



# Designing and Testing a Model of Some Precedents and Consequences of Oppositional Defiant Disorder in High School Students

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## Abstract

**Background:** Previous research has demonstrated that oppositional defiant disorder is a strong predictor of mental illness that causes significant distress for adolescents, who manifest this disorder and pose remarkable costs for the society.

**Objectives:** The aim of this study was to design and test a model of some antecedents (secure attachment and insecure attachment, early trauma, behavioral activation system, behavioral inhibition system, schema, emotion regulation, and callous-unemotional) and consequences (aggression, conduct disorder, educational performance, and vandalism) of oppositional defiant disorder.

**Methods:** The sample consisted of 320 high school students of Dezfoul, who were selected by multistage random sampling. The instruments included the oppositional defiant behavioral inventory, revised adult scale (RAAS), Early Trauma Inventory, Carver and White Behavioral Activation System/Behavioral Inhibition system, Young's Schema Questionnaire - Short Form, difficulties in emotion regulation scale (DERS), Callous-Unemotional trait inventory, Boss and Perry aggression questionnaire, child behavior checklist (CBCL), and questionnaire of vandalism. Structural equation modeling through AMOS 22 and SPSS 22 were used for data analysis.

**Results:** Results showed that the model with some modification had good fit with the data and model indicators ( $\chi^2/df = 3.24$ , GFI = 0.90, RMSEA = 0.07) improved. Six out of 20 direct paths were not significant, and were omitted from the model. Two out of nine indirect paths were omitted and the rest of the paths were confirmed.

**Conclusions:** The results showed that the model fitted the data with some amendments.

**Keywords:** Oppositional Defiant Disorder, Attachment, Early Trauma, Brain and Behavioral System, Aggression, Conduct Disorder, Educational Performance, Vandalism

## 1. Background

Oppositional defiant disorder (ODD) is an externalization disorder, which is one of the most popular accommodation disorders. It is very prevalent among children and teenagers (1). According to the fifth version of the diagnostic and statistical manual of mental disorder (DSM5) of American Psychiatric Association, a continuous and repeated pattern of hostility, anger, irritability, verbal dispute, disobedience, pertinacity, defiance, and vindictiveness is the characteristic of oppositional defiant. This disorder may appear before the age of three, yet the normal age is between eight and twelve years old (2). Most researchers believe that the disorder occurs because of different factors. Boden (3) performed a research on the etiology of the disorder and found that incompatible family environment, exposure to early childhood trauma, violence between parents, and individual traits (age, gender, cognitive ability, acceptance of deviant peers) are the causes of the

disorder. In fact, childhood behavioral disorders are considered as a response to a hedonic environment and appears in different forms (4). The results of the research of Pace and Zappulla (5) showed that insecure attachment is a danger for further behavioral problems. On the other hand, attachment theory focuses on cognitive schema. These schemas influence the organization of one's relationship with others and one's perception of the surrounding (6).

Another matter in this research was early childhood trauma, which was related to a wide range of mental health problems of childhood and adulthood. Exposure to trauma can lead to oppositional solutions and defect schemas (7). This may be because of immature oppositional skills of young children, who experience negative consequences of trauma. Children with complicated trauma are at risk of inability to develop essential capacities of the brain. These children often lack self-relief and emotional self-regulation; therefore, their behavior is of

ten negative and includes resistance to change, aggressive behavior, and oppositional defiant disorder Cook et al. (8). In other words, experiencing trauma, brain damage, and chronic misbehavior, child abuse, neglected nursery, and disorders such as reactive attachment, can make difficulties in regulating emotions (9). Eisenberg et al. (10) in their study showed that there is a relationship between inability in emotion regulation and endocrine disorders (depression, anxiety, and social isolation) and exocrine disorders (delinquency and aggressive behavior) in abused children. Difficulty in regulating emotions leads to behavioral problems and interferes with people's interaction in the society and their relationship at home and at school. Karpman (11) argued that individuals exposed to early childhood trauma experience emotional detachment and they use it as a way for getting along with distress (12). The person turns to emotional numbing and brutality towards others to protect himself from negative emotions. Emotional numbing is considered as a pathological adaptation after exposure to trauma, which intensifies the formation of callous-unemotional traits, and along traits, such as choosing new and dangerous activities, lack of sensibility to punishment, lack of emotional response to negative emotions, represents a mood that identifies with low level of fear (13).

Children with ODD may have subtle differences in a part of their brain, which is responsible for reasoning and impulse control. It is believed that these children possess a B (BAS) and a behavioral inhibition system (BIS) (14). Sarter (15) believed that brain/behavioral system is the basis of calling of different emotional responses.

