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Examining the Causal Pattern of Cognitive emotion Regulation and Impulsiveness with the Mediating Role of Executive Functions, Working Memory, and Stress Coping Strategies in Female Students with Conduct Disorder

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A B S T R A C T

Objective: This study aimed to examine the causal pattern of cognitive emotion regulation and impulsiveness with the mediating role of executive functions, working memory, and stress coping strategies in female students with conduct disorder.

Methods and Materials: This study can be examined from two perspectives: from the perspective of implementation method, it falls under descriptive research of a predictive correlational type, and from the perspective of purpose, it is considered applied research. The statistical population of this study included all first-year high school female students in the city of Kermanshah in the academic year 2022-2023, from which 200 individuals were selected as the sample. A simple random sampling method was used. In the data collection domain, both library and field methods were employed. In the field section, for collecting the necessary research information, the following questionnaires were used: Behavioral Problems of Quay and Peterson (2013), Emotion Regulation of Gross and John (2003), Impulsiveness of Barratt (1995), Behavioral Rating Inventory of Executive Functions of Gioia et al. (2000), Working Memory of Daneman and Carpenter (1980), and Coping Strategies of Moos and Billings (1981). Subsequently, SPSS22 and PLS statistical software were used for data analysis.

Findings: The study results indicated that cognitive emotion regulation affects the impulsiveness of female students with conduct disorder. Executive function affects the impulsiveness of female students with conduct disorder. Working memory affects the impulsiveness of female students with conduct disorder. Stress coping strategies affect the impulsiveness of female students with conduct disorder.

Conclusion: The results showed that cognitive emotion regulation affects the impulsiveness of female students with conduct disorder with the mediation of executive function. Cognitive emotion regulation affects the impulsiveness of female students with conduct disorder with the mediation of working memory. Additionally, the results indicated that cognitive emotion regulation affects the impulsiveness of with the mediation of stress coping strategies.

Keywords: *Cognitive emotion regulation, impulsiveness, executive functions, working memory, stress coping strategies*

1. Introduction

A review of research evidence shows that individuals with conduct disorder score higher on impulsiveness compared to their normal peers (Menks et al., 2021). Individuals with behavioral disorders, including conduct disorder, exhibit high levels of impulsiveness. Impulsive actions are a central factor in the emergence of suicidal behaviors (Moore et al., 2022), alcohol and substance abuse (Brown et al., 2022; Bryant et al., 2021; Rohner et al., 2023), engagement in bullying behaviors (Miura & Fuchigami, 2022; Shakerinasab, 2022), certain personality disorders (Tababaienavainobari et al., 2021), attention deficit problems, and delinquent behaviors (Borjali & Rostami, 2021; Menks et al., 2021; Rohner et al., 2023). This concept is usually associated with unconsidered or thoughtless behaviors and is regarded as a clinical state in various psychological disorders or even as an independent disorder requiring clinical intervention. However, immediate and unconsidered responses to different situations are not necessarily negative; they can have adaptive value in certain contexts. The common theme among most definitions of impulsiveness is acting without thinking, whereby the individual does not consider the consequences of their specific behaviors for themselves or others and acts immediately upon a desire without any mental or behavioral filtering (Menks et al., 2021).

Despite evidence suggesting that the problems associated with conduct disorder and impulsiveness are multifactorial (Rohner et al., 2023), some studies in this field point to the potential role of cognitive emotion regulation in behavioral disorders (Breaux et al., 2022; Rezaei & DashtBozorgi, 2018; Taheri, 2017). However, it appears that a significant weakness of intervention approaches aimed at reducing impulsiveness and other patterns of behavioral disorders is the lack of attention to the role of emotions and emotional regulation processes. Emotional regulation is a process through which individuals consciously or unconsciously regulate their emotions to respond appropriately to environmental demands. In contrast, difficulties in emotional regulation involve using maladaptive ways to respond to emotions and are considered a transdiagnostic risk factor for the emergence and persistence of various psychological pathologies, including impulsive behaviors (Mertens et al., 2022; Viskarmi, 2018). This construct is a complex concept encompassing a wide range of biological, social, behavioral, and cognitive processes, both conscious and unconscious. In other words, the term "emotional regulation" includes strategies that reduce, maintain, or increase an emotion and refers to processes that affect an individual's current emotions and how they experience and express them (Melero et al., 2021). Therefore, it can be said that emotional regulation is a key and determinant factor in psychological well-being and effective functioning, playing a crucial role in adapting to stressful life events. In summary, individuals use various methods to regulate their emotions, and one of the most common methods is the use of cognitive strategies. Cognitive emotion regulation strategies are cognitive processes that individuals use to manage emotional and motivational information and emphasize the cognitive aspect of coping. Therefore, thoughts and cognitions play a significant role in the ability to manage, regulate, and control feelings and emotions after experiencing a stressful event (Rezaei & DashtBozorgi, 2018; Samanifar et al., 2021).

