may face additional challenges in maintaining sensitive caregiving, even in the absence of personal trauma history (Harden et al., 2026). Similarly, exposure to ongoing stressors such as violence or poverty can exacerbate the effects of trauma and increase the risk of emotional dysregulation in children (Mooren et al., 2023; Smith et al., 2024). These findings underscore the importance of adopting a holistic approach that considers multiple levels of influence in understanding child emotional development.

Another emerging area of research involves the application of advanced analytical methods, including machine learning approaches, to model complex relationships among psychological variables. Traditional statistical methods, while valuable, may be limited in their ability to capture non-linear interactions and high-dimensional data structures. Applied learning techniques, such as gradient boosting and random forest algorithms, offer enhanced predictive capabilities and can identify subtle patterns that may not be apparent through conventional analyses (Riser et al., 2025; Rodrigues, 2024). These approaches are particularly well-suited for studying multifactorial phenomena such as emotional dysregulation, where multiple interacting variables contribute to outcomes.

Despite the growing body of literature on maternal trauma, reflective functioning, and parental sensitivity, several gaps remain. First, many studies have examined these variables in isolation, without considering their combined effects within an integrated model. Second, there is a need for research that incorporates both traditional and advanced analytical methods to enhance predictive accuracy. Third, relatively few studies have focused on non-Western populations, limiting the generalizability of findings across cultural contexts. Addressing these gaps is essential for developing a comprehensive understanding of the mechanisms underlying child emotional dysregulation and for informing effective interventions.

In light of these considerations, the present study seeks to examine the combined and interactive effects of maternal trauma history, reflective functioning, and parental sensitivity on emotional dysregulation in children, using an applied learning approach that integrates traditional statistical analyses with machine learning techniques. The aim of this study is to investigate whether maternal trauma history, reflective functioning, and parental sensitivity significantly predict emotional dysregulation in children within an integrated predictive model.

2. Methods and Materials

2.1. Study Design and Participants

The present study was conducted using a cross-sectional correlational design with a predictive modeling approach grounded in applied learning methods. The target population

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consisted of mothers and their children residing in Tehran. A total of 240 mother–child dyads were selected through a multistage cluster sampling method from different districts of Tehran to ensure socio-economic and cultural diversity. Inclusion criteria for mothers included having a child aged between 6 and 12 years, the ability to read and write, and willingness to participate in the study. Children with diagnosed severe neurodevelopmental disorders or chronic psychiatric conditions were excluded to control for confounding variables affecting emotional regulation. After screening for eligibility and obtaining informed consent, participants completed the study instruments in a controlled setting, either at schools or community centers, under the supervision of trained researchers.

2.2. Measures

Maternal trauma history was assessed using the Childhood Trauma Questionnaire (CTQ), originally developed by Bernstein and colleagues in 1994. This self-report instrument consists of 28 items designed to measure retrospective experiences of abuse and neglect during childhood across five subscales: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Each item is rated on a 5-point Likert scale ranging from 1 (never true) to 5 (very often true), with higher scores indicating greater exposure to traumatic experiences. The CTQ has demonstrated strong psychometric properties in various populations, including high internal consistency and test-retest reliability. Its construct validity has been confirmed through factor analysis and correlations with related constructs such as psychological distress and attachment insecurity. Previous studies have validated its use in both clinical and non-clinical samples, confirming its reliability and validity in assessing early trauma experiences.

Maternal reflective functioning was measured using the Reflective Functioning Questionnaire (RFQ), developed by Fonagy and colleagues in 2016. This instrument evaluates the capacity to understand one's own and others' mental states and consists of 8 items divided into two subscales: certainty about mental states (RFQ_C) and uncertainty about mental states (RFQ_U). Items are rated on a 7-point Likert scale, and scoring involves recoding procedures to capture impairments in mentalization. Higher scores on the uncertainty subscale reflect difficulties in understanding mental states, whereas extreme scores on certainty may indicate hypermentalizing. The RFQ has been widely used in psychological research and has demonstrated acceptable levels of internal consistency and construct validity. Empirical studies have confirmed its reliability across different cultural contexts, supporting its use as a brief and effective measure of reflective functioning.

