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Modeling Children's Executive Functions Based on Mentalization and Emotion Regulation Mediated by Distress Tolerance in Mothers

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Abstract

Abstract

The present study was conducted to model children's executive functions based on mentalization and emotion regulation, with maternal distress tolerance serving as a mediating factor. The research method was correlational and employed path analysis. The statistical population included all mothers and first-grade elementary school children in Tehran during the 2023–2024 academic year. According to Morgan's table, a sample of 385 participants was selected using cluster random sampling. Data were collected through the Behavior Rating Inventory of Executive Function (Gioia et al., 2000), Emotion Regulation Questionnaire), Parental Reflective Functioning Questionnaire (Luyten et al., 2017), and Distress Tolerance Scale (Simons & Gaher, 2005). Data analysis was conducted using path analysis. Findings revealed a direct relationship between mothers' mentalization and children's executive functions ($p = 0.001$, $\beta = 0.301$, $t = 4.340$) as well as between mothers' emotion regulation and children's executive functions ($p = 0.001$, $\beta = 0.301$, $t = 4.340$). Furthermore, mothers' distress tolerance played a mediating role in the relationship between mentalization and emotion regulation. The proposed model also demonstrated a satisfactory fit (IFI, NFI, CFI, GFI > 0.90; RMSEA, SRMR < 0.08). These findings may serve as a theoretical and practical framework for understanding the relationship between mothers' mentalization and emotion regulation and children's executive functions with the mediating role of distress tolerance.

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Introduction

Executive functions include working memory (i.e., the ability to retain and manipulate information) and planning-organization (i.e., the ability to identify the necessary steps to solve problems) (Nilsen et al., 2017), which emerge in the first years of life and play an important role in maintaining a person's mental health throughout life (Diamond, 2012). Research has shown that mothers with high levels of mentalization have a better ability to understand their children's emotional needs, which contributes to the development of children's executive functions (Brenning et al., 2020; Sharp & Fonagy, 2008; Zimmer-Gembeck et al., 2019). Mothers' ability to understand their children's mental states (mentalization) can affect their children's emotion regulation and, consequently, their children's executive functions. Studies have also shown that mothers who can regulate their emotions create a more stable family environment, which is associated with improved children's executive functions (Eisenberg & Zhou, 2016). Mehrotra et al. (2026) showed that the interaction of parents who are emotionally responsive, regular, and sensitive provides a platform for the development of the child's executive skills. On the other hand, the lack of regulation of the mother's emotions and unfavorable responsiveness to the child causes problems in executive functions. In addition, distress tolerance is an individual difference variable that refers to the capacity to experience and resist emotional distress. Individuals with low distress tolerance engage in behavioral disorders in a futile attempt to cope with their negative emotions (Keough et al., 2010). Greater distress tolerance causes less family chaos; a calm environment is provided for the development of children, which results in the strengthening of children's executive functions. Conversely, the greater the family chaos, the weaker the child's executive functions (Andrews et al., 2021; Dhaliwal et al., 2020; Jafari et al., 2025). Engert et al. (2024) showed that the severity of maternal stress affects children's cognitive flexibility and working memory. Therefore, the present study was dedicated to modeling children's executive functions based on mothers' mentalization and emotion regulation, mediated by mothers' distress tolerance.

Method

The present study design was descriptive-correlational and employed path analysis. The population included all first-grade elementary school students in Tehran and their mothers in 2023. Using Morgan's table, 385 individuals (student-mother pairs) were selected by random cluster sampling and completed the questionnaires. The data were analyzed using path analysis and SPSS software (version 18). The instruments were as follows:

- The Behavior Rating Inventory of Executive Function (Gioia et al., 2000) included two forms for parents and teachers with 86 items and eight components of inhibition, attention transfer, emotional control, initiation, working memory, planning, organization, and monitoring.
- Distress Tolerance Scale (Simons & Gaher, 2005) included 15 items and four subscales (i.e., tolerance, absorption, appraisal, and regulation).
- Emotion Regulation Scale (Gross & John, 2003) included 10 items and two subscales of cognitive reappraisal (6 items) and suppression (4 items).
- Parental Reflective Functioning Questionnaire (Luyten et al., 2017) included 18 items and three subscales of pre-mentalization, certainty of mental states, and interest and curiosity in mental states.

