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Predicting Parenting Inconsistency Using Machine Learning: Executive Dysfunction, Stress Reactivity, and Role Overload

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A B S T R A C T

Objective: The present study aimed to predict parenting inconsistency using machine learning models based on executive dysfunction, stress reactivity, and role overload among parents.

Methods and Materials: This study employed a descriptive–correlational design with a machine learning predictive approach. The statistical population consisted of parents residing in Canada with at least one child aged 6 to 16 years, from which 412 participants were selected using stratified random sampling. Data were collected through standardized self-report instruments, including the Parenting Consistency Scale, the Behavior Rating Inventory of Executive Function–Adult Version (BRIEF-A), the Perceived Stress Reactivity Scale (PSRS), and the Role Overload Scale. Data preprocessing involved normalization, outlier detection, and handling missing values using multiple imputation. Statistical analyses were initially conducted using SPSS-27 to compute descriptive statistics and correlations. Subsequently, machine learning models including Random Forest, Support Vector Machine, Gradient Boosting, and Artificial Neural Networks were implemented using Python-based libraries. Model performance was evaluated using accuracy, mean squared error (MSE), coefficient of determination (R^2), and area under the receiver operating characteristic curve (AUC-ROC), with a 70/30 train–test split and cross-validation procedures applied.

Findings: The results indicated that executive dysfunction, stress reactivity, and role overload were all significant positive predictors of parenting inconsistency. Among these variables, executive dysfunction demonstrated the strongest predictive contribution across all models. Machine learning analyses revealed that the Gradient Boosting model achieved the highest performance (Accuracy = 0.86, R^2 = 0.66, AUC = 0.90), followed by Random Forest (Accuracy = 0.84, R^2 = 0.62). Artificial Neural Networks showed moderate predictive performance, while Support Vector Machine exhibited comparatively lower explanatory power. Feature importance analyses confirmed that executive dysfunction was the most influential predictor, followed by role overload and stress reactivity.

Conclusion: Integrating executive functioning, stress regulation, and environmental demands within predictive frameworks offers a comprehensive understanding of parenting variability and provides a foundation for developing targeted interventions to promote consistent parenting practices.

Keywords: *Parenting Inconsistency, Executive Dysfunction, Stress Reactivity, Role Overload*

1 Introduction

Parenting inconsistency, defined as variability in parental responses to child behavior across time and contexts, has emerged as a critical construct in developmental and family psychology due to its robust association with maladaptive child outcomes, including externalizing behaviors, emotional dysregulation, and impaired social functioning. Contemporary theoretical frameworks increasingly conceptualize parenting inconsistency not merely as a behavioral artifact, but as an emergent property of interacting cognitive, affective, and contextual processes within caregivers. In this regard, recent advances in developmental psychopathology and neurocognitive science have emphasized the importance of integrating multiple levels of analysis—including executive functioning, stress physiology, and environmental demands—to better understand variability in parenting practices (Blair & Ku, 2022; Goozen et al., 2022). This multidimensional perspective is particularly relevant in modern family contexts characterized by escalating psychosocial stressors and complex role expectations.

Executive dysfunction has been identified as a central cognitive mechanism underlying inconsistent parenting behaviors. Executive functions, encompassing inhibitory control, working memory, and cognitive flexibility, are essential for goal-directed behavior and adaptive self-regulation in dynamic social environments. Impairments in these processes may limit a parent's capacity to maintain consistent disciplinary strategies, especially under conditions of cognitive load or emotional strain. Emerging evidence suggests that executive functioning is not static but is sensitive to developmental transitions and contextual influences, including the demands of caregiving itself (Ghadimi & McCormack, 2025). Furthermore, neurodevelopmental models highlight that executive dysfunction is often intertwined with broader self-regulatory deficits, which can manifest in both parental and child behavior, creating bidirectional cycles of dysregulation (Blair & Ku, 2022). This is consistent with research indicating that disrupted executive control is associated with increased variability in behavioral responses across contexts, a hallmark of inconsistent parenting.

In parallel, stress reactivity has been increasingly recognized as a key affective and physiological contributor to parenting inconsistency. Stress reactivity refers to individual differences in emotional, cognitive, and biological responses to stressors, often mediated by neuroendocrine systems such as the hypothalamic–pituitary–adrenal (HPA) axis. Dysregulation in these systems, particularly elevated cortisol responses, has been linked to impaired emotional regulation and decision-making processes, which are critical for consistent parenting practices (George et al., 2025). The cumulative impact of stress exposure can alter neural circuitry involved in self-regulation, thereby increasing susceptibility to reactive and inconsistent responses in caregiving contexts (Chaudhuri & Gupta, 2025). Empirical findings further indicate that heightened stress reactivity is associated with poorer behavioral adjustment and greater variability in caregiving behaviors, particularly in high-demand environments (Ewing-Cobbs et al., 2023). Moreover, stress-related cognitive impairments, including attentional biases and reduced working memory capacity, may exacerbate executive dysfunction, further compounding the risk of inconsistent parenting (Wang et al., 2023).

