

Modeling Rational Decision Making Based on Executive Functions with the Mediating Role of Moral Judgment in Adolescents

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Article Info	ABSTRACT
Article type: Research Article	Objective: The aim of the present study was to investigate the role of executive functions in predicting rational decision making in adolescents with the mediating role of moral judgment. Rational decision making, as one of the key functions of cognitive development in adolescence, plays a crucial role in individual, social, and academic adaptation. Since adolescence is accompanied by extensive biological, cognitive, and emotional changes, identifying the underlying factors affecting rational decision making is of particular importance.
Article history: Received March 02, 2025 Received in revised form May 14, 2025 Accepted June 05, 2025 Published online June 26, 2025	Method: The present research was quantitative and correlational using structural equation modeling. The statistical population of the study included junior high school adolescents in Yazd in the academic year 2024-2025, from which a cluster random sample was selected. The research instruments included Scott and Bruce's General Decision Making Styles Questionnaire (1995), Nejati's Cognitive Functions Questionnaire (2013), and Rust's Moral Judgment Questionnaire (1973). Data were analyzed using AMOS-24 software.
Keywords: Adolescence, Executive Functions, Moral Judgment, Rational Decision-Making	Results: The findings showed that executive functions directly predicted rational decision-making ($P < .05$, $\beta = .17$). Moral judgment also played a mediating role in this relationship ($P < .002$, $\beta = .308$). In other words, adolescents who had higher executive function abilities also had better moral judgment, and these factors led to improved quality of their rational decision-making.
	Conclusions: The results of this study highlight the importance of considering cognitive and moral processes in an integrated manner and can be a basis for designing educational and counseling interventions aimed at improving adolescents' decision-making skills.
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Introduction

Adolescence is one of the critical stages of growth in the life span which is portrayed by physical, psychological, emotional, and social development of individuals, as well as the effort to find identity and form a stable concept of self, along with the effort to gain independence and autonomy (Aizpitarte et al., 2019). Academic life skills in adolescence, which include theoretical and practical knowledge, help students achieve academic success. These skills include decision-making, time planning and the use of resources that help store and process information (Allahverdiani, 2023). This period is accompanied by cognitive and emotional challenges, and all of these, in turn, make successful decision-making more complex for adolescents (Icenogle & Cauffman, 2021), with rational decision-making being one of the main axes of successful decision-making.

Rational decision-making means using optimal cognitive processes - including analysis, weighing consequences, controlling impulses, and weighing various factors. As one of the superior cognitive functions, it plays a fundamental role in the individual and social development of adolescents. This type of decision-making is based on logical analysis, prediction of consequences, impulse control, and careful evaluation of options, and helps adolescents make more adaptive and purposeful choices (Blakemore, 2018). Since adolescence is accompanied by significant biological, cognitive, and emotional changes, the quality of decision-making during this period will have a significant impact on the individual's psychological, academic, and social adaptation (Fallon et al., 2020). Research has shown that many factors can affect the decision-making ability of adolescents, among which the ability of the brain's executive functions can be mentioned (Hosseini & Hosseini, 2010). Executive functions are considered the basic foundation of rational decision-making.

Executive functions refer to a set of higher-level abilities of the brain, including organization, decision-making, planning, working memory, initiation, inhibition, and attention. This term includes complex cognitive processes that are necessary for performing challenging or novel goal-oriented tasks (Demehri & Takhtkashian, 2024). This set of cognitive processes allows for the processing of complex information and the selection of appropriate strategies (Diamond, 2016). Research findings have shown that weakness in executive functions can lead to impulsive, dependent, or avoidant decision-making, while strengthening these abilities helps to make more rational and forward-looking decisions (Zelazo & Carlson, 2020). Wang and Zhou (2023) also showed in their research that adolescents and adults who have stronger executive function abilities are more rational in their decision-making, and avoidant or dependent styles are more common in those who have fewer executive skills (Wang & Zhou, 2023). However, decision-making is not solely the product of cognitive processes, and other factors also play a key role in

it, influencing the way people make decisions and improving decision-making in individuals, including moral judgment.

