JCHR

Journal of Community Health Research 2018; 7(4): 231-241.

The Relationship between Cognitive-Behavioral Skills and Mother-Child Interaction with Symptoms of Conduct Disorder and Oppositional Defiant Disorder in Children with ADHD

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ARTICLE INFO

Original Article

Received: 25 May 2018

Accepted: 13 Nov 2018

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ABSTRACT

Introduction: Nowadays, the main focus of modern researches in the field of ADHD has been on the area of comorbid disorders and reducing their symptoms. In this regard, cognitive-behavioral therapies have tried to reduce the symptoms by using methods such as self-control, problem-solving, and social skills. Given the important role of the family, the present study investigated the pre-assumptions of the treatment by addressing the structural relationships between the social skills, problem-solving skills, and self-control with the symptoms of conduct disorder and oppositional defiant disorders in the children with ADHD and the mediating role of the mother-child interaction.

Methods: This study was performed on 104 male students, fourth to sixth grade students of the elementary schools in Yazd City, Iran. In this study, the Child Symptom Inventory (CSI), Child-Parent Relationship Scale (CPRS), Problem-Solving Inventory (PSI), Self-Control Rating Scale (SCRS), and Matson Evaluation of Social Skills with Youngsters (MESSY) were used. The results were analyzed with path analysis by SPSS software version 23.

Results: Findings showed that problem-solving skills, self-control skills, social skills, and mother-child interaction can explain 75% of the variance of CD and 71% of the variance of ODD in the model. In another section of the analysis, the findings showed that the effect of problem-solving and self-control skills on the mother-child interaction was significant, but the social skills had no significant effect on the mother-child interaction. Also, the problem-solving variable can affect the CD through the mediating variable in the mother-child interaction, and also has a direct relationship with the current disorder but does not have a significant effect on ODD. The self-control variable in addition to its direct relationship to disorder can affect CD and ODD through the mother-child interaction.

Conclusion: Self-control, problem-solving, and social skills are associated with the symptoms of behavioral disorders in the children with ADHD, and can be used in designing cognitive-behavioral therapy packages, and also the way the mother and child interact, is effective in this type of treatments.

Keywords: Attention Deficit and Hyperactivity Disorder, Conduct Disorder, Oppositional Defiant Disorder, Cognitive Behavioral Therapy, Mother-Child Interaction

How to cite this paper:

Motavalli Pour A, Beh-Pajooh A, Shokoohi-Yekta M, Sorbi MH, Farahzadi H. The relationship between cognitive-behavioral skills and mother-child interaction with symptoms of conduct disorder and oppositional defiant disorder in children with ADHD. Journal of Community Health Research. 2018; 7(4): 231-241.

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[DOI: 10.18502/jchr.v7i4.269]

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of the common childhood disorders which occurs in the early child development stages. In most cases, the criteria in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [1] is used to define the current disorder. Accordingly, ADHD is a Neurodevelopmental disorder which starts in the childhood and is characterized by persistent patterns of inattention or hyperactivity-impulsivity which reduces the quality of social, educational, and occupational performances [1]. In fact, ADHD is caused by the disturbances in the brain pathways which are responsible for the inhibition and self-control, and as a result, self-regulation impairment causes damage to other brain functions which are important in maintaining attention [2].

This disorder can lead to behavioral problems at home, school, work, and in other social settings leading to some problems in school learning, social skills, and managing the aggression [3]. Deficits in the social skills in many children with ADHD, are the direct consequences of the current disorder, and even in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [1], some symptoms of this disorder are directly social in nature. These conditions are aggravated when there are comorbid disorders such as Oppositional Defiant Disorder (ODD) or Conduct Disorder (CD) which are considered to be the most common disorders associated with ADHD. According to the definition of the Council for Exceptional Children (CEC) [4], emotional and behavioral disorders (EBD) refer to the emotional and behavioral responses of the individual at school which differ from cultural, age, and ethnic norms, and have effects on their academic performance, self-care, social relationships, individual adaptability, class-room behavior and adaptation in the work environment. These disruptions must appear at least in two different situations, one of which is school.