The concept of role overload provides an important contextual dimension to understanding parenting inconsistency. Role overload occurs while individuals perceive that the demands of their various social roles exceed their available resources, including time, energy, and cognitive capacity. In contemporary societies, parents often juggle multiple responsibilities, including employment, caregiving, and household management, which can lead to chronic strain and reduced capacity for consistent parenting. Theoretical models of stress and adaptation suggest that role overload can deplete psychological resources necessary for effective self-regulation, thereby increasing reliance on reactive rather than deliberate parenting strategies (Watanabe et al., 2023). This is supported by findings indicating that high levels of perceived stress and workload are associated with greater inconsistency in parental discipline and responsiveness (Ostrov et al., 2022). Additionally, role overload may interact with individual differences in executive functioning and stress reactivity, amplifying their effects on parenting behavior.

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From a developmental perspective, the interplay between parenting inconsistency and child outcomes is further complicated by processes of differential susceptibility and environmental sensitivity. These frameworks posit that children vary in their responsiveness to environmental inputs, including parenting behaviors, such that inconsistent parenting may have disproportionately negative effects on certain individuals (Kelly & Sullivan, 2022). This variability underscores the importance of identifying the underlying mechanisms of parenting inconsistency, as even subtle variations in caregiving can have significant developmental consequences. Moreover, models such as the ESCAPE-AL framework emphasize the role of cumulative stress and allostatic load in shaping both parental and child behavior over time, suggesting that chronic exposure to stressors can lead to maladaptive patterns of interaction within families (Kimonis, 2023).

Early life adversity and broader ecological factors also play a crucial role in shaping parenting behaviors and their consistency. The social ecology of childhood highlights the influence of multiple contextual layers, including family, community, and societal factors, on developmental trajectories (Lopez et al., 2021). Parents who have experienced adversity themselves may exhibit altered stress responses and cognitive functioning, which can influence their parenting practices. Neurodevelopmental research indicates that early adversity can lead to long-term changes in brain structure and function, particularly in regions associated with executive control and emotional regulation (Aluğan, 2024). These alterations may increase vulnerability to inconsistent parenting, especially under conditions of stress or role overload. Furthermore, intergenerational transmission models suggest that patterns of inconsistency may be perpetuated across generations through both biological and behavioral pathways (Logue & Nemeroff, 2025).

The quality of the parent–child relationship and attachment processes further mediate the impact of parenting inconsistency on child outcomes. Attachment theory posits that consistent and responsive caregiving is essential for the development of secure attachment, which in turn supports emotional and social competence. Inconsistent parenting may undermine this process, leading to insecure attachment patterns and associated behavioral difficulties (Shah et al., 2022). Empirical studies have demonstrated that variations in parental responsiveness, including inconsistency, are linked to differences in children's physiological regulation and behavioral adjustment (Scott et al., 2022). Additionally, supportive parenting has been shown to buffer the effects of stress reactivity on child development, highlighting the protective role of consistent caregiving (Kok et al., 2022).

Recent research has also emphasized the importance of considering biological and psychophysiological mechanisms in understanding parenting behaviors. For example, hormone–behavior interactions, including those involving cortisol and oxytocin, have been implicated in caregiving processes and emotional regulation (Marceau, 2025; Papke et al., 2023). These findings suggest that parenting inconsistency may be partly rooted in underlying biological processes that influence both cognition and affect. Moreover, the integration of biological and contextual factors provides a more comprehensive framework for understanding the complexity of parenting behaviors and their variability.

In addition to individual and contextual factors, broader developmental and psychopathological processes must be considered. Parenting inconsistency has been linked to a range of child outcomes, including antisocial behavior, emotional dysregulation, and cognitive difficulties (Goozen et al., 2022; Squillaci & Benoit, 2021). These associations highlight the importance of identifying the mechanisms underlying inconsistent parenting, as they have implications for both prevention and intervention efforts. Furthermore, the dynamic interplay between parent and child characteristics suggests that parenting inconsistency is not solely a function of parental factors but is also influenced by child behavior and temperament (Golden et al., 2025; Shakiba et al., 2022). This bidirectional perspective aligns with contemporary models of developmental psychopathology, which emphasize the reciprocal nature of parent–child interactions (Vaughn & Weisz, 2021).