Moral judgment reflects an individual's ability to evaluate the rightness or wrongness of actions from the perspective of social values and norms and adds a value dimension to decision-making (Kertinauer, 2021).

Adolescents who have a higher level of moral judgment are not only better able to assess the social and moral consequences of their decisions, but also move towards value-based goals and show more self-control (Gibbs, 2019). Good moral judgment leads to self-control. One of the most important tools to help individuals move from external controls to internal controls is moral judgment training. People who have appropriate moral judgment can control themselves in different contexts and when face emerging issues; they can make sound decisions, and move towards a value-based goal (Salehnejad Bahrestaghi & Heidari Parchkouhi, 2022). Despite the importance of these variables, a fundamental challenge during adolescence is that the simultaneous development of the brain, social pressures, and emotional changes can disrupt the rational decision-making process (Shulman et al., 2016).

Finally, since adolescence is a period when the brain and its cognitive and emotional structures are still developing, and given the importance of these variables in the development and mental health of adolescents, the aim of this study was to model rational decision-making based on the executive functions of adolescents and to examine the mediating role of moral judgment in this process. The importance of the present study is that by modeling rational decision-making based on executive functions and examining the mediating role of moral judgment, it can lead to a deeper understanding of the interaction of cognitive and moral processes in adolescence. Such knowledge not only adds to the richness of the scientific literature from a theoretical perspective, but also can be a guide for educational, training and psychotherapy programs to improve the quality of adolescent decision-making. Therefore, the main question of this study was to see whether executive functions, through the mediating role of emotional intelligence and moral judgment, are able to predict rational decision-making in adolescents.

Materials and Method

This research adopted a correlational method, with the structural equation modeling, in which the executive functions of the brain variable was considered as the predictor variable, the rational decision-making variable was considered as the criterion variable, and the moral judgment variable was considered as the mediating variable.

Participants

The statistical population of the present study includes all junior high school students in Yazd high schools, from which 300 students were selected based on sample selection in order to allocate 10 participants for each variable to perform the structural equation model. The sampling method was cluster sampling, in which a number of schools were selected from junior high schools and 300 students were considered as the research sample, among which the data of 16 outliers were identified and excluded from the analysis; thus, the analysis was carried out on the data of 284 participants.

Instruments

The following instruments were used in this study.

General Decision-Making Styles Questionnaire (GDMS)

This questionnaire was designed by Scott and Bruce (1995). The questionnaire measures five different dimensions: rational, intuitive, dependent, avoidant, and impulsive. The questionnaire has 25 questions, each dimension having 5 questions. In this study, the rational dimension was assessed. The reliability of this questionnaire using Cronbach's alpha for different styles has been reported to be .62 to .87 (Alu, 2000, Scott & Bruce, 1995). Hadizadeh Moghadam and Tehrani (2008) also reported the reliability of this questionnaire as .71 and its construct validity as acceptable.

Nejati Executive Function Questionnaire

Nejati (2013) designed a cognitive abilities questionnaire with the aim of assessing seven separate factors (memory, selective attention and inhibitory control, decision-making, planning, sustained attention, social cognition, cognitive flexibility). This questionnaire consists of 30 questions, 5 to 7 questions for each indicator, and the answer to each question is determined based on a 5-point Likert scale from almost never (1) to almost always (5). The Cronbach's alpha of the questionnaire was .83 and the Pearson correlation between the two tests was significant at the .01 level. The validity and reliability of the questionnaire are desirable for assessing cognitive functions. In the present study, all components of the questionnaire except social cognition had a positive correlation with each other at the .01 level, so this component was excluded from the analysis.