Parental sensitivity was assessed using the Maternal Behavior Q-Sort (MBQS), developed by Pederson and Moran in 1995. This observational tool evaluates maternal sensitivity based on naturalistic interactions between mother and child. The instrument consists of 90 descriptive items that are sorted into categories according to how well they characterize the mother's behavior during interaction. The final sensitivity score is calculated by correlating the participant's sort with a criterion sort representing the prototypically sensitive mother. Higher scores indicate greater parental sensitivity and responsiveness. The MBQS has been extensively validated in attachment research and has shown high inter-rater reliability and strong predictive validity for child attachment security. Its ecological validity and robustness across diverse populations make it a gold-standard measure for assessing parental sensitivity.

Children's emotional regulation was measured using the Emotion Regulation Checklist (ERC), developed by Shields and Cicchetti in 1997. This parent-report instrument consists of 24 items assessing two primary dimensions: emotion regulation and lability/negativity. Items are rated on a 4-point Likert scale ranging from 1 (never) to 4 (almost always), with higher scores indicating greater emotional dysregulation or better regulation depending on the subscale. The ERC has demonstrated strong internal consistency and factorial validity in numerous studies involving children. Its convergent validity has been established through correlations with behavioral and emotional outcomes, and it has been widely used in developmental and clinical psychology research. Reliability and validity have been confirmed across different age groups and cultural contexts, supporting its applicability in the present study.

2.3. Data analysis

Data analysis was conducted using a combination of statistical and machine learning techniques to achieve a robust predictive model. Initially, descriptive statistics and preliminary analyses were performed to examine data distribution, missing values, and assumptions of normality. Pearson correlation coefficients were calculated to assess the relationships among variables. Subsequently, multiple regression analysis was employed to evaluate the predictive power of maternal trauma history, reflective functioning,

and parental sensitivity on children's emotional dysregulation. In addition to traditional statistical methods, an applied learning approach was implemented using supervised machine learning algorithms, including gradient boosting regression and random forest models, to enhance prediction accuracy. Model performance was evaluated using cross-validation techniques and metrics such as mean squared error and R-squared. Feature importance indices were also computed to determine the relative contribution of each predictor variable. All analyses were conducted using SPSS-27 and Python-based machine learning libraries, ensuring both statistical rigor and computational precision.

3. Findings and Results

The demographic characteristics of the participants indicated that the mean age of mothers was 34.72 years (SD = 5.81), with an age range between 24 and 47 years. The majority of mothers were married (91.3%), while a smaller proportion were single, divorced, or widowed (8.7%). Regarding educational level, 28.8% of mothers held a high school diploma, 46.3% had a bachelor's degree, and 24.9% had postgraduate education. In terms of employment status, 57.5% were homemakers and 42.5% were employed in various occupations. The children included in the study had a mean age of 8.94 years (SD = 1.87), with 51.7% being boys and 48.3% girls. Socioeconomic status, assessed based on self-reported income and living conditions, showed that 36.2% of families were in the lower-middle category, 44.6% in the middle category, and 19.2% in the upper-middle category. No significant demographic differences were observed that would confound the main study variables.

Table 1

Descriptive Statistics of Study Variables

Variable	Mean	SD	Minimum	Maximum	Skewness	Kurtosis
Maternal Trauma History	43.58	11.72	28.00	82.00	0.62	0.41
Reflective Functioning (Uncertainty)	3.84	1.26	1.20	6.70	0.38	-0.29
Reflective Functioning (Certainty)	4.12	1.08	1.90	6.80	-0.21	-0.47
Parental Sensitivity	0.46	0.19	0.08	0.89	-0.34	-0.12
Child Emotional Dysregulation	32.74	7.63	15.00	52.00	0.57	0.36

The descriptive statistics presented in Table 1 indicate that maternal trauma history scores were moderately elevated with a mean of 43.58, suggesting a noticeable presence of early adverse experiences among participants. Reflective functioning showed a balanced distribution, although uncertainty scores were slightly skewed toward higher values, indicating variability in mothers' mentalization capacity. Parental sensitivity demonstrated moderate levels with relatively low dispersion, suggesting some consistency in observed maternal behaviors. Child emotional dysregulation scores were moderately high, with a slight positive skew, indicating that a subset of children exhibited higher levels of dysregulation. Skewness and kurtosis values for all variables fell within acceptable ranges (±1), confirming normal distribution assumptions for subsequent parametric analyses.