Chronic ODD is a permanent pattern of behaviors, such as anger, defiance, and verbal aggression, which is towards parents and/or people in authority. Furthermore, it can appear in the form of vandalism, always prevent academic achievement of the student, and leads to problems in interpersonal relationships. The results of researchers showed that the symptoms of the disorder increase with age so that they lead to conduct disorder or mood disorder (4). According to what was said and because of the lack of research in the field of investigating the consequences of ODD in teenagers, the current research will discuss if secure attachment, insecure attachment, early childhood trauma, brain/behavioral system, early maladaptive schemas, difficulty in regulating emotion, and cruelty-unemotional traits are effective factors on ODD. This study also investigated whether aggression, conduct disorder, academic performance and tendency to vandalism can be the consequences of this disorder. In other words, if the proposed pattern is suitable for the data.

## 2. Objectives

The purpose of this study was to assess a hypothesized model, including the precedents and outcomes of oppositional defiant disorder in adolescents, as presented in Figure 1. The rectangles represent the measured variables, and circles indicate latent variables. It was assumed that secure attachment and insecure attachment, and early trauma indirectly predict ODD through schema (includes latent variable with two indicators), emotional dysregulation (latent variable with five indicators) and callous-unemotional trait (latent variable with three indicators), and ODD in this model directly influences aggression, conduct disorder, educational performance, and vandalism.

## 3. Methods

### 3.1. Patients and Methods

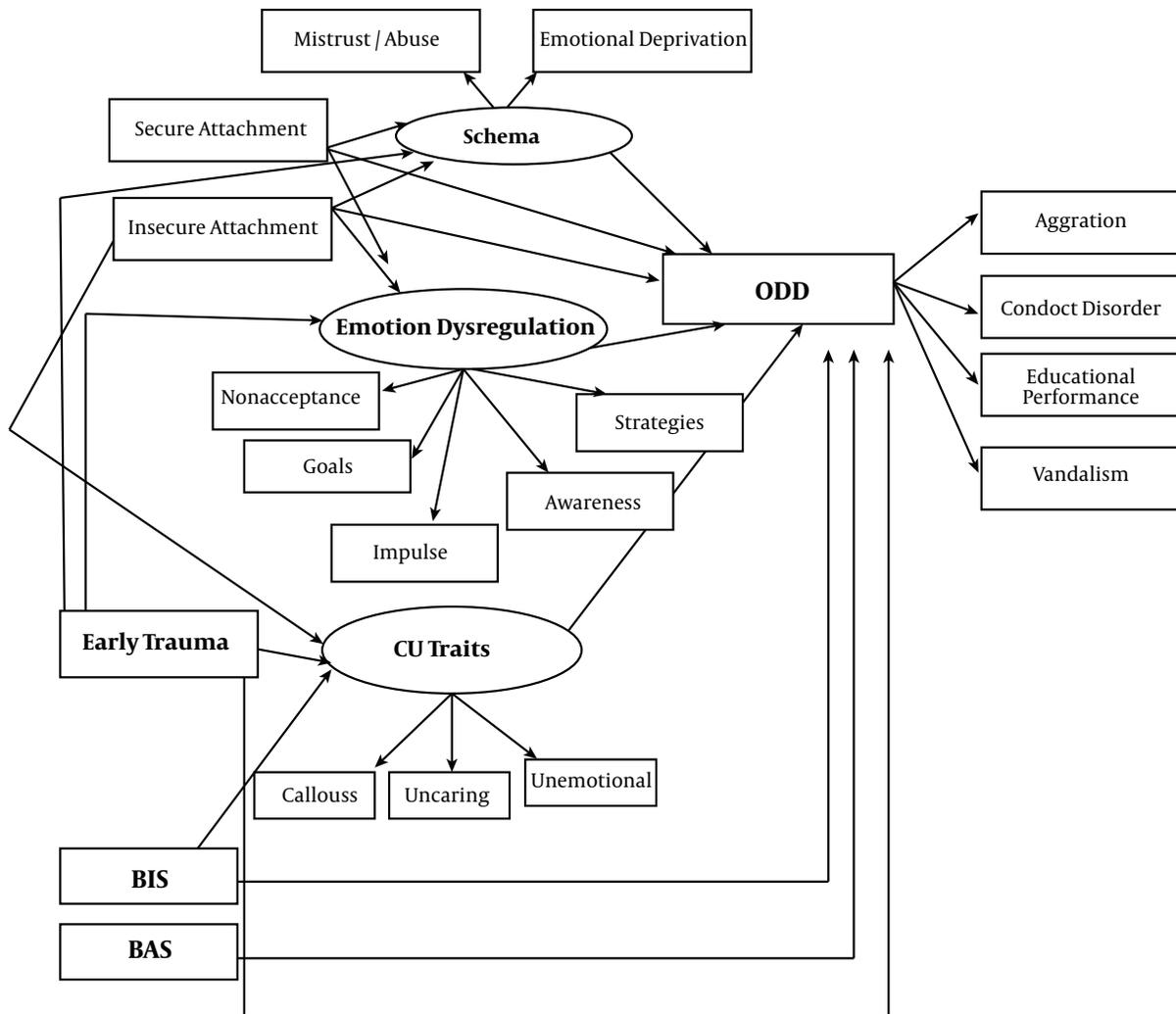
Structural equation modeling (16), a general linear model of regression equations, was applied in this correlational study. For this purpose, SPSS version 22 and AMOS version 22 were used.