Barkley [5] reported that 29% - 30% of pre-adolescents with ADHD, and 40% - 60% of adolescents with this disorder, have met the criteria for other comorbid behavioral disorders. A study by Loeber and colleagues [6] suggested that the presence of ADHD significantly predicts CD in boys ages of 8 to 17. Walker et al. [7] concluded that children with ADHD and CD show more physical aggression and severe antisocial behaviors. O'brien et al. [8] reported that children with both ADHD and CD had less educational achievements compared to the children who had only conduct disorder.

ODD is less severe than CD and indicates more problematic cases rather than extremely destructive behaviors and these children are more disobedient to their parents, teachers, and the authorities. Barkley [5] reported that 65% of the children with ADHD had diagnostic criteria for ODD.

In fact, ADHD is one of the common disorders which have a complex and multidimensional nature, derived from a variety of factors that affect various dimensions of the individual and the child's social development. From the psychosocial viewpoint of the researchers, the role of family and environment is significant in the etiology and continuity of symptoms, and the symptoms of this disorder and the internal structure of the family have reciprocal relationships. Therefore, parent-child relationships problems are among the characteristics of families with a child with ADHD [9]. In this regard, Kimiae & Beigi [10] identified a defective cycle in the parent-child relationships in families with problematic children (such as children with ADHD) and called it the "Defective Cycle of Incompatible Behavior." Also, Kar-Ahmmadi and colleagues [11] concluded that the interactive pattern of the parental acceptance has an inverse relationship to the severity of the symptoms of attention deficit and hyperactivity of their offspring.

Cognitive-behavioral therapy is one of the methods used in ADHD [12], which refers to some techniques used to change behaviors that focus on how people think. Two important points must be considered in the effectiveness of the cognitive-behavioral therapy. First, the aim of this method is to improve the self-control or self-regulation which is the main aim of ADHD therapy, and the second, there is evidence that show the current method combined with the behavioral treatments,

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[DOI: 10.18502/jchr.v7i4.269]

can be useful in the ADHD treatments [13]. In fact, in cognitive-behavioral therapy, children with ADHD learn to use self-instruction, self-monitoring, self-empowerment, problem-solving, and self-control to pay attention and manage the impulsive behaviors [14].

Amongst the various goals in the cognitive-behavioral therapy for children with ADHD, self-control, problem-solving and social skills are of great importance [15]. Since in one hand, the self-control problem causes impulsive behaviors which disrupts the cognitive, developmental, educational and social areas and increases the risk of anxiety, depression, conduct, poor social relationships and low academic performances. [16] and on the other hand, the child with the self-regulation problem due to response inhibition is unable toperform behavioral targetting and to pursue his own behavioral goals. Moreover, this child is not able to stop thinking or behaving in the inappropriate time and place, and therefore, suddenly answers the questions or interrupts other people's conversations [17].

On the other hand, the effective use of the problem-solving strategies helps the children be more successful in social communications, and also improves the self-confidence and children's adaptive behaviors. Studies have shown that the child's behavioral problems such as disobedience, conduct problems and antisocial behaviors improve by problem-solving skill learning and cognitive changes, and it causes better anger management technique skills as well as establishing an appropriate peer-to-peer communication and increasing the social acceptance and positive attitude towards oneself [18].

Many studies investigated the effectiveness of cognitive-behavioral treatments on childhood disorders [19], and its impact has been shown in the ADHD treatment [15]. In this regard, considering the importance, effectiveness, and the influence of the family in the emergence of CD and ODD, and also the high level of comorbidity of these two disorders with ADHD, it is necessary to illustrate the mediate role of the mother-child interaction on the effect of the three key elements in cognitive-behavioral therapy on the level of CD and ODD symptoms in the children with ADHD and accordingly the family-centered treatment programs based on the cognitive-behavioral therapy can be designed. Therefore, the purpose of the present study was to examine the structural relationships between the social skills, problem-solving skills and self-control with the mediating role of mother-child interaction and symptoms of CD and ODD in children with ADHD. In fact, this study investigated the pre-assumption design of an intervention program in the family-based cognitive-behavioral therapy to reduce the symptoms of CD and ODD and to improve the mother-child interaction in the children with ADHD.