Given the complexity of these interacting factors, traditional statistical approaches may be insufficient to fully capture the nonlinear and multidimensional relationships underlying parenting inconsistency. Machine learning methods offer a powerful alternative by enabling the analysis of complex datasets and the identification of patterns that may not be apparent using conventional techniques. These approaches are particularly well-suited for modeling interactions among cognitive, emotional, and contextual variables, and for generating predictive models with high accuracy. The integration of machine learning with developmental and family research thus represents a promising direction for advancing our understanding of parenting processes and their determinants.

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Despite the growing body of research on parenting inconsistency, there remains a need for integrative models that simultaneously consider executive dysfunction, stress reactivity, and role overload within a predictive framework. Previous studies have often examined these factors in isolation, limiting our understanding of their combined effects. Moreover, there is a paucity of research utilizing advanced analytical techniques to model these relationships in a comprehensive manner. Addressing this gap is essential for developing targeted interventions aimed at promoting consistent parenting and improving child outcomes.

Therefore, the aim of the present study is to predict parenting inconsistency using machine learning models based on executive dysfunction, stress reactivity, and role overload among parents.

2 Methods and Materials

2.1 Study Design and Participants

The present study employed a descriptive–correlational design with a predictive modeling approach grounded in machine learning techniques to examine the extent to which executive dysfunction, stress reactivity, and role overload contribute to parenting inconsistency. The statistical population consisted of parents residing in Canada who had at least one child between the ages of 6 and 16 years. A total of 412 participants were recruited using a stratified random sampling method to ensure representation across different provinces, socioeconomic statuses, and family structures. Inclusion criteria included being a primary caregiver, fluency in English, and absence of diagnosed severe psychiatric disorders that could impair response validity. Data collection was conducted through an online survey platform, ensuring anonymity and voluntary participation.

2.2 Measures

Data were collected using standardized and psychometrically validated instruments widely employed in psychological and family studies. Parenting inconsistency was measured using the Parenting Consistency Scale, originally developed by Shelton et al., which assesses fluctuations in discipline practices and rule enforcement across situations. The scale consists of multiple items rated on a Likert continuum, with higher scores indicating greater inconsistency in parenting behaviors. Executive dysfunction was assessed using the Behavior Rating Inventory of Executive Function–Adult Version (BRIEF-A), developed by Roth, Isquith, and Gioia, which evaluates domains such as inhibitory control, cognitive flexibility, working memory, and planning. Stress reactivity was measured using the Perceived Stress Reactivity Scale (PSRS), developed by Schlotz et al., capturing individual differences in emotional, cognitive, and physiological responses to stressors. Role overload was assessed using the Role Overload Scale by Reilly, which measures the extent to which individuals perceive their social and familial roles as excessive relative to their available time and resources. All instruments demonstrated acceptable reliability and validity in previous studies, and internal consistency coefficients (Cronbach's alpha) in the present study exceeded 0.80 for all scales, indicating high reliability.

2.3 Data Analysis

Data analysis was conducted using a combination of traditional statistical methods and advanced machine learning algorithms. Initial data preprocessing included handling missing values through multiple imputation, normalization of continuous variables, and detection of outliers using Mahalanobis distance. Descriptive statistics and Pearson correlation coefficients were calculated using IBM SPSS version 27 to examine preliminary relationships among variables. For predictive modeling, machine learning analyses were performed using Python-based libraries, including scikit-learn. Multiple algorithms were implemented and compared, including Random Forest, Support Vector Machine (SVM), Gradient Boosting, and Artificial Neural Networks (ANN), to identify the most accurate predictive model for parenting inconsistency. The dataset was split into training (70%) and testing (30%) subsets, and model performance was evaluated using cross-validation techniques. Key performance metrics included accuracy, mean squared error (MSE), R-squared (R^2), and area under the receiver operating characteristic curve (AUC-ROC) where applicable. Feature importance analysis was conducted to determine the relative contribution of executive dysfunction, stress reactivity, and role overload to the predictive model. Hyperparameter tuning was performed using grid search optimization to enhance model performance and generalizability.

3 Findings and Results

The demographic characteristics of the participants indicated that the sample (N = 412) was composed of 61.17% mothers and 38.83% fathers, with a mean age of

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38.46 years (SD = 6.92). The majority of participants were married (78.40%), while 14.56% were single parents and 7.04% were divorced or separated. In terms of educational attainment, 27.91% held a bachelor's degree, 34.22% a master's degree, 18.93% a doctoral degree, and the remaining 18.94% had completed secondary or vocational education. Regarding employment status, 72.57% were employed full-time, 15.29% part-time, and 12.14% were unemployed or engaged in unpaid domestic work. The average number of children per household was 2.14 (SD = 0.87), and the mean age of children was 10.23 years (SD = 3.11). These characteristics indicate a socioeconomically and educationally diverse sample, suitable for modeling parenting-related processes.