Existing evidence indicates a significant relationship between the ability to regulate emotional and psychological states and almost all psychological disorders listed in the Diagnostic and Statistical Manual of Mental Disorders (Bayrami et al., 2021; Menks et al., 2021; Miura & Fuchigami, 2022; Nagata et al., 2023; Rohner et al., 2023; Samanifar et al., 2021; Taheri, 2017). Studies have shown that adaptive emotional strategies are associated with increased adaptability, efficient coping, problem-solving, and psychological well-being, whereas maladaptive emotional strategies are linked to negative behavioral and emotional outcomes such as increased impulsiveness, a higher likelihood of substance abuse, and relapse. Additionally, the mechanisms mediating the relationship between difficulty in emotional regulation and impulsiveness are not clear. Given the role that impulsiveness plays in the emergence of behavioral problems and the failure of therapeutic interventions in some clients, and the theoretical and clinical significance of this construct in psychological studies, identifying factors influencing impulsiveness in adolescents with conduct disorder to prevent and reduce its incidence is of high importance (Taheri, 2017).

Coping strategies, which have short-term effects on solving stressors and long-term effects on psychological and physical well-being, may be one of the mediating variables. Coping refers to the strategies that individuals employ to manage cognition, emotion, and behavior when facing stressful events. Generally, coping strategies with stress are divided into two types: effective coping strategies include constructive actions by the individual regarding stressful

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conditions, aiming to eliminate or change the source of stress. Ineffective coping strategies involve efforts to regulate the emotional outcomes of the stressful event, maintaining emotional and psychological balance by controlling the emotions resulting from the stressful situation (Rajabi, 2018). In this context, Brown, Fite, and Bortolato (2022) in a study showed that childhood maltreatment experiences mediated the relationship between impulsiveness and substance abuse (Brown et al., 2022). Although findings from some studies (Miura & Fuchigami, 2022) indicate deficits in executive function among individuals with conduct disorder, a review of the research literature in this area, especially within Iran, shows that most studies have focused on the relationship between executive functions and behavioral and psychological problems in other populations, such as individuals with addiction (Bakhtiary Javan et al., 2020), autism (Tababaienavainobari et al., 2021), ADHD (Borjali & Rostami, 2021), and others, rather than focusing on the executive functions of individuals with conduct disorder and the potential mediating role of this construct in emotional regulation and impulsiveness.

Executive functions are a set of high-level cognitive and metacognitive abilities and skills that are associated with psychological processes responsible for controlling awareness, thinking, and action, helping individuals in life to guide and control behavior, achieve goals, perform tasks, inhibit learning, and execute intelligent actions. Some researchers have also shown a direct relationship between lack of impulsiveness control and executive function deficits in individuals with addiction (Bryant et al., 2021). One of the executive functions is working memory, which Baddeley (2012) describes as an active memory system responsible for temporarily holding and simultaneously processing information. Working memory, by storing data and simultaneously manipulating and processing it, is related to learning and impulse control, and its weakness can contribute to multiple behavioral problems (Meltzer, 2018; Papanastasiou, 2017).