Moral Judgment Test by Rust et al. (1973)

This short form of the test, which includes three stories, was developed by Rust et al. in 1973. These stories are moral puzzles, and the participant must answer the questions after each story. The questionnaire is scored on a 5-point Likert scale from 1 (very little) to 5 (very much). This

questionnaire has been validated by Moradi (2016). The reliability of the questionnaire was reported as follows: for the first story: .72, the second story: .76, the third story: .73, and the total moral reasoning: .77.

Results

Prior to addressing the research question, descriptive statistics were computed for the study variables.

Table 1. Descriptive Statistics of Study Variables

Variable	Mean	SD	Skewness	Kurtosis
Memory	26.70	2.66	-.80	.058
Inhibitory Control	24.18	3.33	-.28	-.50
Decision-Making	20.50	2.91	-.30	-.65
Planning	11.99	2.18	-.52	-.31
Sustained Attention	11.24	2.13	-.20	-.53
Cognitive Flexibility	16.049	2.61	-.47	-.34
Executive Function Total Score	119.81	12.13	.005	-.75
Moral Judgment	114.33	7.24	-.005	.14
Rational Decision-Making Style	12.56	2.34	.051	-.23

According to the results obtained from Table 1, the skewness and kurtosis of the research variables in the sample group are in the range of -1 to 1, which indicates that the variables have a normal distribution. The normality status of the total score of the variables is also reported in the Kolmogorov-Smirnov Table.

Table 2. Examining the normality of the variables using the Kolmogorov-Smirnov test

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Moral Judgment	.77	284	.048
Executive Function	.50	284	.089
Rational Decision-Making	.66	284	.056

As the results of the Table show, the significance level of the variables is greater than .05, so the data follows a normal distribution

Table 3. Correlation matrix of the research variables

Variable	1	2	3	4	5	6	7	12	13
Memory	1								
Inhibitory Control	.57**	1							
Decision-Making	.50**	.54**	1						
Planning	.41**	.54**	.18**	1					
Sustained Attention	.34**	.040**	.12*	.28**	1				
Cognitive Flexibility	.50**	.60**	.091	.52**	.35**	1			
Executive Function Total Score	.71**	.82**	.16**	.69**	.62**	.78**	1		
Moral Judgment	.28**	.15**	.17**	.077	.16**	.16**	.20**	1	
Rational Decision-Making Style	.28**	.21**	.25**	.25**	.064	.24**	.24**	.21**	1

* $p < .05$ ** $p < .01$

Based on the results obtained, the correlation coefficient between executive functions of the brain and moral judgment is significant at the alpha level of .01 ($R = .20$ and $P < .01$), the correlation coefficient between executive functions of the brain and rational decision-making style is significant at the alpha level of .01 ($R = .24$ and $P < .01$). The correlation coefficient between moral judgment and rational decision-making style is significant at the alpha level of .01 ($R = .21$ and $P < .01$).