Table 1

Descriptive Statistics and Correlations Among Study Variables

Variable	Mean	SD	1	2	3	4
1. Parenting Inconsistency	3.47	0.68	—			
2. Executive Dysfunction	3.12	0.71	0.56**	—		
3. Stress Reactivity	3.64	0.63	0.49**	0.52**	—	
4. Role Overload	3.38	0.66	0.53**	0.47**	0.58**	—

As presented in Table 1, all study variables demonstrated moderate to strong positive correlations with parenting inconsistency. Executive dysfunction showed the strongest association ($r = 0.56$, $p < 0.01$), indicating that deficits in cognitive control and regulatory processes are closely linked to inconsistent parenting behaviors. Role overload ($r = 0.53$, $p < 0.01$) and stress reactivity ($r = 0.49$, $p < 0.01$) also exhibited significant positive relationships, suggesting that both environmental pressures and emotional reactivity contribute substantially to variability in parenting practices. Additionally, the predictors were significantly intercorrelated, with the highest correlation observed between stress reactivity and role overload ($r = 0.58$, $p < 0.01$), reflecting a meaningful overlap between perceived stress sensitivity and excessive role demands. These findings support the conceptual coherence of the model and justify their inclusion in predictive analyses.

Table 2

Machine Learning Model Performance Metrics

Model	Accuracy	MSE	R^2	AUC-ROC
Random Forest	0.84	0.21	0.62	0.88
Support Vector Machine	0.79	0.27	0.54	0.82
Gradient Boosting	0.86	0.19	0.66	0.90
Artificial Neural Network	0.83	0.23	0.60	0.87

The results in Table 2 demonstrate that among the implemented machine learning models, the Gradient Boosting algorithm yielded the highest predictive performance, with an accuracy of 0.86, the lowest mean squared error (MSE = 0.19), and the highest explained variance ($R^2 = 0.66$). It also achieved the strongest classification capability with an AUC-ROC of 0.90, indicating excellent discriminative power. The Random Forest model also performed robustly (Accuracy = 0.84, $R^2 = 0.62$), suggesting that ensemble-based methods are particularly effective in capturing nonlinear relationships among the variables. In contrast, the Support Vector Machine demonstrated comparatively lower performance, particularly in terms of explained variance ($R^2 = 0.54$), although its AUC-ROC remained acceptable. The Artificial Neural Network showed balanced performance across all metrics, indicating its capability to model complex interactions, albeit slightly less efficiently than Gradient Boosting in this dataset.

Table 3

Feature Importance Across Machine Learning Models

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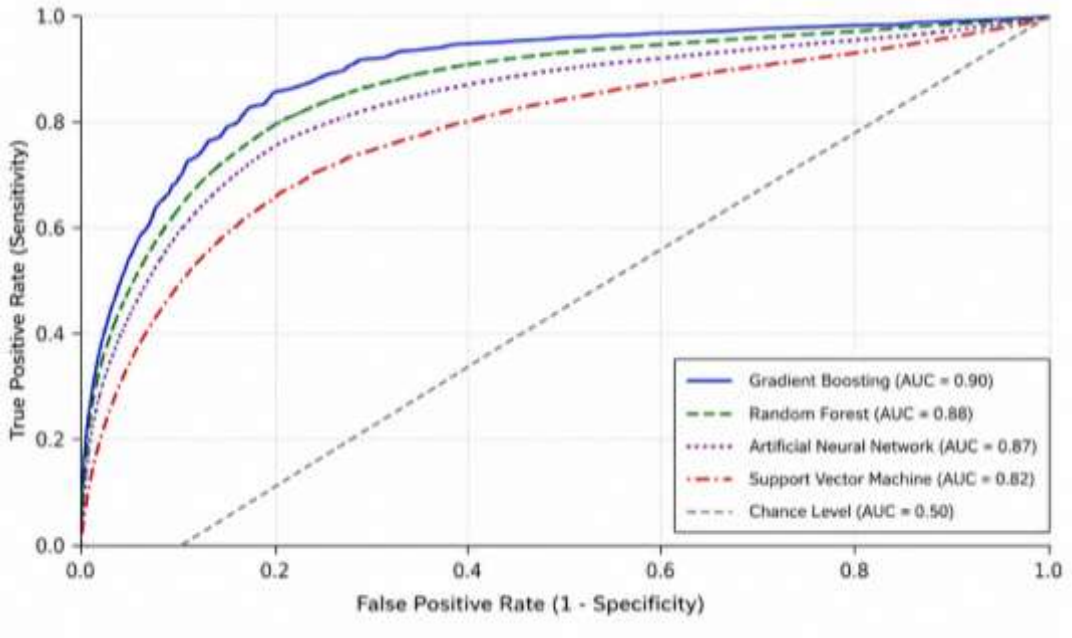
Predictor Variable	Random Forest	Gradient Boosting	ANN (Relative Weight)
Executive Dysfunction	0.41	0.44	0.39
Stress Reactivity	0.27	0.29	0.31
Role Overload	0.32	0.27	0.30