Methods

Statistical population: The statistical population of the present study included the second grade male students with the symptoms of ADHD in the elementary school in Yazd City, Iran in 2017-2018.

Sampling and sampling method: The statistical samples consisted of 104 second grade male students in the elementary school (aged 10 to 12) with the ADHD combined type, which were selected in a convenience method from two public elementary schools and two private elementary schools with the population of about 2000 students. In order to provide the required number of samples, "Akhtar Danesh", private school and "Ha'aj Mahmoud Soheili" and "Shahid Moshki-Baf" public schools were selected for this purpose from two educational districts of Yazd City, Iran.

Instruments: In this study, five tools were used as follows:

A. **Child Symptom Inventory (CSI):** In order to recognize ADHD, the Child Symptom Inventory was used. This inventory is one of the diagnostic tools for determining the childhood psychiatric disorders, which is based on the Diagnostic and Statistical Manual of Mental Disorders criteria (Fourth Edition). The child Symtom Inventory has two forms for the parents include 110 items and the teachers form include 78 items and has been used in most studies related to ADHD and has shown its efficacy. The sensitivity

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of this tool was respectively 0.75, 0.89, and 0.89, based on the best score of cut off points of 4, 5 and 7 for ADHD, ODD and CD, and its characteristics were respectively 0.92, 0.91 and 0.90 In addition, the validity of this inventory has been reported for both parents and teachers as 0.90 and 0.93 [20].

B. **Child-Parent Relationship Scale (CPRS):** The child-parent relationship scale was used to determine the parent-child relationships. This scale was created by Pianta for the first time in 1992, and includes 33 questions which measure the parent perception on their relationship to their child. This scale has closeness, dependency, conflict, and the overall positive relationship parts between the mother and child. This tool consists of a 5-point Likert scale from 5 (completely agree) to 1 (completely disagree). The overall positive relationship which is the total score is obtained from the total scores of the closeness and the reverse scores of the conflict and dependency. The content validity and the reliability of this questionnaire were obtained by Abareshi and colleagues. [21]. This scale included conflict, closeness, dependency, and the overall positive relationship parts, each with Cronbach's alpha of 0.83, 0.69, 0.46, and 0.84, respectively. The reliability of these areas was reported as 0.60, 0.70, 0.84 and 0.86 respectively.

C. **Self-Control Rating Scale (SCRS):** The Self-Control Rating Scale was developed by Kendall & Wilcox in 1979 to measure the extent of child control. This scale was designed include 33 items for assessing the behavioral restraint of the children based on the cognitive-behavioral restraint model. In this tool, a seven-point scale was used for scoring which ranged from 1 (always) to 7 (never). In this tool, the score was calculated by summing the scores of all items, and the scores above 160 were assigned to individuals who had difficulty in self-control. Indeed, a higher score in this tool represented less self-control. The internal stability of this tool was reported as high, and its alpha coefficient was 0.98. The reliability of the retest method of this tool was also about 0.84. Regarding the validity, this scale had a strong correlation with Peabody visual vocabulary test, confirmed similar shapes and proteus maze, and also had a high degree of differential validity [22].

D. **Problem-Solving Inventory (PSI):** The problem-solving inventory was developed by Heppner & Petersen [23] to measure the respondent's understanding of problem-solving behaviors. This questionnaire has 35 items, of which three (9, 22 and 29) were not used for the present research's purposes. The problem-solving questionnaire had three subscales, including trust and managerial problem-solving including eleven items, tendency-avoidance conflict including sixteen items, and personal control including five items which examined the ability of the individual in problem-solving. The scores of this tool were in the form of 6-point Likert scale, which were in the range of 1 (completely agree) to 6 (completely disagree). The tool had a high internal consistency of 90%, and the validity of this tool was also satisfactory, indicating that it measured the structures which were completely related to self-control [23].