### 3.2. Participants

Overall, 350 male students, studying in the second and third grades of high school in educational year of 2014 to 2015 (Iranian year of 1394 to 1395), were chosen via multistage random sampling, using multistage cluster sampling method; from 30 schools, ten schools, and from each high school, two classes were selected randomly and then among the students of that class, about half of the students were randomly selected to answer the questionnaires, and one of their parents participated in the questionnaire surveys. Thirty respondents were eliminated from the sample due to not completing the questionnaire accurately. The final sample consisted of 320 male students within the age range of 15 to 18 years old (average, 16.34; SD, 0.66). In total, 44.7% of the subjects were in the second grade of high school, while 55.3% were in the third grade. The students' mean cumulative grade point average (CGPA) was 17.76 (SD, 1.62).

### 3.3. Instruments

To evaluate the variables, a self-report questionnaire was applied, while the average educational score was measured to determine educational performance. Each participant completed several questionnaires.



**Figure 1.** Proposed model of precedents and outcomes of oppositional defiant disorder (ODD)

**3.4. Oppositional Defiant Behavior Inventory Pilot Version (ODBI; Harada et al., 2004)**

This is an 18-item parent-report inventory, evaluating concrete oppositional behaviors using a four-point scale ranging from zero (rarely) to three (always) (17). The ODBI is scored on a four-point Likert scale ranging from zero (rarely, once a month), one (sometimes, once a week), two (often, twice or three times in a week), and three (always, four time or more in a week). Total score range was from 0 to 54, and as the cut-off point was 20, scores above 20 were associated with oppositional defiant disorder; a higher score indicated a more severe ODB. The psychometric properties of the inventory were reported to be sufficiently accurate ( $\alpha > 0.92$ ) (18). In the present study, Cronbach's  $\alpha$  was calculated as 0.90.

**3.5. Revised Adult Attachment Scale (RAAS; Collins and Read, 1990)**

The revised adult attachment scale (RAAS) includes 18 items, graded on a five-point scale (one, indicating not at all characteristic and five, very characteristic). It was developed in a sample of students in order to assess attachment style dimensions, including close subscale (comfortable with closeness and intimacy), depend subscale (comfortable with depending on others), and anxiety subscale (worrying about being rejected or unloved). Collins and Read (19) reported a Cronbach's  $\alpha$  of 0.69 for the close subscale, 0.75 for the depend subscale, and 0.72 for the anxiety subscale. Test-retest correlation coefficients were 0.68, 0.71, and 0.52 for close, depend, and anxiety subscales over two months, respectively. Cronbach's  $\alpha$  for the current sample

was 0.82.

### 3.6. Early Trauma Inventory (ETI; Mehrabizade et al., 2011)

The early trauma inventory (ETI) contains 23 items, evaluating trauma before the age of 18 years (one for “yes” and zero for “no”). The total score ranged from 0 to 23. In large samples, acceptable psychometric properties were indicated. In this regard, Mehrabizade et al. (20) reported a Cronbach’s  $\alpha$  of  $< 0.89$  in a sample of 120 subjects and  $\alpha$  of  $> 0.91$  to  $0.93$  in a sample of 180 subjects. Cronbach’s  $\alpha$  was estimated at  $0.70$  in the present study.

### 3.7. The Behavioral Inhibition/Behavioral Activation System Scales (BIS/BAS Scales; Carver and White, 1994)

These are a 24-item self-report questionnaire, assessing BIS reactivity and three types of BAS reactivity (i.e., reward responsiveness, drive, and fun seeking). A four-point scale (one indicating strongly agree; four indicating strongly disagree) is used to grade the items. Acceptable internal consistency has been reported for this scale in Iranian samples ( $\alpha > 0.86$ ) (21). Cronbach’s  $\alpha$  was  $0.84$  in the present sample.

### 3.8. The Young Schema Questionnaire, Short-Form (YSQ-SF)

This was developed by Young and Brown (1990), and is a self-report scale, consisting of 75 items on 15 early maladaptive schemas (5 domains), as hypothesized by Young and colleagues (22). Each item is rated on a six-point Likert scale and describes a negative belief about the self (one, completely untrue; six, completely true). By averaging the scores of five items in each schema, the individual schema score is calculated. The Iranian version of YSQ-short form (22) has shown acceptable psychometric properties. In this study, the subscales of emotional deprivation and mistrust/abuse were associated with features of oppositional defiant disorder ( $\alpha$ ,  $0.76$  and  $0.81$ , respectively).

### 3.9. Difficulties in Emotion Regulation Strategies Scale (DERS; Gratz and Roemer, 2004)

This scale was introduced by Gratz and Roemer (23). The current version of this questionnaire contains 36 paragraphs and six subscales, which are as follows: 1) non-acceptance, 2) impulse-control problems (impulse), 3) lack of emotional awareness (aware), 4) difficulties in goal-oriented behaviors (goals), 5) limited access to emotion-regulation strategies (strategies), and 6) lack of emotional clarity (clarity). Sharp et al. (24), Gratz and Roemer (23), and Wineberg and Klonsky (25) have reported the structural validity, form see validity and test stability of a retest in teens and students. In this study, Cronbach alpha was calculated as  $0.84$ .