As shown in Table 3, executive dysfunction consistently emerged as the most influential predictor of parenting inconsistency across all machine learning models, with the highest importance scores in both Random Forest (0.41) and Gradient Boosting (0.44), as well as the highest relative weight in the neural network (0.39). This indicates that impairments in executive functioning play a central role in shaping inconsistent parenting behaviors. Role overload and stress reactivity also contributed meaningfully, though their relative importance varied slightly across models. Role overload demonstrated stronger influence in the Random Forest model, whereas stress reactivity showed relatively higher importance within the neural network framework. These variations suggest that different algorithms capture distinct aspects of the data structure, yet converge on the overarching conclusion that all three predictors significantly contribute to the outcome.

Figure 1

Comparative ROC Curves of Machine Learning Models for Predicting Parenting Inconsistency



The ROC curve analysis further substantiated the superiority of the Gradient Boosting model, which displayed the largest area under the curve, indicating optimal sensitivity–specificity balance across classification thresholds. The Random Forest and Artificial Neural Network models also exhibited strong curves, closely approaching the upper-left corner of the ROC space, while the Support Vector Machine showed a comparatively flatter curve, reflecting lower discriminative efficiency. Collectively, the figure illustrates that ensemble-based and boosting techniques are particularly effective in modeling parenting inconsistency, likely due to their ability to capture nonlinear interactions and complex feature dependencies among executive dysfunction, stress reactivity, and role overload.

4 Discussion

The present study aimed to model and predict parenting inconsistency using machine learning approaches based on executive dysfunction, stress reactivity, and role overload. The findings revealed that all three predictors were significantly and positively associated with parenting inconsistency, with executive dysfunction emerging as the most influential predictor across models. Furthermore, among the machine learning algorithms applied, the Gradient Boosting model demonstrated the highest

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predictive performance, followed closely by Random Forest and Artificial Neural Networks. These findings provide strong empirical support for the conceptualization of parenting inconsistency as a multidetermined construct shaped by cognitive, affective, and contextual processes.

The prominent role of executive dysfunction in predicting parenting inconsistency is consistent with theoretical and empirical frameworks emphasizing the centrality of self-regulation in caregiving behavior. Executive functions are essential for maintaining behavioral consistency, particularly in emotionally charged or cognitively demanding parenting situations. The observed strong association aligns with prior research indicating that deficits in executive functioning undermine goal-directed behavior and increase susceptibility to impulsive and inconsistent responses (Blair & Ku, 2022). Additionally, recent findings suggest that executive functioning in parents is particularly vulnerable during periods of heightened demand, such as caregiving transitions, which may further exacerbate inconsistency in parenting practices (Ghadimi & McCormack, 2025). The present results extend this literature by demonstrating that executive dysfunction not only correlates with parenting inconsistency but also serves as the most critical predictor within a multivariate machine learning framework.

The significant contribution of stress reactivity to parenting inconsistency further underscores the importance of affective and physiological processes in shaping caregiving behavior. Individuals with heightened stress reactivity are more likely to exhibit emotional volatility and reduced regulatory capacity under stress, which can lead to inconsistent responses to child behavior. This finding is consistent with neurobiological models linking dysregulation of the HPA axis and cortisol responses to impairments in emotional regulation and decision-making (George et al., 2025). Moreover, empirical studies have shown that elevated stress reactivity is associated with poorer behavioral adjustment and greater variability in caregiving behaviors, particularly in high-stress contexts (Ewing-Cobbs et al., 2023). The present study builds on this evidence by demonstrating that stress reactivity retains significant predictive value even when considered alongside executive dysfunction and role overload, highlighting its independent contribution to parenting inconsistency.