E. **Matson Evaluation of Social Skills with Youngsters (MESSY):** It was used to assess the social skills of the children by parents and trainers. This scale was developed by Matson et al. in 1983 to measure the social skills of the children and adolescents aged 4 to 18, and have three forms for the parent, teacher, and student. In this study, the parent and the teacher forms were used. The parent form had 55 questions, and the teacher's form had five general questions about the five main factors of Matson's social skills which the individuals must read and respond to a Likert index from 1 (never) to 5 (always). The subscales of this questionnaire included good social behavior, non-social behavior, aggression, impulsive behavior, high self-esteem, and communication with peers. In this scale, in addition to the scores in each subscale, a total score was also calculated as a social skill by summing the scores of the subscales. Yousefi and Khair [24], using the same scale in a group of students, reported the same Cronbach alpha coefficient for the whole scale which was0.86. Researches, using the factor analysis method, measured the validity of the scale and identified 5 sub-scales in the form of 5 separate factors and the alpha coefficients in the components

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of the teacher's version including good social behaviors (0.73), non-social behaviors (0.71), aggression and impulsive behaviors (0.76), high self-esteem and self-confidence (0.68), and the relationship with peers (0.80) was reported as desirable. Also, the alpha coefficients in the components of the teacher's version including good social behaviors (0.82), non-social behaviors (0.76), aggression and impulsive behavior (0.87), high self-esteem and self-confidence (0.76), and relationship with peers (0.76) were reported as suitable.

Inclusion Criteria:

- Not receiving any psychological and counseling treatments while participating in the research by either the mother or child.
- No physical disability in the child
- Educated parents

Exclusion Criteria:

- Incomplete answers to the question Not living with the mother
- Lack of combined type of attention deficit hyperactivity disorder

Procedure: In the first stage of the research, a meeting with the teachers was held, and the criteria for recognizing ADHD was explained and they were asked to determine the students who had these characteristics. In the second stage, the Child Symptom Inventory was completed by the parents and teachers. After collecting the questionnaires, the data were analyzed with path analysis by SPSS software version 23.

Results

The present study was conducted on 104 boys aged 10 to 12 with ADHD. The demographic characteristics of the participants showed that the mean and standard deviation of the subjects' age was 10.83 ± 0.78. Of these, 40.4% were in the fourth grade, 36.5% were in the fifth grade, and 23.1% were in the sixth grade. The mean and standard deviation of the father's age was 36.42 ± 5.93, and the mean and standard deviation of the mother's age was 34.15 ± 4.53. It was found that 29.8% of the participant's parents were relatives and 62.5% had two children, 20.2% had one child, and 17.3% had three children. The highest level of education in the fathers (42.3%) and mothers (37.5%) were middle schools. Most fathers (76%) were self-employed, and the mothers (75%) were housewives. The economy status of the family of most participants (64.4%) was also average (Table 1).

In the following, the statistical characteristics and correlation matrix between problem-solving skills (SOL), self-control skills (SELF), and social skills (SOC) with mother-child interaction (MCI) and CD and ODD in children with ADHD were discussed (Table 2).

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Table 1. Demographic characteristics of subjects (N=104)

Variables	Categories	Frequency	%
The Children's Grade	Fourth Grade	42	40.4
	Fifth Grade	38	36.5
	Sixth Grade	24	23.1
Father's Education	Middle School Degree	44	42.3
	High School Diploma	29	27.9
	Associate Degree	12	11.5
	Bachelor Degree	12	11.5
	Master's Degree and Higher	7	6.8
Mother's Education	Middle School Degree	39	37.5
	High School Diploma	24	23.1
	Associate Degree	20	19.2
	Bachelor Degree	15	14.4
	Master's Degree and Higher	6	5.8
Father's Job	Unemployed	1	1
	Government's Employee	24	23
	Self Employed	79	76
Mother's Job	Housewives	78	75
	Government's Employee	16	15.4
	Self Employed	10	9.6
Kinship Marriage	Yes	31	29.8
	No	73	70.2
Number Of Children	One	21	20.2
	Two	65	62.5
	Three and More	18	17.3
Socio-Economic Status	Poor	14	13.5
	Average	67	64.4
	Wealthy	23	22.1

Table 2. The correlation matrix of variables

Variables	M	SD	CA	1	2	3	4	5	6
1. SOL	113.23	15.21	0.78	-	0.45**	0.37**	-0.57**	0.11	0.394**
2. SELF	143.27	26.00	0.85		-	-0.49**	-0.52**	0.68**	0.71**
3. SOC	114.14	32.80	0.95			-	0.22*	-0.07	0.008
4. MCI	99.17	13.12	0.78				-	-0.62**	-0.57**
5. CD	5.91	4.66	0.81					-	0.62**
6. ODD	14.50	5.40	0.82						-

** P< 0.01, * P< 0.05

The contents of Table 2 show that there was no significant relationship between the problem-solving skills and CD. Also, there was no significant relationship between the social skills and CD and ODD while there was a significant relationship between the other variables of this research ($p < 0.05$).