Table 2

Pearson Correlation Matrix Among Study Variables

Variable	1	2	3	4	5
1. Maternal Trauma History	1				
2. RF Uncertainty	0.41**	1			
3. RF Certainty	-0.28**	-0.36**	1		
4. Parental Sensitivity	-0.47**	-0.39**	0.42**	1	
5. Emotional Dysregulation	0.53**	0.46**	-0.33**	-0.58**	1

The correlation matrix reveals significant relationships among the primary study variables. Maternal trauma history was positively correlated with reflective functioning uncertainty ($r = 0.41$, $p < 0.01$) and child emotional dysregulation ($r = 0.53$, $p < 0.01$), while negatively correlated with parental sensitivity ($r = -0.47$, $p < 0.01$).

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Reflective functioning uncertainty showed a moderate positive association with emotional dysregulation ($r = 0.46$, $p < 0.01$), whereas reflective functioning certainty was negatively associated with dysregulation ($r = -0.33$, $p < 0.01$). Parental sensitivity demonstrated the strongest inverse relationship with child emotional dysregulation ($r = -0.58$, $p < 0.01$), highlighting its protective role. These findings support the hypothesized interrelations among maternal psychological characteristics and child outcomes.

Table 3

Multiple Regression Analysis Predicting Child Emotional Dysregulation

Predictor	B	SE B	β	t	p
Maternal Trauma History	0.28	0.05	0.36	5.62	<0.001
RF Uncertainty	1.94	0.48	0.24	4.04	<0.001
RF Certainty	-1.37	0.42	-0.19	-3.26	0.001
Parental Sensitivity	-9.82	1.21	-0.44	-8.12	<0.001

The results of the multiple regression analysis indicate that the overall model was statistically significant and explained 52% of the variance in child emotional dysregulation. Maternal trauma history emerged as a significant positive predictor ($\beta = 0.36$, $p < 0.001$), indicating that higher levels of maternal trauma were associated with greater emotional dysregulation in children. Reflective functioning uncertainty also significantly predicted dysregulation ($\beta = 0.24$, $p < 0.001$), while reflective functioning certainty showed a negative predictive effect ($\beta = -0.19$, $p = 0.001$). Parental sensitivity was the strongest predictor ($\beta = -0.44$, $p < 0.001$), demonstrating a substantial inverse relationship with emotional dysregulation. These findings underscore the combined influence of maternal internal and behavioral factors on child emotional outcomes.

Table 4

Machine Learning Model Performance Comparison

Model	R^2	MSE	MAE
Linear Regression	0.52	28.64	4.37
Random Forest	0.61	22.18	3.74
Gradient Boosting	0.67	18.92	3.29