### 3.10. Inventory of Callous-Unemotional Traits (ICU; Frick 2003)

This is a 24-item self, parent or teacher report questionnaire (26) that assesses callous-unemotional traits among adolescents aged 13 to 18 years old. Participants rate each item using a five-point Likert scale with responses ranging from zero (not at all true) to three (definitely true) to evaluate callousness (11 items), uncaring (eight items), and unemotional (five items) (27). The ICU showed adequate internal consistency in a sample of 540 students, aged 10 to 16 years old ( $\alpha > 0.66$ ) (28). In this study, Cronbach’s  $\alpha$  was measured at  $0.70$  for the total scale and  $0.64$ ,  $0.68$ , and  $0.48$  for callousness, uncaring, and unemotional dimensions, respectively.

### 3.11. The Child Behavior Checklist (CBCL; Achenbach, 1991)

This is a standardized format with 112 items, completed by the parents regarding behavioral problems and skills in children and adolescents (age range of 6 to 18 years old). The CBCL scores are graded on a three-point Likert scale: zero (not true as far as I know), one (somewhat or sometimes true), and three (often true or very true). The psychometric properties of this inventory have shown sufficient accuracy ( $\alpha > 0.91$ ) (29). Cronbach’s  $\alpha$  was  $0.84$  in the current study.

### 3.12. Buss-Perry Aggression Questionnaire (AQ; Buss and Perry, 1992)

This is a 29-item self-rating scale, used as the gold standard for the measurement of aggression. It consists of four factors: verbal aggression (n, 5), physical aggression (n, 9), hostility (n, 8), and anger (n, 7). A five-point Likert scale (one, very uncharacteristic of me; five, very characteristic of me) is used to rate the items (minimum and maximum scores of 29 and 145, respectively) (Valdivia-Peralta et al., 2014). Regarding the internal consistency, adequate indices were obtained for full scale and subscales; Cronbach’s  $\alpha$  coefficient of  $0.89$  for the whole scale,  $0.85$  for physical aggression;  $0.72$  for verbal aggression;  $0.83$  for anger, and  $0.77$  for hostility. Test-retest reliability of the scale (over nine weeks) ranged from  $0.72$  to  $0.80$  for the subscales and total score (30).

### 3.13. Questionnaire of Vandalism (QV; Thawabieh and Ahmad, 2010)

The QV has 18 items. The questionnaire shows the tendency toward vandalism at school, each rated on a five-point scale ranging from one= strongly disagree to five=strongly agree. The lowest score on this scale is 18, and the highest score is 90, and a higher score indicates a tendency to more vandalism behavior. Thawabieh and Ahmad (31) reported Cronbach’s  $\alpha$  coefficients of  $0.94$ . Cronbach’s  $\alpha$  for the current sample was  $0.96$ .

#### 4. Results

The sample consisted of 320 male students enrolled in Dezful high schools. The age range of the entire sample was 15 to 18 years old with an average age of 16.34 and a standard deviation of 0.66.

Descriptive statistics and correlation matrix for the variables are shown in Table 1.

According to the data presented in Table 1, the Mean  $\pm$  SD scores of the sample ( $n = 320$ ) on variables of oppositional defiant disorder was  $9.39 \pm (7.85)$ , secure attachment  $13 \pm (2.98)$ , insecure attachment  $23.76 \pm (5.28)$ , early trauma  $3.50 \pm (2.82)$ , behavioral activation system  $40.23 \pm (4.84)$ , behavioral inhibition system  $20.14 \pm (2.74)$ , schema  $23.84 \pm (9.57)$ , emotion dysregulation  $71.91 \pm (43)$ , callous unemotional traits  $21.11 \pm (6.45)$ , aggression  $75.65 \pm (16.7)$ , conduct disorder  $2.19 \pm (3.17)$ , educational performance  $17.76 \pm (1.62)$ , and vandalism  $20.26 \pm (12.51)$ . As expected, oppositional defiant disorder was positively associated with insecure attachment, maladaptive schema, emotion dysregulation, aggression, conduct disorder, and vandalism, yet there was no significant relationship between oppositional defiant disorder, secure attachment, early trauma, behavioral activation system, behavioral inhibition system, and educational performance.