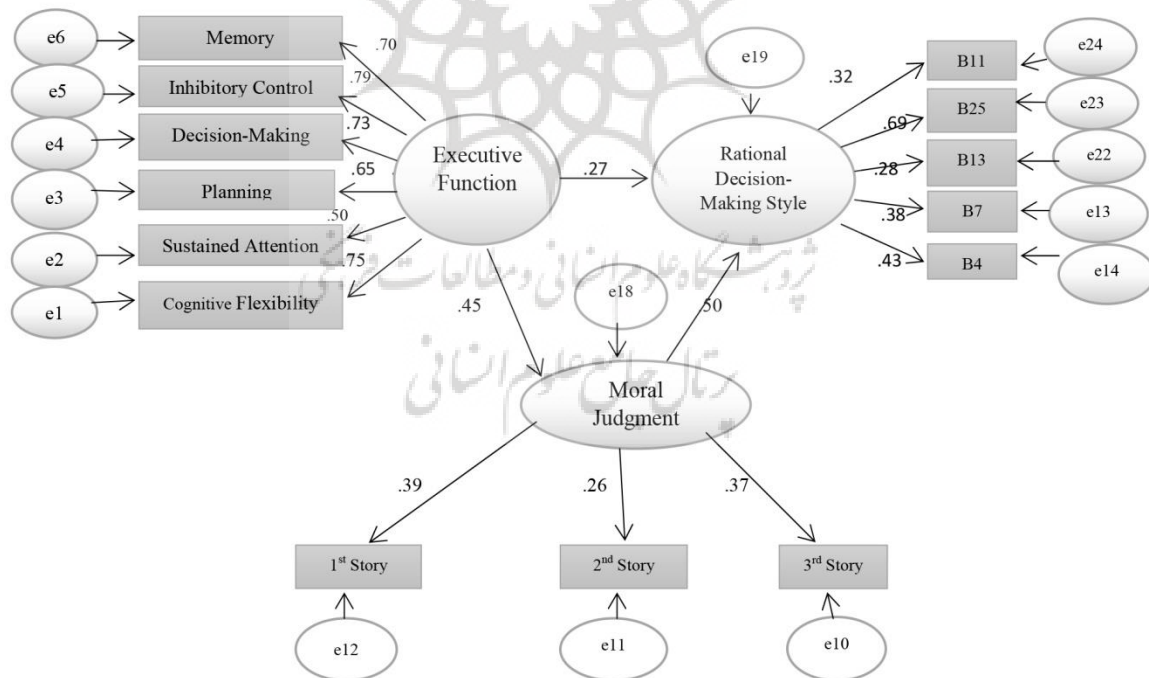


Figure 1. Standard coefficients of the final model of the mediating role of moral judgment in the relationship between executive brain functions and rational decision-making style

In order to test the research model, the structural equation model was used using the Amos24 software. Before using structural equations, univariate outliers were examined using box plots and multivariate outliers were examined using the Mahalanobis statistic and removed from the data set. The skewness and kurtosis of the distribution of the variable scores were calculated using SPSS 24 software and the results showed that none of the skewness and kurtosis values were outside the range of ± 1 , therefore the data followed a normal distribution. After examining the assumptions and ensuring their validity, the structural equation model was used to evaluate the model under study. The results are presented in Figure 1.

Figure 1 shows the standard coefficient of the proposed model to investigate the mediating role of moral judgment in the relationship between executive brain functions and rational decision-making style. The indicators related to the model fit are presented in the Table below.

Table 4. Goodness of fit indices of the tested research model

Index	Acceptable criterion	Result
(χ^2/df)	1-5	1.42
CFI	less than .1	.95
TLI	More than .9	.95
IFI	More than .9	.98
NFA	More than .9	.987
RMSEA	More than .9	.036

Table 4 presents the model fit indices. The chi-square ratio index per degree of freedom (df/χ^2) is a number in the range between 1 and 5 and confirms the model fit. The IFI and CFI indices are also greater than the desired criterion (.9) and are in the range of 0-1. The root mean square error of approximation (RMSEA) was found to be .036, which is less than .1 and is in the desired range. Therefore, the obtained coefficients indicate the desired fit of the model.

Table 5. Direct, indirect and total effects of variables

Relationship Path			Direct	Indirect	Total effect
Executive Function	→	Moral Judgement	.447	----	.447
Executive Function	→	Rational Judgement Style	.267	.225	.491
Moral Judgement			.502	----	.502

Table 5 presents the direct, indirect and total effects between the variables of the model. Based on the results obtained, executive functions of the brain had a direct and significant effect on moral judgment ($P < .05$, $\beta = .447$), executive functions of the brain had a direct and significant effect on rational decision-making style ($P < .05$, $\beta = .502$), finally executive functions of the brain indirectly had a direct and significant effect on rational decision-making style through moral judgment ($P < .05$, $\beta = .225$).