Figure 1

Conceptual Predictive Model of Emotional Dysregulation Based on Maternal Factors

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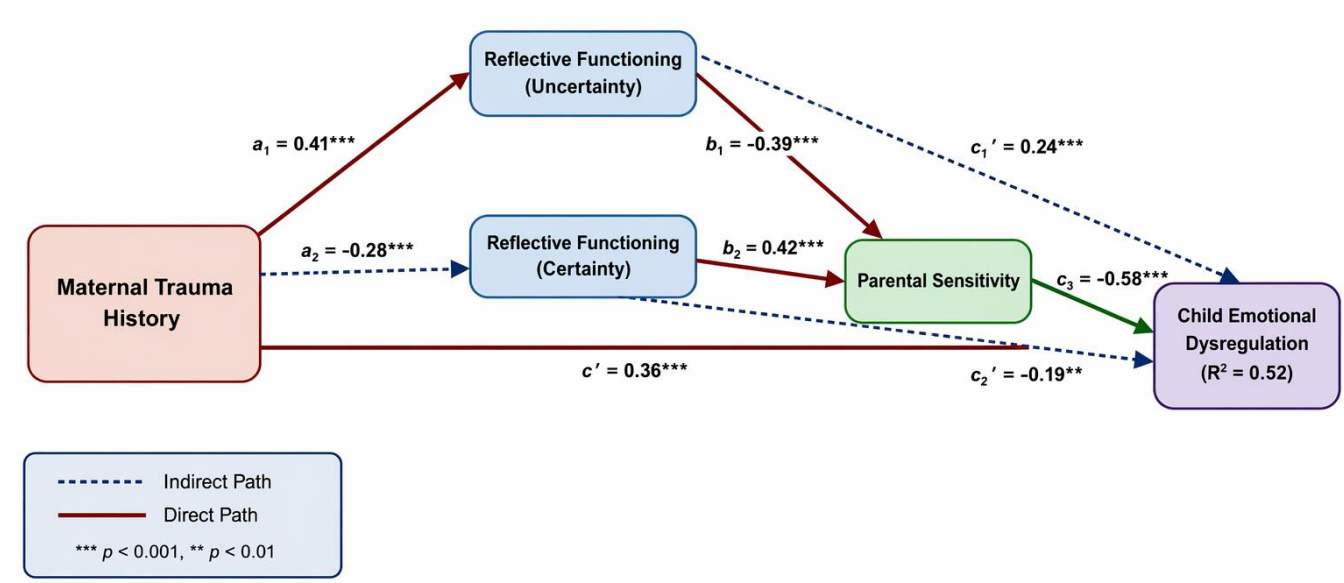

The comparison of machine learning models demonstrates that the gradient boosting algorithm outperformed both linear regression and random forest models, achieving the highest R^2 (0.67) and lowest error metrics (MSE = 18.92, MAE = 3.29). This indicates superior predictive accuracy in estimating child emotional dysregulation. The random forest model also showed improved performance compared to linear regression, suggesting that non-linear relationships among variables contribute meaningfully to prediction. These results highlight the added value of applied learning approaches in enhancing predictive precision beyond traditional statistical models.

The conceptual model illustrates the direct and indirect pathways linking maternal trauma history, reflective functioning components, and parental sensitivity to child emotional dysregulation. Maternal trauma exerts both a direct effect on child outcomes and an indirect effect through its influence on reflective functioning and parenting sensitivity. Reflective functioning operates as a cognitive-emotional mechanism shaping maternal responsiveness, while parental sensitivity serves as a proximal behavioral factor impacting the child's emotional regulation capacities. The integration of these pathways within a predictive framework supports a multidimensional understanding of emotional dysregulation in children and aligns with the applied learning approach employed in the present study.

4. Discussion

The present study aimed to investigate the predictive roles of maternal trauma history, reflective functioning, and parental sensitivity in explaining emotional dysregulation in children using both traditional statistical analyses and applied learning approaches. The findings demonstrated that maternal trauma history significantly and positively predicted children's emotional dysregulation, while reflective functioning and parental sensitivity emerged as critical mechanisms through which this relationship operates. In particular, higher levels of reflective functioning uncertainty and lower levels of parental sensitivity were associated with greater emotional dysregulation in children, whereas reflective functioning certainty and parental sensitivity functioned as protective factors. Furthermore, the applied learning models, particularly gradient boosting, provided enhanced predictive accuracy, highlighting the complex and potentially non-linear interactions among these variables.