As seen in Table 2, the results based on the hypothesized model ( $\chi^2 = 518.219$ ,  $P < 0.001$ ; RMSEA = 0.08, CFI = 0.76, NFI = 0.70, AGFI = 0.80) are indicative of adequate initial model fit. Despite this proper fit, post-hoc model modifications were performed to develop a better fitting model by excluding six insignificant paths (secure attachment to schema, insecure attachment to callous-unemotional traits, secure attachment to oppositional defiant disorder, insecure attachment to oppositional defiant disorder, behavioral activation system to oppositional defiant disorder, behavioral inhibition system to oppositional defiant disorder and educational performance to oppositional defiant disorder), characterized by  $\chi^2 = 472.09$ ,  $P < 0.001$ ; RMSEA = 0.08, CFI = 0.78, NFI = 0.72, and AGFI = 0.82. The best fit to the data was obtained in the final model, in which two path errors (emotion dysregulation to callous-unemotional trait, and schema to callous-unemotional trait) were correlated,  $\chi^2 = 437.75$ ,  $P < 0.001$ ; RMSEA = 0.07, CFI = 0.91, NFI = 0.90, AGFI = 0.85. The final model represents the direct effect of early trauma, maladaptive schemas, emotion dysregulation and callous-unemotional on oppositional defiant disorder, the direct effect of oppositional defiant disorder on aggression, conduct disorder and vandalism (Figure 2).

Indirect effects were tested by bias-corrected bootstrapped confidence intervals (49). These indicated significant indirect effects of secure attachment on ODD via

schema (boot = -0.05), significant indirect effects of secure attachment on ODD via emotional dysregulation (boot = -0.07), insignificant indirect effects of insecure attachment on ODD via schema (boot = 0.06), significant indirect effects of insecure attachment on ODD via emotional dysregulation (boot = 0.07), insignificant indirect effects of insecure attachment on ODD via callous-unemotional traits (boot = 0.01), significant indirect effects of early trauma on ODD via schema (boot = 0.16), significant indirect effects of early trauma on ODD via emotional regulation (boot = 0.13), and significant indirect effects of early trauma on ODD via callous - unemotional traits (boot = 0.06). Behavioral inhibition system also had a significant indirect effect on ODD via callous-unemotional traits (boot = -0.14).

#### 5. Discussion

The purpose of this study was to design and test a model of some antecedents and consequences of ODD. The results showed that the final pattern is suitable for the observed data. Most of the obtained variables are in accordance with previous researches. However, based on the obtained information, no research has ever studied all of these relationships concurrently in a model.

The results of the study showed that secure attachment through two mediators of early maladaptive schema and difficulty in regulating emotion has an indirect significant effect on ODD. The emphasis of Bowlby (32) on internal active pattern matches with early maladaptive schemas. An internal active pattern, such as schemas is mainly the result of mother-child interaction pattern. Generally, parents, who have a secure attachment manner are described as supporter and affectionate, they advise children in gently, and admire the suitable behavior of the child at the suitable time. Therefore, it is expected for children with secure attachment to use reasoning strategies for solving conflicts instead of disobedience, pertinacity, and aggression. To explain the indirect path of secure attachment style and ODD by difficulty in regulating emotion, it is useful to refer to the research of Karavasilis et al. (33). When a child grows up in an affectionate environment and with the attention and control of the parents, and parent-child interaction indicates their supportiveness and responsiveness, this will form a coherent self in the person and prevent aggressive behavior of the child.

The next path, in which insecure attachment directly influences oppositional defiant disorder, by three mediators of early maladaptive schemas, difficulty in regulating emotion and callous-unemotional traits, was not confirmed and does not match with the findings of the results of Roelofs et al. (34) and Bosmans et al. (35). To explain this hypothesis, it could be said that since there is a negative

**Table 1.** Correlation Matrix and Descriptive Statistics for Study Variables<sup>a</sup>

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
<b>ODD</b>	-												
<b>Secure attachment</b>	-0.05												
<b>Insecure attachment</b>	0.13 <sup>b</sup>	-0.15 <sup>c</sup>											
<b>Early traumatic life events</b>	0.07	-0.05	0.30 <sup>c</sup>										
<b>BAS</b>	-0.09	0.04	0.07	-0.01									
<b>BIS</b>	-0.009	0.024	0.10	0.05	0/38 <sup>c</sup>								
<b>Schema</b>	0.24 <sup>c</sup>	-0.13 <sup>b</sup>	0.38 <sup>c</sup>	0.40 <sup>c</sup>	-0.02	0.01							
<b>Emotion dysregulation</b>	0.28 <sup>c</sup>	-0.13 <sup>b</sup>	0.29 <sup>c</sup>	0.26 <sup>c</sup>	-0.02	0.04	0.39 <sup>c</sup>						
<b>ICU</b>	0.27 <sup>c</sup>	-0.03	0.05	0.13 <sup>b</sup>	-0.18	-0.11 <sup>b</sup>	0.29 <sup>c</sup>	0.31 <sup>c</sup>					
<b>Aggression</b>	0.31 <sup>c</sup>	-0.20 <sup>c</sup>	0.32 <sup>c</sup>	0.34 <sup>c</sup>	-0.03	0.05	0.42 <sup>c</sup>	0.48 <sup>c</sup>	0.29 <sup>c</sup>				
<b>Conduct disorder</b>	0.63 <sup>c</sup>	0.01	0.07	0.09	-0.07	-0.11 <sup>b</sup>	0.19 <sup>b</sup>	0.18 <sup>c</sup>	0.28 <sup>c</sup>	0.26 <sup>c</sup>			
<b>Educational performance</b>	-0.03	-0.06	-0.06	-0.24 <sup>c</sup>	-0.01	-0.03	-0.12 <sup>b</sup>	-0.007	-0.17 <sup>c</sup>	-0.002	0.02		
<b>Vandalism</b>	0.20 <sup>c</sup>	-0.16 <sup>c</sup>	0.04	0.15 <sup>c</sup>	-0.02	-0.02	0.11 <sup>b</sup>	0.22 <sup>c</sup>	0.23 <sup>c</sup>	0.29 <sup>c</sup>	0.29 <sup>c</sup>	-0.07	
<b>Mean</b>	9.39	13	23.76	3.50	20.14	40.23	23.84	71/91	21.11	75.65	2.19	17.76	20.26
<b>SD</b>	7.85	2.98	5.28	2.82	2.74	4.84	9.57	43	6.45	16.7	3.17	1.62	12.51
<b>Range</b>	0-43	2-20	8-37	0-14	12-28	22-52	10-60	34-138	7-42	37-132	0-25	11.50-20	18-90