In the following, a path analysis method was used to examine the research variables. This is a generalized method of multivariate regression in relation to the formulation of causal models. The path analysis technique is based on the assumption of the relationship between the independent and dependent variables. It is necessary to ensure the accuracy of the model' measurement before entering the test phase of the hypotheses and the conceptual model in this method. Hence, we used a path analysis method in figure (1).

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Each equation included the path coefficient between the latent variables along with its significance test based on β, and also the value of R^2, which is, the determination coefficient or the variance ratio explained by the latent variable. It should also be noted that the number of ADHD patients is limited and difficult to access, also the fact that the minimum sample size for causal's research is 100 [25].

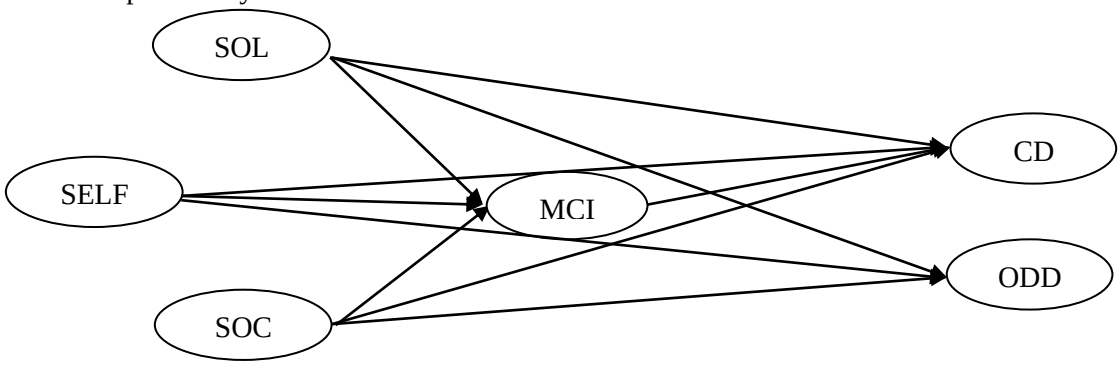

Figure 1. The research model

Confirmation of a measurement model

In general, path analysis using the multiple regression methods was performed in several steps. The results obtained for the path coefficients in the first base were R^2 = 0.75 and e^2 = 0.25. Thus, exogenous variables (problem-solving skills, self-control skills, and social skills) along with the mediating variable (parent-child interaction) explained 75% of the variance of the endogenous variable (CD) in the model, but the remaining 25%were notby the model. This means that problem-solving skills, self-control skills, social skills, and mother-child interaction can explain 75% of CD changes. It is worth noting that the effect of these four variables on CD was significant.

The results obtained for the path in the second base were R^2 = 0.71 and e^2 = -0.29. This means that the problem-solving skills, self-control skills and social skills (exogenous variables) along with the mother-child interaction (endogenous mediator variables) explained71% of the variance of ODD (endogenous variance) in the model and only the remaining 29% were not explained by the model. In this base, it should be noted that the effect of self-control skills and social skills along with the mother-child interaction had a significant effect on ODD, but the problem-solving skills did not have any significant effects on ODD (Table 3).