Role overload also emerged as a significant predictor, reflecting the impact of contextual and environmental demands on parenting behavior. The positive association between role overload and parenting inconsistency suggests that when parents perceive their responsibilities as exceeding their available resources, they are more likely to exhibit variability in their responses to children. This finding aligns with stress and adaptation theories, which posit that chronic overload depletes cognitive and emotional resources necessary for consistent self-regulation (Watanabe et al., 2023). Furthermore, research conducted during high-stress periods, such as the COVID-19 pandemic, has demonstrated that increased parental burden is associated with less consistent and more reactive parenting practices (Ostrov et al., 2022). The current results extend these findings by situating role overload within a predictive framework and demonstrating its interaction with cognitive and emotional factors.

The intercorrelations observed among executive dysfunction, stress reactivity, and role overload provide additional insight into the mechanisms underlying parenting inconsistency. These variables appear to form a mutually reinforcing system, wherein cognitive deficits, heightened stress responses, and contextual pressures collectively contribute to reduced regulatory capacity. This pattern is consistent with integrative models of self-regulation that emphasize the interaction between cognitive control systems and emotional processes (Blair & Ku, 2022). Moreover, the concept of allostatic load offers a useful framework for understanding how chronic exposure to stressors can lead to cumulative physiological and psychological strain, ultimately impairing parenting consistency (Kimonis, 2023). The present findings support this perspective by demonstrating that multiple dimensions of stress and regulation converge to influence parenting behavior.

The superiority of ensemble-based machine learning models, particularly Gradient Boosting and Random Forest, highlights the complexity and nonlinearity of the relationships among the studied variables. These models are well-suited for capturing interactions and hierarchical structures within the data, which may explain their superior performance compared to more traditional approaches such as Support Vector Machines. The ability of these models to account for nonlinear effects is particularly relevant in the context of parenting, where the interplay between cognitive, emotional, and contextual factors is unlikely to be strictly linear. The findings therefore underscore the value of machine learning methodologies in advancing research on family processes and behavioral prediction.

From a developmental perspective, the results have important implications for understanding the pathways through which parenting inconsistency affects child

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outcomes. Previous research has demonstrated that inconsistent parenting is associated with a range of maladaptive outcomes, including antisocial behavior, emotional dysregulation, and impaired cognitive functioning (Goozen et al., 2022; Squillaci & Benoit, 2021). The identification of executive dysfunction, stress reactivity, and role overload as key predictors suggests that interventions targeting these factors may be effective in promoting more consistent parenting practices. For example, enhancing executive functioning through cognitive training or stress management interventions may improve parents' ability to maintain consistent behavioral responses.

The findings are also consistent with differential susceptibility and environmental sensitivity frameworks, which posit that individuals vary in their responsiveness to environmental influences, including parenting behaviors (Kelly & Sullivan, 2022). Inconsistent parenting may have particularly pronounced effects on children who are more sensitive to environmental variability, thereby amplifying the impact of parental inconsistency on developmental outcomes. Additionally, the bidirectional nature of parent–child interactions suggests that child characteristics, such as temperament and behavioral regulation, may further influence the relationship between parental factors and parenting consistency (Golden et al., 2025; Shakiba et al., 2022). This underscores the importance of considering both parent and child factors in future research.

The role of early life adversity and broader ecological influences also provides an important context for interpreting the findings. Parents who have experienced adversity may exhibit altered stress responses and executive functioning, which can influence their parenting behavior (Aluğan, 2024; Logue & Nemeroff, 2025). The social ecological model further emphasizes the influence of contextual factors, such as socioeconomic status and social support, on parenting practices (Lopez et al., 2021). These considerations suggest that parenting inconsistency is not solely an individual-level phenomenon but is embedded within broader social and developmental contexts.

Biological and psychophysiological mechanisms may further elucidate the observed relationships. Hormonal processes, including cortisol and oxytocin regulation, have been implicated in both stress reactivity and caregiving behavior (Marceau, 2025; Papke et al., 2023). Dysregulation in these systems may contribute to both executive dysfunction and emotional instability, thereby increasing the likelihood of inconsistent parenting. Additionally, research on attachment and parent–child relationships highlights the importance of consistent and responsive caregiving for healthy development (Scott et al., 2022; Shah et al., 2022). The present findings reinforce the notion that disruptions in these processes can have far-reaching implications for both parents and children.

5 Conclusion

Overall, the study contributes to the literature by providing an integrative and predictive model of parenting inconsistency that incorporates cognitive, emotional, and contextual factors. The use of machine learning methods allows for a more nuanced understanding of these relationships and highlights the potential for advanced analytical approaches in family research. By identifying key predictors of parenting inconsistency, the findings offer valuable insights for both theory and practice, and underscore the importance of addressing multiple domains of functioning in efforts to promote effective parenting.