Abbreviations: BAS, behavioral activation system; BIS, behavioral inhibition system; ODD, oppositional defiant disorder.

<sup>a</sup> N = 320.

<sup>b</sup> P < 0.05.

<sup>c</sup> P < 0.01.

**Table 2.** Hypothesized, Modified and Final SEM Model Fit Based on Fit Indicators

Fit Indicators	$\chi^2$	df	$\chi^2/df$	GFI	AGFI	IFI	TLI	CFI	NFI	RMSEA
<b>Hypothesized model</b>	518.219	149	3.50	0.86	0.80	0.76	0.70	0.76	0.70	0.08
<b>Modified model</b>	472.09	137	3.44	0.86	0.82	0.80	0.72	0.78	0.72	0.08
<b>Final model</b>	437.75	135	3.24	0.90	0.85	0.80	0.80	0.91	0.90	0.07

view about both distrust/misbehavior schemas and emotional deprivation, teenagers avoid expressing their true viewpoints. In addition, only two schemas were used in this research, and using other schemas may be helpful in doing the research. Other findings, which showed the indirect effect of insecure attachment on oppositional defiant disorder by difficulty in regulating emotion, were confirmed; lack of attachment during childhood could limit the individual's ability in reinforcing self-control and self-regulation skills, i.e. the skills that are necessary for individuals with oppositional defiant disorder. To explain this hypothesis, it could be said that emotions act like a feedback system and individuals cannot regulate interpersonal and relations and behavior by this system (36). Berenbaum (37) asserted that individuals cannot identify their emotions, thus, they might not be able to use the feedback of emotions. Since emotional dysregulation is one of the characteristics of ODD, inability in identifying emotions is

related to inability in regulating them. Therefore, it is expected that insecure attachment causes difficulty in regulating emotions and thus leads to ODD. The next hypothesis was that insecure attachment leads to ODD by callus-unemotional traits. This path was not confirmed. The results of the study are not consistent with the researches of Pasalich et al. (38) and the research of Green et al. (39). To explain the hypothesis, the findings of Viding could be considered. They showed that when callus-unemotional is accompanied by behavior disorder, a powerful genetic factor should be considered as the interfering factor and the environment does not have a strong role in this field. The effect of religious doctrine is an important factor in explaining the current findings. Since some of the personality traits, such as lack of sympathy, callus, apathy and inclemency have been condemned, the individuals are prohibited to show these traits.