Table 3. Summary of determination coefficients and t-values with enter method

Paths	Un-standardized Coefficient		B	T	Sig	R2	Results
	B	Std. Error					
SOL → CD	- 0.133	0.019	-0.435	-6.89	0.000		Confirm
SELF → CD	0.127	0.012	0.706	10.91	0.000		Confirm
SOC → CD	0.033	0.008	0.234	4.02	0.000	0.75	Confirm
MCI → CD	-0.196	0.023	-0.552	-8.51	0.000		Confirm
SOL → ODD	0.032	0.024	0.090	1.34	0.185		Reject
SELF → ODD	0.164	0.014	0.787	11.36	0.000	0.71	Confirm
SOC → ODD	0.078	0.010	0.471	7.58	0.000		Confirm
MCI → ODD	-0.090	0.029	-0.218	-3.14	0.002		Confirm
SOL → REL	- 0.386	0.075	- 0.447	-5.17	0.000		Confirm
SELF → REL	-0.192	0.047	-0.380	-4.13	0.000	0.41	Confirm
SOC → REL	- 0.52	0.035	- 0.131	-1.47	0.143		Reject

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The result of Table 3 show the path coefficients in the third base which were R^2 = 0.41 and e^2 = 0.59. Thus, exogenous variables (problem-solving skills, self-control skills, and social skills) explained 41% of the variance of the mediating variable (mother-child interaction) in the model, but the remaining 59% werenot explained by the model. In this base, the effect of problem-solving skills and self-control skills on mother-child interaction was significant, but social skills had no significant effect on the mother-child interaction.

Then, the Sobel test was used to determine the indirect effect of the problem-solving skills and self-control, and social skills on CD and ODD with the mediating role of the mother-child interaction. The statistics of this test in problem-solving skills on the conduct disorder were T = 5.40, Std. Error = 0.005 and p-value = 0.001, which was less than 0.01, which means that the problem-solving variable, in addition to its direct relationship to the conduct disorder, it can have an effect through the mediating variable of mother-child interaction, and its indirect effect was 0/194. The statistics of this test in this skill on ODD were T = -1.22, Std. Error = 0.002 and p-value = 0.22, which were greater than 0.01, which means that the mother-child interaction variable cannot be a mediator between the problem-solving skill and ODD, and its indirect effect was not significant.

On the other hand, the statistics of this test in self-control skills on conduct disorder were T = -2.99, Std. Error = 0.003 and p-value = 0.001, which were less than 0.01, which means that the self-control variable, in addition to the direct relationship to CD, can have an effect through the mediating variable of mother-child interaction, and its indirect effect was equal to 0.555%. The statistics of this test in this skill on ODD were T = -2.99, Std. Error = 0.005 and p-value = 0.002, which were smaller than 0.01, which means that the self-control variable, in addition to the direct relationship to the ODD, can affect the ODD through the mediating variable of the mother-child interaction, and its indirect effect equals to 0.171.

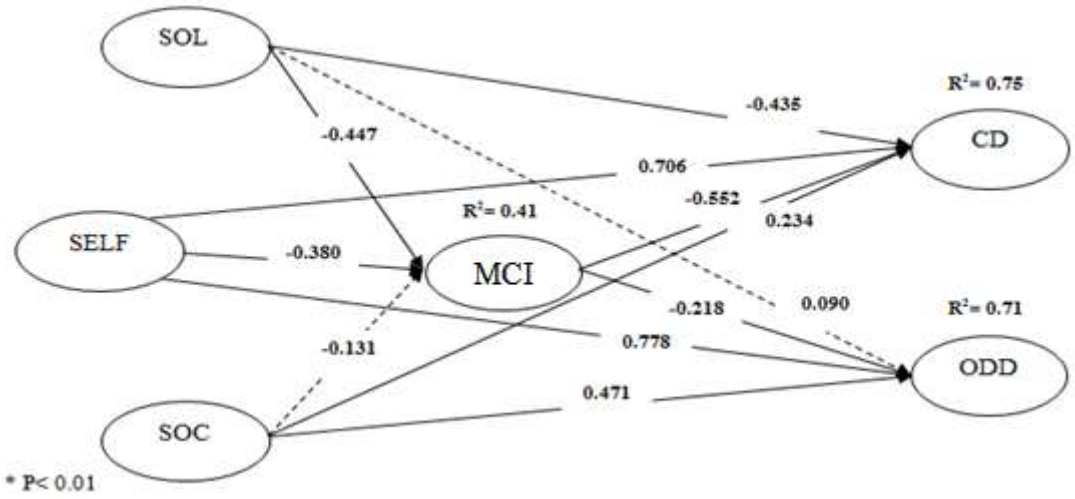

Figure 2. Structural relationships of cognitive-behavioral skills with symptoms of conduct disorder and oppositional defiant disorder emphasizing on the role of the mother-child interaction

Discussion

The present study investigated the structural relationships of the social skills, problem-solving skills, and self-control with the mediating role of mother-child interaction and symptoms of the CD and ODD in children with ADHD. Results showed that problem-solving skills, self-control skills, social skills, and mother-child interaction can explain the symptoms of CD in the children with ADHD and these results are in line with research by Barghi Irani and colleagues. [26], Rajabi and colleagues. [27] and Safaeian [28].