Findings

The results of direct estimation of the model using the maximum-likelihood method (see Table 1) are presented to examine the effects of the predictor variables on executive functions. Mothers' mentalization showed a positive and significant effect on executive functions with an unstandardized effect coefficient of 0.336, a standardized effect coefficient of 0.301, a coefficient of determination of 0.101, and a t-statistic of 4.340 at the 0.001 significance level. This finding indicates that mothers' mentalization explains 10.1% of the variance in executive functions. Mothers' emotion regulation had a positive and significant effect on executive functions with an unstandardized coefficient of 0.369, a standardized coefficient of 0.334, a coefficient of determination of 0.123, and a t-statistic of 4.664 at the 0.001 significance level. This variable was the strongest predictor among the three variables, explaining 12.3% of the variance. Distress tolerance also showed a positive and significant effect on executive functions with an unstandardized coefficient of 0.272, a standardized coefficient of 0.217, a determination coefficient of 0.059, and a t-statistic of 3.418 at the 0.001 significance level, explaining 5.9% of the variance. In sum, all three variables of maternal mentalization, maternal emotion regulation, and distress tolerance significantly predicted executive functions. Among them, maternal emotion regulation with a standardized coefficient of 0.334 had the greatest effect

on executive functions, followed by maternal mentalization with a coefficient of 0.301, and distress tolerance with a coefficient of 0.217. All path coefficients were significant at the 0.001 significance level, indicating the appropriate predictive power of these variables for executive functions.

Table 1. *Direct estimation of the effect size of the model using the maximum likelihood method*

Variable	B (unstandardized effect)	β (standardized effect)	R2 (predictor)	t-statistic	P
Mothers' mentalization with executive functions	.336	.301	.101	4.340	.001
Mothers' emotion regulation with executive functions	.369	.334	.123	4.664	.001
Distress tolerance with executive functions	.272	.271	.059	3.418	.001

According to Table 2, the indirect path of mentalization and emotion regulation to children's executive functions, with the mediating role of distress tolerance, was confirmed according to the bootstrap estimation method. Specifically, the effect of emotion regulation on children's executive functions with the mediating role of distress tolerance was 0.380. This means that emotion regulation, with the mediating role of distress tolerance, had an effect of 38 percent on children's executive functions. Moreover, the explained variance of emotion regulation in children's executive functions with the mediating role of distress tolerance was 0.311. This means that emotion regulation, with the mediating role of distress tolerance, predicted 31 percent of the changes in children's executive functions. Specifically, the effect of mentalization on children's executive functions with the mediating role of distress tolerance was 0.418. This means that mentalization, with the mediating role of distress tolerance, had an effect of 41 percent on children's executive functions.

Furthermore, the explained variance of mentalization in children's executive functions with the mediating role of distress tolerance was equal to 0.380. This means that mentalization, with the mediating role of distress tolerance, predicted 38 percent of the changes in children's executive functions.

Table 2. *Indirect estimation of the model effect size using the bootstrap method*

Variable	β	Min	Max	Sig.
Maternal mentalization → Maternal distress tolerance → Children's executive functions	.418	.334	.511	.001
Maternal emotion regulation → Maternal distress tolerance → Children's executive functions	.380	.294	.464	.001

Discussion

The findings of the study showed that the proposed model had a good fit. The first finding of the study showed that maternal mentalization had a significant direct effect on the children's executive functions. This finding was consistent with the results of Cheng et al. (2018) and Baptisa et al. (2017). The significant positive effect of mentalization on maternal distress tolerance was the second finding of this study. Mentalization had an indirect effect on the children's executive functions through maternal distress tolerance; increasing mentalization increases maternal distress tolerance and in turn the children's executive function. This finding is consistent with the results of Andrews et al. (2021), Dhaliwal et al. (2020), and Todorovic et al. (2025). Distress tolerance can act as a protective factor, which leads to the development of children's self-regulation skills and executive functions. Maternal mentalization can directly affect children's behaviors, but this effect may be indirect through maternal distress tolerance. The third finding was that maternal emotion regulation had a significant positive effect on children's executive functions. This finding was consistent with the results of Norwood (2023), Zimmer-Gembec et al. (2019), and Hector-Nathan et al. (2026). According to the findings, maternal emotion regulation had a direct effect on children's executive function and could predict children's executive functions. The fourth finding was that emotion regulation had a significant positive effect on maternal distress tolerance. As emotion regulation increases, maternal distress tolerance increases, which in turn increases child executive function. The results obtained are consistent with the findings of Feiz Abadi (2020), Morford et al. (2022), and Hosein Esfand Zad et al. (2017). Further studies can investigate the mediating role of mother-child interaction quality, parenting sensitivity, or emotional regulation in this relationship.

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Conflict of interest
According to the authors, this study had no conflict of interest.

AI Use Statement
The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were used at any stage of the preparation, writing, editing, analysis, or translation of this manuscript.

Ethical Approval
The authors declare that All procedures performed in this study were conducted in accordance with the ethical standards of the responsible institutional and national research committee.

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