Other results of the study showed that early child-

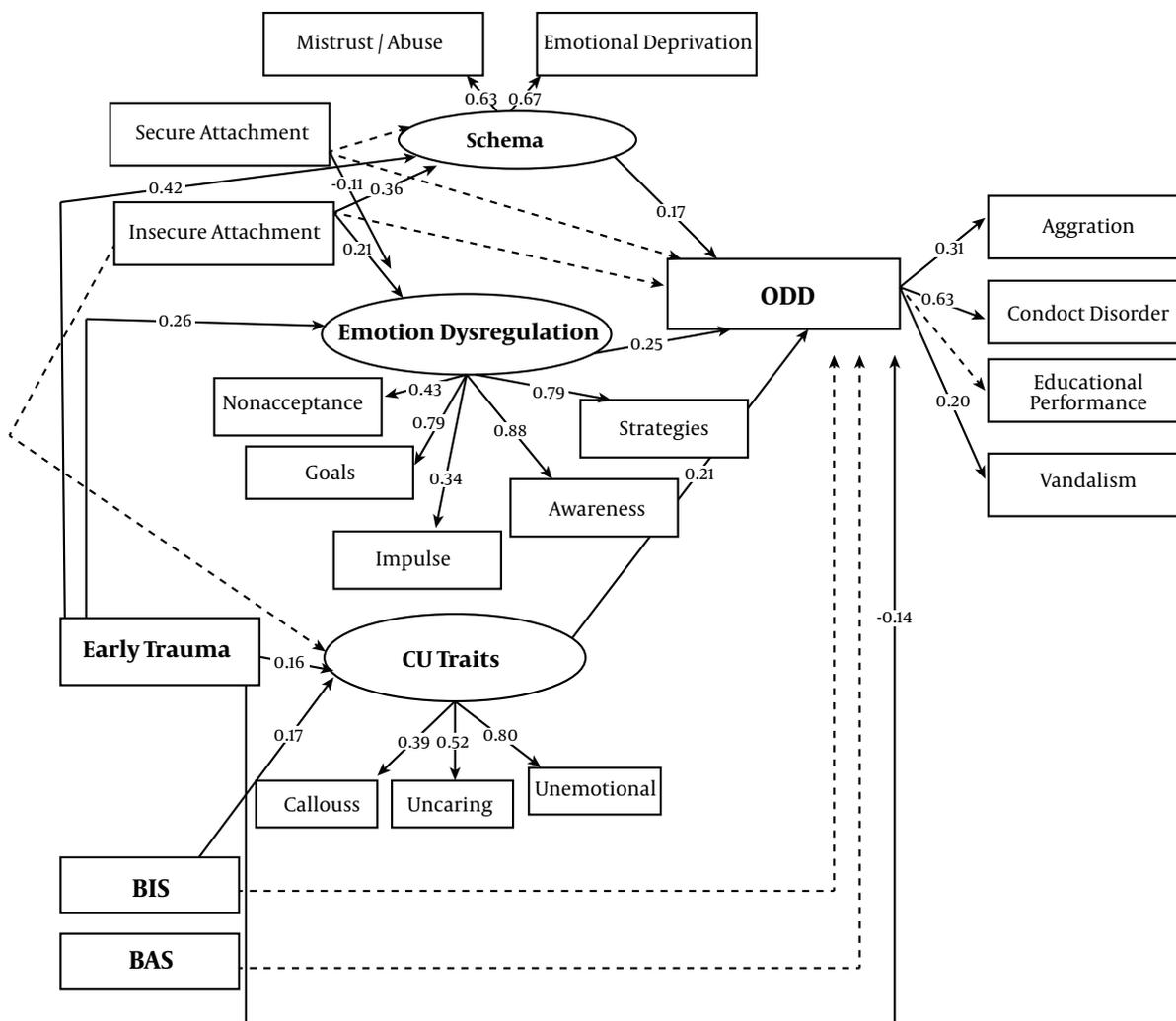


Figure 2. Final model of precedents and outcomes of oppositional defiant disorder (ODD)

hood trauma has an indirect effect on ODD by three mediators of early maladaptive schema, difficulty in regulating emotion, and callus-unemotional traits. All three hypotheses were confirmed. The findings of early childhood trauma path to ODD by early maladaptive schema are consistent with the research of Follingstad et al. (40) and Young (22). To explain this hypothesis, it could be suggested that individuals, who were abandoned, abused, neglected or rejected during childhood, will have an aroused schema if they perceive their current life events (unconsciously), like their harmful childhood experiences. When the schemas are aroused, they will experience severe negative emotions, such as pertinacity, anger, shame, fear, and sorrow. The finding of the current research, which showed the early childhood trauma path to ODD by difficulty in

regulating emotion, is consistent with the research Cook et al. (8) and Henry et al. (41). To explain this, it could be suggested that children's analysis ability is limited under stress and they will respond by bewilderment, isolation, and anger. Therefore, instead of creating a gradual change from the right hemisphere (the place of emotion and sensory brain) to the left hemisphere (the place of language, reasoning and problem solving) and at last integrating the information of right and left hemisphere, damaged individuals often use the sensory brain (right hemisphere), which lacks planning and thought. This clearly shows how a damaged child can be similar to the symptoms of a person with ODD. Early childhood trauma causes problems in psychological and biological process of emotion regulation. These individuals have greater problems in emo-