Also, in the model presented in this study, the results showed that the self-control skills and

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[DOI: 10.18502/jchr.v7i4.269]

social skills, as well as mother-child interaction, can explain the symptoms of ODD in children with ADHD, which are consistent with the results of the studies by Mohammadlu et al. [29] and Salehizadeh [30].

Interpreting the results, according to the Barclay model [2], the problems and deficits of a child with ADHD were due to disturbances in some areas such as behavioral inhibition, self-regulation, and internal dialogue and as a result, the more trained with skills, such as problem solving, self-control and social skills, the less deficiencies were faced in the child. Another point worth noting in the finding is that, reducing symptoms can be attributed to the mother-child interaction during the play therapy sessions and these are consistent with the results of the researches done by NouzariArdakani [31], Climie & Mitchell [32], and Sohrabi et al. [33]. As inferred from the proposed model of the research and the literature in this field, families can play a key role in the treatment of children with ADHD because many skills and even skills such as self-control, problem-solving skills and social skills in the texture of the family can be transfered to the child through the mother-child interaction and affect the symptoms of CD and ODD.

The findings of this study did not support the effect of the problem-solving skills on ODD symptoms, and the findings were inconsistent with most studies such as JamaliPaghaleh et al. [34], Afzali et al. [35], and Kupai and Lachini [36], which showed the positive impact of problem-solving skills on reducing the symptoms of ODD. Given the discrepancy between this study findings and the research literature, it is necessary to evaluate the relationship between these two factors and mediate the mother-child interaction with more specialized tools. Thus, these study findings could indicate that learning problem-solving skills through the mother-child interaction can be deliberately neglected and disproved by the child with ADHD.

In the last part of the analysis, the overall effect of the problem-solving and self-control skills on the mother-child interaction was significant. In other words, problem-solving skills had a positive effect on the improvement of the mother-child interaction, which is consistent with the research by Shokouhi-Yekta and colleagues. [37]. On the other hand, self-control had a significant effect on the interaction between the mother and child, which was consistent with the findings of Meece & Robinson [38]. It can be concluded that the more the child is able to use the problem-solving skills in solving his problems and the less he is dependent on his/her mother in solving the problems, the interaction between them have the best quality. On the other hand, self-control improvements will prevent some of the child's misbehaviors, and thus the mother-child interaction would improve.

Findings of this study did not show a significant effect of social skills on the mother-child interaction, which was not consistent with the theoretical foundations in this field. However, children with higher social skills naturally have a better relationship with their parents, but this result was not confirmed in the present study.

Conclusion

The present study was performed to determine the pre-assumptions of the designing cognitive-behavioral treatment package for children with ADHD. The overall results of this study confirmed the direct and indirect effects (through mother-child interaction) of cognitive-behavioral skills on the level of CD and ODD symptoms in ADHD children. Based on this, family-center cognitive-behavioral therapy packages can be designed in which some aspects of treatment can be provided from mother to child.

Limitations: The limitations of the present study were the lack of diagnostic interviews for all the criteria and the low number of female subjects. Thus, only male subjects participated in the research.

Recommendations: Based on the present research, it was suggested that the participation of the parents and especially the mother will increase in the implementation of psychological interventions and the family-centered programs should be expanded. It was also suggested that

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[DOI: 10.18502/jchr.v7i4.269]

comorbid symptoms in ADHD treatment should be more addressed by intervention program designers.

Acknowledgments

We are grateful to the principals of Akhtar Danesh, Haj Mahmoud Soheili and Shahid Moshki Baf elementary schools that helped us in the present research with code number of 34701-13 in 1396/10/02.

Conflict of Interest

The authors declared no conflicts of interest.

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