The finding that maternal trauma history significantly predicts child emotional dysregulation is consistent with a large body of literature emphasizing the intergenerational transmission of trauma. Maternal exposure to adverse childhood experiences has been shown to disrupt emotional regulation systems, which can subsequently influence parenting behaviors and child developmental outcomes (Harden et al., 2026; Riser et al., 2025). These results align with prior research indicating that trauma-exposed mothers are more likely to exhibit heightened emotional reactivity,

reduced stress tolerance, and maladaptive coping strategies, all of which can negatively affect the emotional climate of the family (Fatehi et al., 2021; Lapointe et al., 2025). Additionally, neurobiological studies suggest that early trauma can lead to long-term alterations in brain regions associated with emotion regulation, thereby increasing vulnerability to dysregulation across generations (Tomoda et al., 2024). The present findings extend this literature by demonstrating that maternal trauma is not only associated with child outcomes but also serves as a robust predictor within a multivariate model that includes key relational and cognitive factors.

Reflective functioning emerged as a significant mediator in the relationship between maternal trauma and child emotional dysregulation. Specifically, higher levels of uncertainty in reflective functioning were associated with increased dysregulation, while certainty showed a protective effect. These findings are consistent with theoretical models of mentalization, which posit that the ability to understand and interpret mental states is essential for effective parenting and emotional attunement (Dollberg & Hanetz-Gamliel, 2023; Ensink et al., 2021). Mothers with impaired reflective functioning may struggle to accurately perceive their children's emotional needs, leading to misattuned or inconsistent responses. This is supported by previous studies demonstrating that low reflective functioning is linked to increased parenting stress, reduced emotional availability, and higher levels of child psychopathology (Paris et al., 2023; Ribaudo et al., 2022). Conversely, higher reflective functioning has been associated with greater emotional awareness, empathy, and responsiveness, which facilitate the development of adaptive emotional regulation in children (Finzi-Dottan & Gewirtz-Meydan, 2024; Hanetz-Gamliel & Dollberg, 2022). The present results reinforce the central role of reflective functioning as a cognitive-emotional mechanism underlying the transmission of trauma effects.

Parental sensitivity was identified as the strongest predictor of child emotional dysregulation, demonstrating a substantial inverse relationship. This finding underscores the critical importance of caregiving behavior in shaping children's emotional development. Sensitive parenting provides a secure base for the child, enabling the development of trust, emotional security, and regulatory capacities (Idsøe et al., 2021; Swales et al., 2022). In contrast, insensitive or inconsistent caregiving has been linked to increased emotional lability, behavioral problems, and vulnerability to stress (Langevin et al., 2023; Powers et al., 2022). The strong predictive value of parental sensitivity in the present study suggests that it serves as a proximal mechanism through which maternal characteristics influence child outcomes. This is consistent with research indicating that the quality of parent–child interactions is a key determinant of emotional regulation, mediating the effects of broader psychological and contextual factors (Cotter et al., 2024; Glaus et al., 2022).

The interplay between reflective functioning and parental sensitivity provides further insight into the mechanisms underlying emotional dysregulation. Reflective functioning can be conceptualized as the internal cognitive framework that informs caregiving behavior, while sensitivity represents the observable manifestation of this framework in parent–child interactions. The findings of the present study suggest that deficits in reflective functioning may lead to reduced sensitivity, which in turn contributes to emotional dysregulation in children. This pathway is supported by empirical evidence demonstrating that mentalization abilities are closely linked to caregiving quality and attachment security (Mattheß et al., 2023; Zitzmann et al., 2023). Moreover, interventions aimed at enhancing reflective functioning have been shown to improve parental sensitivity and child outcomes, further supporting the causal relationship between these constructs (Dollberg & Hanetz-Gamliel, 2023; Spearman et al., 2023).

Another important aspect of the findings is the significant predictive contribution of applied learning models. The superior performance of gradient boosting and random forest models compared to traditional linear regression suggests that the relationships among maternal trauma, reflective functioning, parental sensitivity, and child emotional dysregulation are complex and potentially non-linear. This is consistent with recent research advocating for the use of machine learning approaches in psychological studies to capture high-dimensional interactions and improve predictive accuracy (Riser et al., 2025; Rodrigues, 2024). The identification of parental sensitivity as the most important predictor in these models further reinforces its central role, while also highlighting the value of integrating computational methods with traditional theoretical frameworks.