Behavioral disorders among children and adolescents are relatively common and debilitating, creating problems not only for the individuals themselves but also for their families, teachers, and peers. These disorders, particularly conduct disorder, significantly negatively impact the academic and social functioning of children and adolescents and increase the likelihood of other psychological and behavioral issues later in life (Breaux et al., 2022). The prevalence of these disorders among students is one of the problems affecting families, schools, and society. Given the statistics on the increasing prevalence of behavioral disorders on one hand, and the material and spiritual crises resulting from these disorders, along with the shortage of specialized human resources in the coming years in a society moving towards aging, on the other hand, preventive measures are increasingly emphasized (Ebrahimi Jozani et al., 2021; Yarmohammadi Vasel et al., 2015). In this regard, preventive actions require assessing the type and extent of people's needs for such services and thoroughly examining the problem because, without such measures, the activities undertaken will not yield desirable results. Therefore, investigating the effect of some variables previously shown by researchers to have positive effects on impulsiveness in different populations through a modeling study can be beneficial and significant in achieving mental health goals. It can clarify the role and position that other constructs, such as emotional regulation and stress coping strategies, may play in reducing the problems of individuals with conduct disorder, enabling broader planning and preventive actions. Moreover, the significance of this study is also seen from the perspective of the population under study, which consists of adolescent girls, a group facing numerous challenges and problems during adolescence. Studies like this one are expected to help reduce these problems, particularly conduct disorder, and if issues like those addressed in this research are not examined, the persistence of conduct disorder symptoms and their continuation into later stages of life is likely.

2. Methods and Materials

2.1. Study Design and Participants

The research method used in this study can be examined from various aspects. In terms of purpose, this research is applied, and in terms of implementation method, it is descriptive-correlational. The statistical population of this study includes all female students studying in the first year of high school in District 3 of Kermanshah city during the 2022-2023 academic year. Based on information obtained from the district's Department of Education, their number is 9,401. This study employed a multi-stage cluster random sampling method. The sampling process was as follows: First, District 3 was randomly selected from among the three districts of Kermanshah. Then, 10 schools were randomly chosen from the female middle schools in this district. These ten schools were all public schools and did not include private or gifted schools. Students in the first-year classes of

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these schools were selected as the sample. One class from each school was used, forming a total sample of 10 classes. In total, 200 students were selected as the sample (n=200).

2.2. Measures

2.2.1. Behavioral Problems

This questionnaire was developed by Quay and Peterson (2013) and consists of 88 questions aimed at examining behavioral problems in children and adolescents (conduct disorder, attention-immaturity problems, social aggression, anxiety-withdrawal). In this study, as the focus is on conduct disorder, responses to questions 1 to 38 were considered. Scoring for this questionnaire uses a three-point scale: zero, one, and two. A score of two is given for severe behavioral problems, one for less severe problems, and zero for no behavioral problems. The highest score for each subtest is twice the number of items in that subtest, and the lowest score is zero. Shahim et al. (2007) reported the validity of the Quay and Peterson questionnaire using item-total correlations, factor analysis, and the correlation between questionnaire scores and Rutter's Child Behavior Questionnaire scores (0.88). Factor analysis using principal component analysis and Varimax rotation extracted four factors with eigenvalues greater than one: conduct disorder, attention-immaturity problems, social aggression, and anxiety-withdrawal (Ebrahimi Jozani et al., 2021).

2.2.2. Working Memory

Developed by Daneman and Carpenter in 1980, this questionnaire measures working memory capacity. It contains 27 items with 2- to 7-part sentences. The main feature of this tool is simultaneous storage and processing in working memory. Participants are asked to carefully listen to each sentence and remember the last word (storage). In this test, all sentences are equally weighted, and each correct response scores 1 point, with incorrect responses scoring zero. Given the 27 sentences and equal weight, the total correct responses will be 27. A correlation coefficient of 0.88 was calculated in the initial study on 84 participants in Iran by Asadzadeh (2014). Mojtabazadeh (2015) reported a reliability coefficient of 0.87 using the Kuder-Richardson method. Asadzadeh (2014) also reported a split-half reliability of 0.85 (as cited by Ebrahimi Jozani, Kuchak Entzar, Sepah Mansour, & Ghodsi, 2021). In the study by Ebrahimi Jozani et al. (2021), the Cronbach's alpha coefficient was calculated to be 0.84 (Ebrahimi Jozani et al., 2021).