Table 6. Results of the bootstrap of indirect relationships in the entire sample

Indicator Path	Standard Coefficients	Unstandardized Coefficients	Lower Limit Standard Coefficient	Upper Limit Standard Coefficient	Sig.
Indirect Effect of Brain Executive Functions on Rational Decision-Making Style through Moral Judgment	.225	.038	.038	1.26	.014

According to the results of Table 6, the upper and lower limits of the results of the indirect effect of executive brain functions on rational decision-making style through moral judgment do not include zero, so this indicates that the indirect effect of executive brain functions on rational decision-making style is significant at the $P < .014$ level.

Discussion

The findings of the present study showed that executive functions including (working memory, inhibitory control, cognitive flexibility, and planning) directly and significantly predict rational decision-making in adolescents, because rational decision-making requires the ability to structurally analyze problems, temporarily store information in working memory to compare options, control impulses to prevent hasty decisions, and organize strategically to evaluate different outcomes (Diamond, 2013). Wolf et al. (2012) also believe that rational decision-making style can be predicted by the executive function of the posterior-lateral cortex of the frontal lobe; Because it is a cognitive and linear process that includes three stages: correctly identifying the problem, searching for possible options, and selecting the most appropriate option and taking action to implement it (Wolf et al., 2012). Therefore, the executive functions of the brain can act as important predictors of rational decision-making; because these cognitive processes allow an individual to make decisions based on careful analysis of information, control impulses, and carefully regulate his behavior, and to make the best choice in complex social situations, balancing cognition and emotion.

Beyond the direct effects of executive functions, the results also confirmed the mediating role of moral judgment. Adolescents who had higher levels of moral judgment made more rational decisions, even with executive functions controlled. This finding is consistent with Kohlberg's (1984) theory and subsequent evidence that shows that integrating moral principles with cognitive and emotional regulation strengthens adolescents' capacity for responsible and considered decision-making (Gibbs, 2019). Therefore, moral judgment training can have a strengthening role on the quality of adolescents' decision-making. From a neuro-ethical perspective, studies have shown that complex moral judgments are associated with the activity of prefrontal regions, which indicates that cognitive control and moral frameworks operate jointly in

adolescents' judgment (Luciana, 2016). In general, it can be argued that executive functions and moral judgment are complementary and interdependent actors: executive functions provide the context of "control and analysis" and moral judgment provides the framework of values, which can affect the quality of adolescent decision-making and help them make more rational decisions. Therefore, these results emphasize that the simultaneous promotion of cognitive and moral functions in educational programs can improve the quality of adolescents' rational decision-making.

Conclusion

The results of the present study indicate that adolescents' executive functions act as a direct and strong predictor of rational decision-making, and moral judgment has a significant mediating and reinforcing role in this relationship. From a theoretical perspective, it was shown that rational decision-making in adolescence is a multidimensional phenomenon that is formed at the intersection of cognition, emotion, and morality. From a practical perspective, it is suggested that educational and intervention programs focus on simultaneously strengthening executive functions and promoting moral judgment.

In general, the findings indicate that executive functions and moral judgment play a role as complementary and interdependent factors in rational decision-making. From an educational perspective, this three-dimensional model suggests that educational interventions should not focus solely on cognitive skills but should also include the promotion of moral judgment. Previous evidence supports the integration of executive function training (such as working memory and inhibitory control exercises) and moral discussion sessions into school curricula.

This study faces some limitations due to its cross-sectional design and limited sample size to junior high school students in Yazd. Longitudinal studies can examine the interaction of these variables over time and into adulthood. It is also suggested that cross-cultural studies be conducted, as cultural norms and values may affect the expression of emotion and moral judgment, and consequently, affect decision-making. From an applied perspective, the findings emphasize the importance of designing comprehensive educational interventions that simultaneously focus on cognitive and moral functions. Such programs can prepare adolescents to base decisions on moral principles and ultimately improve the quality of their rational decision-making in critical life situations.

Data Availability Statement

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

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Conflicts of Interest

The authors declare no conflicts of interest.

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