The findings also align with broader ecological and contextual perspectives on child development. Emotional dysregulation is influenced not only by individual and relational factors but also by environmental stressors and cultural contexts. For instance, exposure to chronic stress, violence, or socioeconomic adversity can exacerbate the

effects of maternal trauma and compromise parenting capacities (Mooren et al., 2023; Smith et al., 2024). Cultural factors may also shape parenting practices, beliefs about emotion, and access to support systems, thereby influencing the pathways through which trauma affects child outcomes (Tohme et al., 2025). The inclusion of a diverse sample from Tehran in the present study contributes to the growing literature on cross-cultural aspects of trauma and parenting, although further research is needed to fully understand these dynamics.

The association between maternal trauma and emotional dysregulation can also be understood in light of attachment theory and developmental psychopathology. Trauma-exposed mothers may develop insecure attachment representations, which can affect their ability to provide consistent and responsive caregiving. This, in turn, can lead to insecure attachment in children, which is associated with difficulties in emotional regulation and increased risk for psychopathology (Langevin et al., 2022; Olsavsky et al., 2023). Additionally, maternal emotional dysregulation, often resulting from unresolved trauma, can directly influence children through modeling and co-regulation processes (Powers et al., 2022; Wang et al., 2022). The present findings support these theoretical perspectives by demonstrating that both cognitive (reflective functioning) and behavioral (sensitivity) factors mediate the impact of maternal trauma.

5. Conclusion

Taken together, the results of this study provide a comprehensive understanding of the mechanisms linking maternal trauma to child emotional dysregulation. By integrating multiple constructs within a single predictive model and employing both traditional and advanced analytical methods, the study offers valuable insights into the complexity of intergenerational processes. The findings highlight the importance of addressing maternal trauma, enhancing reflective functioning, and promoting sensitive caregiving in efforts to prevent and reduce emotional dysregulation in children.

6. Limitations & Suggestions

One limitation of the present study is the cross-sectional design, which precludes causal inferences regarding the relationships among variables. Although predictive modeling was employed, longitudinal studies are necessary to establish temporal ordering and examine developmental trajectories. Another limitation concerns the reliance on self-report measures for assessing maternal trauma and reflective functioning, which may be subject to recall bias or social desirability effects. Additionally, while parental sensitivity was assessed through a validated observational tool, the controlled setting may not fully capture naturalistic interactions. The sample, although diverse within Tehran, may limit the generalizability of findings to other cultural or socioeconomic contexts. Finally, the use of machine learning models, while enhancing predictive accuracy, may reduce interpretability compared to traditional statistical approaches.

Future research should employ longitudinal designs to examine the dynamic interplay among maternal trauma, reflective functioning, parental sensitivity, and child emotional regulation over time. Such studies could provide insights into critical developmental periods and the stability of these relationships. There is also a need to explore additional mediating and moderating variables, such as social support, paternal involvement, and child temperament, to develop a more comprehensive model. The integration of biological measures, including neuroimaging and physiological indicators, could further elucidate the mechanisms underlying intergenerational transmission. Moreover, future studies should consider cross-cultural comparisons to examine the influence of cultural norms and practices on parenting and child development. The application of advanced machine learning techniques should be expanded to include larger datasets and more diverse populations, while also addressing issues of interpretability and clinical applicability.

From a practical perspective, the findings of this study have important implications for intervention and prevention programs. Interventions targeting maternal trauma, such as trauma-focused therapies, can help reduce the impact of unresolved trauma on parenting and child outcomes. Programs designed to enhance reflective functioning, including mentalization-based interventions, may improve mothers' ability to understand and respond to their children's emotional needs. Parenting programs that focus on increasing sensitivity and responsiveness can provide caregivers with concrete skills to support their children's emotional development. Additionally, integrating applied learning approaches into clinical practice may enhance the identification of high-risk families and inform personalized intervention strategies. Early identification and support for families with a history of trauma are essential for preventing

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the development of emotional dysregulation and promoting healthy developmental trajectories in children.

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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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Authors' Contributions

All authors equally contributed in this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

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