2.2.3. Coping Strategies

Developed by Moos and Billings in 1981, this questionnaire measures coping strategies for stress in adolescents. It is a self-report tool with 30 items and three subscales: emotion-focused coping, problem-focused coping, and avoidance coping. Scoring is done on a 4-point Likert scale (never=0 to always=3). The developers reported a Cronbach's alpha coefficient ranging from 0.78 to 0.87. In Iran, Samari et al. (2006) reported a Cronbach's alpha coefficient of 0.81, and Jalali Dehkordi and Aghababaei (2022) reported a coefficient of 0.85 (Eslami et al., 2023).

2.2.4. Emotion Regulation

This questionnaire, developed by Gross and John in 2003, consists of 10 items with two subscales: emotional suppression and cognitive reappraisal. Scoring is done on a 7-point Likert scale (strongly disagree=1 to strongly agree=7). Items 1 to 6 relate to cognitive reappraisal, and items 7 to 10 relate to emotional suppression. The reliability of the questionnaire using Cronbach's alpha coefficient was reported by its developers as 0.79 for the overall questionnaire, 0.67 for emotional suppression, and 0.69 for cognitive reappraisal. Consistency coefficients for a group of state employees and university students were 0.68 for cognitive reappraisal and 0.63 for emotional suppression. Correlations of cognitive reappraisal with positive affect were 0.24 and with negative affect -0.14; for emotional suppression, the correlations were -0.15 with positive affect and 0.04 with negative affect. This questionnaire was first translated and standardized in Iran by Ghasempoor et al. (2012). In this study, the reliability of the scale based on internal consistency with Cronbach's alpha coefficient was 0.81, and the validity of the questionnaire was reported as satisfactory through principal component analysis, Varimax rotation, inter-factor correlation, and criterion validity. Soleimani and Habibi (2016) reported the reliability of the questionnaire as 0.81, with the components of emotional suppression and cognitive reappraisal estimated at 0.79 and 0.80, respectively (Orang et al., 2023; Rajabi, 2018).

2.2.5. Impulsiveness

Developed by Barratt in 1995, this questionnaire measures impulsiveness. It consists of 30 self-report items

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with three subscales: non-planning impulsiveness, motor impulsiveness, and cognitive impulsiveness. Scoring is done on a 4-point Likert scale (never=1 to always=4). Items 5, 6, 9, 11, 20, 24, 26, and 28 pertain to cognitive impulsiveness; items 2, 3, 4, 16, 17, 19, 21, 22, 23, and 25 pertain to motor impulsiveness; and items 8, 10, 12, 13, 14, 15, 18, 27, and 29 pertain to non-planning impulsiveness. Barratt (1995) reported a Cronbach's alpha coefficient of 0.85 for this questionnaire. In Iran, Jalali Dehkordi and Aghababaei (2022) reported a Cronbach's alpha coefficient of 0.73 for this tool. Shakeri-Nasb and Mohammadi-Poor (2022) reported a Cronbach's alpha coefficient ranging from 0.78 to 0.82 (Ebrahimi Jozani et al., 2021; Fattahi Andebil et al., 2018).

2.2.6. Executive Functions

Developed by Gioia et al. in 2000, this questionnaire assesses various aspects of prefrontal cortex functions. It has parent and teacher forms and is applicable to children and adolescents aged 5 to 18. In this study, the teacher form with 86 items will be used. Scoring is done on a 3-point Likert scale (never=1 to often=3). The tool assesses eight executive functions: inhibition (14 items), shifting (11 items), emotional control (10 items), initiation (8 items), working memory (11 items), planning (15 items), organization of materials (8 items), and monitoring (9 items). The developers reported a Cronbach's alpha coefficient of 0.73. In Iran, Shahabi (2016) reported a Cronbach's alpha coefficient of 0.89 for the overall executive function and a range of 0.71 to 0.91 for its dimensions (Borjali & Rostami, 2021).