Despite its contributions, the present study is subject to several limitations. First, the cross-sectional design limits the ability to draw causal inferences regarding the relationships among executive dysfunction, stress reactivity, role overload, and parenting inconsistency. Longitudinal studies are needed to examine the temporal dynamics of these variables and to establish causal pathways. Second, the reliance on self-report measures may introduce biases related to social desirability and subjective perception, potentially affecting the accuracy of the data. Third, although the sample was relatively diverse, it was limited to parents residing in Canada, which may restrict the generalizability of the findings to other cultural or socioeconomic contexts. Additionally, while machine learning models provide strong predictive power, they may lack interpretability compared to traditional statistical methods, which can complicate the translation of findings into practical interventions.

Future research should aim to address these limitations by employing longitudinal and multi-method designs that incorporate observational and physiological measures of parenting and stress reactivity. Expanding the scope of research to include diverse cultural contexts would enhance the generalizability of findings and allow for cross-cultural comparisons. Additionally, future studies could explore the role of moderating and mediating variables, such as social support, coping strategies, and child characteristics, in the relationship between parental factors and parenting inconsistency. The integration of advanced machine learning

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techniques with theoretical models of parenting may also provide deeper insights into the complex interactions underlying caregiving behavior. Furthermore, research could examine the effectiveness of targeted interventions designed to improve executive functioning and reduce stress among parents, and assess their impact on parenting consistency.

From a practical perspective, the findings highlight the importance of supporting parents in managing cognitive, emotional, and contextual challenges. Interventions aimed at enhancing executive functioning, such as cognitive training programs, may improve parents' ability to maintain consistent behavioral responses. Stress management interventions, including mindfulness-based approaches and psychoeducation, could help reduce stress reactivity and promote emotional regulation. Addressing role overload through social support services, flexible work arrangements, and resource provision may also alleviate the burden on parents and facilitate more consistent parenting practices. Practitioners should adopt a holistic approach that considers the interplay of cognitive, emotional, and environmental factors in supporting effective parenting.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

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

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

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

References

Aluğan, Z. (2024). The Impact of Early Childhood Adversity on Neurodevelopment: A Comprehensive Review. *Üha*, *11*(2), 45-59. https://doi.org/10.32739/uha.jnbs.11.1539116

Blair, C., & Ku, S. (2022). A Hierarchical Integrated Model of Self-Regulation. *Frontiers in psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.725828

Chaudhuri, A., & Gupta, D. K. (2025). Stress, Stress Management, and Dementia: A Narrative Review. *Cureus*. https://doi.org/10.7759/cureus.94401

Ewing-Cobbs, L., Danna, C. V., Tolar, T. D., Granger, D. A., Cox, C. S., & Prasad, M. R. (2023). Stress Reactivity After Pediatric Traumatic Brain Injury: Relation With Behavioral Adjustment. *Journal of neurotrauma*, *40*(13-14), 1436-1450. https://doi.org/10.1089/neu.2022.0227

George, M. Y., Mageed, S. S. A., Mansour, D. E., & Fawzi, S. F. (2025). The Cortisol Axis and Psychiatric Disorders: An Updated Review. *Pharmacological Reports*, *77*(6), 1573-1599. https://doi.org/10.1007/s43440-025-00782-x

Ghadimi, T., & McCormack, C. (2025). Executive Functioning in Matrescence and Implications for Perinatal Depression. *Frontiers in Psychiatry*, *16*. https://doi.org/10.3389/fpsyt.2025.1663017

Golden, A. B., Choe, D. E., Hibel, L. C., & Olwert, M. R. (2025). Child Effortful Control Moderates the Link Between Parenting Stress and Child Parasympathetic Regulation: Interactions Across Contexts and Measures. *Developmental Psychobiology*, *67*(4). https://doi.org/10.1002/dev.70059

Goozen, S. H. v., Langley, K., & Hobson, C. (2022). Childhood Antisocial Behavior: A Neurodevelopmental Problem. *Annual review of psychology*, *73*(1), 353-377. https://doi.org/10.1146/annurev-psych-052621-045243

Kelly, M. M., & Sullivan, M. C. (2022). Differential Susceptibility. *Advances in nursing science*, *46*(3), E98-E113. https://doi.org/10.1097/ans.0000000000000433

Kimonis, E. R. (2023). The Emotionally Sensitive Child-Adverse Parenting Experiences-Allostatic (Over)Load (ESCAPE-AL) Model for the Development of Secondary Psychopathic Traits. *Clinical Child and Family Psychology Review*, *26*(4), 1097-1114. https://doi.org/10.1007/s10567-023-00455-2