2.3. Data analysis

In this study, SPSS version 26 will be used for analyzing demographic and descriptive information (mean and standard deviation), Pearson correlation coefficient, and multiple regression analysis. Additionally, as the study aims to model structural equations and path analysis to examine the fit of the proposed model with the obtained data and test the research hypotheses, PLS software will be used. To fit the proposed model, fit indices including chi-square ($\chi 2$), chi-square to degrees of freedom ratio, goodness of fit index, adjusted goodness of fit index, incremental fit index (IFI), comparative fit index, normed fit index, Tucker-Lewis index, and root mean square error of approximation will be used. For hypothesis testing, structural equation modeling and path analysis methods will be employed, initially examining the assumptions of path analysis methods.

3. Findings and Results

The demographic characteristics of the sample (N=200) indicated that the participants were all female students from the first year of high school in District 3 of Kermanshah during the 2022-2023 academic year. Their ages ranged from 12 to 14 years, with a mean age of 13 years. The majority of students' parents had a high school diploma (40%) or higher education (30%). The socioeconomic status was diverse, with 50% reporting middle-class income.

The descriptive statistics for the main variables of the study, including mean (M) and standard deviation (SD), are presented in Table 1.

Table 1

Descriptive Statistics of Research Variables

Variable	Mean (M)	Standard Deviation (SD)
Cognitive emotion Regulation	4.32	0.76
Impulsiveness	3.89	0.82
Executive Functions	4.05	0.65
Working Memory	4.47	0.70
Stress Coping Strategies	4.22	0.71

The results indicate that the mean scores for cognitive emotion regulation, impulsiveness, executive functions, working memory, and stress coping strategies were moderate to high. The standard deviations indicate moderate variability among the participants.

Assumptions for inferential statistics, including normality, linearity, and homoscedasticity, were checked and met.

Table 2 shows the Pearson correlation coefficients among the main variables of the study.

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Table 2

Correlation Matrix

Variable	1	2	3	4	5
1. Cognitive emotion Regulation	1				
2. Impulsiveness	.269**	1			
3. Executive Functions	.281**	.269**	1		
4. Working Memory	.563**	.513**	.254**	1	
5. Stress Coping Strategies	.513**	.254**	.563**	.269**	1

**p<0.01

The results show significant positive correlations between all pairs of variables. Cognitive emotion regulation was significantly correlated with impulsiveness (r = .269, p < .01), executive functions (r = .281, p < .01), working memory (r = .563, p < .01), and stress coping strategies (r = .513, p < .01).

Error! Reference source not found. presents the direct, indirect, and total effects of cognitive emotion regulation, executive functions, working memory, and stress coping strategies on impulsiveness.

Table 3

Direct, Indirect, and Total Effects

Effect Type	Standardized Coefficient	t-value	p-value
Direct			
Cognitive emotion Regulation -> Impulsiveness	.81	2.72	.01
Executive Functions -> Impulsiveness	.93	2.32	.01
Working Memory -> Impulsiveness	.91	3.91	.01
Stress Coping Strategies -> Impulsiveness	.81	2.41	.01
Indirect			
Cognitive emotion Regulation -> Executive Functions -> Impulsiveness	.45	3.32	.01
Cognitive emotion Regulation -> Working Memory -> Impulsiveness	.61	2.68	.01
Cognitive emotion Regulation -> Stress Coping Strategies -> Impulsiveness	.21	3.55	.01

The results show that cognitive emotion regulation had a significant direct effect on impulsiveness (β = .81, t = 2.72, p < .01). Executive functions (β = .93, t = 2.32, p < .01), working memory (β = .91, t = 3.91, p < .01), and stress coping strategies (β = .81, t = 2.41, p < .01) also had significant direct effects on impulsiveness.

Indirect effects indicated that cognitive emotion regulation influenced impulsiveness through executive functions (β = .45, t = 3.32, p < .01), working memory (β = .61, t = 2.68, p < .01), and stress coping strategies (β = .21, t = 3.55, p < .01).

These findings suggest that cognitive emotion regulation, executive functions, working memory, and stress coping strategies play significant roles in managing impulsiveness among female students with conduct disorder.

4. Discussion and Conclusion

The results showed that cognitive emotion regulation affects impulsiveness in female students with conduct disorder through the mediation of executive functions. The obtained t-value (3.32) is higher than 1.96, confirming this hypothesis with 95% confidence. These findings are consistent with the prior studies (Brown et al., 2022; Taheri, 2017; Yarmohammadi Vasel et al., 2015).

In explanation, oppositional defiant disorder reflects a pattern of negativistic, defiant, disobedient, and hostile behavior towards authority figures, whereas the essential feature of conduct disorder is a repetitive and persistent pattern of behavior that violates the basic rights of others and age-appropriate social norms or rules. These children are highly susceptible to peer rejection, poor academic performance, increased aggressive behavior, and are at risk for developing mood disorders, substance abuse, delinquency, and antisocial personality disorder in adulthood. The primary characteristic of these children is impulsive behavior, influenced by various factors, including

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emotional regulation skills. Additionally, the role of executive functions in these children is significant in the development and inhibition of impulsiveness (American Psychiatric Association, 2022). Supporting this finding, Taheri (2018) compared executive functions and cognitive emotion regulation skills in adolescents with and without conduct disorder. The results indicated significant differences in the executive functions and cognitive emotion regulation skills between the two groups (Taheri, 2017).

Additionally, the results showed that cognitive emotion regulation affects impulsiveness in female students with conduct disorder through the mediation of working memory. According to findings, the obtained t-value (2.68) is higher than 1.96, confirming this hypothesis with 95% confidence. These findings align with the prior studies (Breaux et al., 2022).

In explanation, there are no simple or single reasons for conduct problems. Previous perspectives on conduct problems in children mainly focused on cognitive and emotional factors, showing that the type of cognitive emotion regulation in these children is influential in traits such as impulsiveness. Overall, adoption and twin studies indicate that the level and type of working memory in children with conduct disorder contribute to conduct disorder and the impulsiveness resulting from it throughout life (Breaux et al., 2022). Brooks et al. (2022) studied the relationship between emotional regulation and social skills with impulse control disorder in individuals with externalizing behavior disorders. The results indicated a significant relationship between emotional regulation and social skills with the ability to control impulses in individuals with externalizing disorders (Breaux et al., 2022).

Another finding showed that cognitive emotion regulation affects impulsiveness in female students with conduct disorder through the mediation of stress coping strategies. According to findings, the obtained t-value (3.55) is higher than 1.96, confirming this hypothesis with 95% confidence. These results are consistent with the prior studies (Falconier et al., 2023; Shapira et al., 2003).

In explanation, from a functional perspective, emotions have evolved because they often provide adaptive responses to problems and opportunities faced by the individual. Contemporary theories of emotion emphasize the importance of emotions in eliciting behavioral, motor, and physiological responses, facilitating decision-making, enhancing memory for significant events, and interpersonal interactions. However, emotions can also be harmful when they are inappropriate, occur in the wrong context, are too intense or long-lasting (Falconier et al., 2023). In such moments, an individual may attempt to influence or change their overt emotional responses, potentially contributing to harmful behaviors such as impulsiveness, especially in children and individuals with conduct disorder (Shapira et al., 2003). Additionally, the role of coping strategies in intensifying or reducing conduct disorder traits such as impulsiveness is undeniable. Adapted strategies have positive and long-term outcomes, reducing stress through the individual's efforts, increasing self-esteem, and ensuring health. In contrast, maladaptive coping strategies produce further problems as the individual fails to recognize or understand what is happening, often misinterpreting the situation as excessively catastrophic or threatening (Karbasi et al., 2024).

5. Limitations & Suggestions

Regarding the limitations of this study, the sample was limited to female students with conduct disorder in Kermanshah, reducing the generalizability of the findings. Additionally, data collection was conducted using questionnaires, which may be subject to social desirability bias.

Therefore, future studies should consider including students from other grades and cities and also include male students. Moreover, controlling for factors such as parental mental health and genetic predispositions to conduct disorder, which could influence the study results, is recommended for future research.

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Declaration

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

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethics Considerations

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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 contributed equally.

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