Kok, R., Luijk, M., Lucassen, N., Prinzie, P., Jongerling, J., Ijzendoorn, M. H. v., Tiemeier, H., & Bakermans-Kranenburg, M. J. (2022). The Role of Supportive Parenting and Stress Reactivity in the Development of Self-Regulation in Early Childhood. *Journal of Child and Family Studies*, *31*(9), 2424-2435. https://doi.org/10.1007/s10826-022-02360-8

Logue, E., & Nemeroff, C. B. (2025). Sex Differences in the Associations Among Early Life Adversity, Inflammation, and

JPRFC
E-ISSN: 3041-8550

Cognition. *Biomolecules*, *15*(2), 161. https://doi.org/10.3390/biom15020161

Lopez, M., Ruiz, M. O., Rovnaghi, C. R., Tam, G. K., Hiscox, J., Gotlib, I. H., Barr, D. A., Carrión, V. G., & Anand, K. J. S. (2021). The Social Ecology of Childhood and Early Life Adversity. *Pediatric research*, *89*(2), 353-367. https://doi.org/10.1038/s41390-020-01264-x

Marceau, K. (2025). Does Including Multiple Hormones and Family Context Together Clarify Hormone-Behavior Associations? A Systematic Review. *Comprehensive Psychoneuroendocrinology*, *24*, 100326. https://doi.org/10.1016/j.cpnec.2025.100326

Ostrov, J. M., Murray-Close, D., Perry, K. J., Perhamus, G. R., Memba, G. V., Rice, D. R., & Nowalis, S. (2022). Parenting and Adjustment Problems Among Preschoolers During COVID-19. *Journal of Child and Family Studies*, *32*(1), 93-109. https://doi.org/10.1007/s10826-022-02439-2

Papke, V., Hodges, H. R., Reigstad, K., Gunlicks-Stoessel, M., & Klimes-Dougan, B. (2023). A Scoping Review of Potential Biological Mechanisms and Predictors of Interpersonal Psychotherapy. *Endocrines*, *4*(4), 742-756. https://doi.org/10.3390/endocrines4040054

Scott, M. G., Smiley, P. A., Ahn, A., Lazarus, M. F., Borelli, J. L., & Doan, S. N. (2022). A Mother's Touch: Preschool-aged Children Are Regulated by Positive Maternal Touch. *Developmental Psychobiology*, *64*(2). https://doi.org/10.1002/dev.22243

Shah, S., Laplante, D. P., Atkinson, L., & Wazana, A. (2022). From Temperament and Parenting to Attachment: A Review of the Interplay of Gene and Environment Factors in the Developmental Pathway to Attachment. *Current Opinion in Psychiatry*, *35*(6), 401-408. https://doi.org/10.1097/yco.0000000000000817

Shakiba, N., Gao, M., Conradt, E., Terrell, S., & Lester, B. M. (2022). Parent–child Relationship Quality and Adolescent Health: Testing the Differential Susceptibility and Diathesis-Stress Hypotheses in African American Youths. *Child development*, *93*(1), 269-287. https://doi.org/10.1111/cdev.13667

Squillaci, M., & Benoit, V. (2021). Role of Callous and Unemotional (CU) Traits on the Development of Youth With Behavioral Disorders: A Systematic Review. *International journal of environmental research and public health*, *18*(9), 4712. https://doi.org/10.3390/ijerph18094712

Vaughn, R., & Weisz, J. R. (2021). Leveraging the Developmental Science of Psychosocial Risk to Strengthen Youth Psychotherapy. *Development and Psychopathology*, *33*(2), 670-683. https://doi.org/10.1017/s0954579420002035

Wang, L., Dong, S., Zhao, C., Gao, Z., Jiang, L., Zhang, R., Shen, T., Guo, Y., Zhou, H., & Xu, S. (2023). Association of Stressful Life Events With Cognitive Impairment in Patients With Type 2 Diabetes Mellitus. *Journal of Diabetes Investigation*, *14*(6), 792-800. https://doi.org/10.1111/jdi.14010

Watanabe, K., Imamura, K., Eguchi, H., Hidaka, Y., Komase, Y., Sakuraya, A., Inoue, A., Kobayashi, Y., Sasaki, N., Tsuno, K., Ando, E., Arima, H., Asaoka, H., Hino, A., Iida, M., Iwanaga, M., Inoue, R., Otsuka, Y., Shimazu, A., . . . Tsutsumi, A. (2023). Usage of the Brief Job Stress Questionnaire: A Systematic Review of a Comprehensive Job Stress Questionnaire in Japan From 2003 to 2021. *International journal of environmental research and public health*, *20*(3), 1814. https://doi.org/10.3390/ijerph20031814

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