tion regulation than others, thus, they have problems in identifying and describing their emotions (42). The next path shows early childhood trauma by callus-unemotional traits to ODD. To explain this hypothesis, it could be said that youth, who were exposed to early childhood trauma showed emotional detachment and used it as a way for getting along with distress (12). In fact, children with early childhood trauma turn to behavior, such as callus, lack of response, and lack of sympathy towards others as a defensive response so that they respond to the environment and people with callus, lack of feeling of guilt, and with aggression. This can be considered as a way for taking revenge from others and a way for protecting themselves from other damages, and frees them from negative emotions. Thus, it is expected for early childhood traumas to influence ODD by callus-unemotional traits. The final path of indirect hypotheses of the research was the path of behavioral inhibition system to ODD by callus-unemotional traits. The results of the current study are consistent with that of Ross et al. (43) and Newman et al. (44). Children with ODD and callus-unemotional traits do new, exciting, and dangerous activities, moreover, they are less sensitive to punishment and not rewarded (45). These children are more interested in showing problems by aggression. They do not care about the negative consequences of their aggression (such as being punished or hurting others) (46). Features, such as preferring new and dangerous activities, lack of sensitivity to punishment and lack of suitable emotional responses, all represent a mood, which is characterized by low level of fear (13) and inhibition behavior (47). Children with ODD and callus-unemotional traits can identify sorrow in face of others (48). To explain this hypothesis, it could also be suggested that mood style of these individuals is characterized by lack of feeling guilty and low level of anxiety. Low level of anxiety leads to behaviors, such as indifference, disobedience, and violent and arbitrary behavior. In another explanation, it could be said that development theories show that socialization of moral and internalization of parents and society's norms partly depend on the negative arousal of potential punishment of misbehavior (49), which leads to the growth of the conscious. Individuals with callus-unemotional traits show lower response to stressful emotional stimuli, thus, this leads to poor growth of conscious in them. Lack of sympathy, feeling guilty, and low level of anxiety in teenagers with callus-unemotional traits makes them indifferent towards the emotions of others, and they try to reach their goals by behaviors, such as getting on someone's back, argument with adults, and doing actions which hurt others.

The final path in the antecedent of the ODD is the direct effect of behavioral activation system on ODD. This was not confirmed in this study and is not consistent with the re-

searches of Johnson et al. (50) and Muris et al. (51). The hypothesis is not confirmed because a biological factor cannot be the only underlying factor of ODD, rather a biological factor, such as inhibition and behavioral activation system, along with factors, such as social, family, and environmental factors, can lead to behavioral disorders like ODD.

Findings related to paths of all hypotheses have been confirmed, except the hypothesis, which is based on the effect of ODD on academic performance. These results are consistent with the results of many researches. In general, these findings are consistent with the results of studies, which investigated the relationship of ODD with aggression (Emond et al. (52) and Dick et al. (1)), ODD with conduct disorder (Lehto-Salo et al. (53), Drabick et al. (54) and Boylan et al. (55)), and inconsistent with researches of ODD with academic performance (Burke et al. (56) and Pardini and Fite (57)), and ODD with tendency to vandalism (Kelley et al. (58) Reynolds et al. (59)). In defining the first path of ODD, Denham and Hauer-Jensen (60) asserted that, children, who are identified as angry by their parents or teachers mostly show externalization behaviors. Teenagers with ODD often only know the negative methods of opposition and respond to real life situations. They become angry in response to their parent's request, and they lack necessary emotional and cognitive skills for meeting the adult's requests. They indulge in expressing their emotions and lose their intellectual capacity (61). To explain the findings, it could be said that children with ODD have a poor performance in encoding and information processing. Thus, lack of this ability leads to a biased style and in turn leads to more bad behaviors. On the other hand, poor processing of social information may limit ODD children ability in identifying emotions expressed by others. Therefore, choosing response of the children will be confined and thus ODD children cannot name the negative behaviors, and respond to hostile signs and symptoms more than neutral symptoms, and behave with bias in choosing the symptoms. Thus, their effort for coping with behavioral problems does not lead to a suitable result (62). The second consequence is about the ODD path on conduct disorder. To explain this hypothesis, it could be said that both disorders lack child's predisposing internal traits (such as biological failure, premature personality traits, and cognitive failure), and factors which are related to social environment of the child (bad parenting, peer's rejection, and unsuitable life condition) are common in both disorders. Furthermore, ODD could be considered as a part of mood and ignoring this disorder during childhood leads to conduct disorder. The third consequence of the disorder was the effect of ODD on academic performance. Pardini and Fite (57) used the four functions of reading, writing, math, spelling activity, and executive function for measuring the academic perfor-

mance of children with ODD. In this research, average was used as a self-report index, thus, participants tried to display an unreal average or forgetting the average or show off.

The forth consequence of the disorder was the effect of ODD on tendency to vandalism. This hypothesis was confirmed with the results of Reynolds et al. (63) and Mandel (64). It could also be said that students, who tend to damage school facilities always look for new stimuli in their living environment and they tend to get it by putting in danger their social prestige and even their physical health and life. Their low levels of arousal causes them to be brave. To achieve an optimal level of arousal, these people look for stimuli, which are new and dangerous for ordinary people and make an unpleasant anxiety.

This research had some limitations. Although the pattern obtained from this research is a suitable representation of the data, there may be a model with other different variables, which have a role in explaining the odd variance. Since the statistic population of the research was high school students (15 to 18 years old) of Dezful city, the findings of the research may not be useful for other populations, such as children under 15 or children or teenagers of other societies. Thus, generalization of the results should be done cautiously. Therefore, it is proposed that future researches should investigate the effect of subcultures in this regard. Furthermore, doing researches with extensive samples in regards to the two genders will lead to more generalized results.

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## Footnote

**Authors' Contribution:** Arezoo Paliziyani: acquisition of data, administrative, technical, material support and drafting of the manuscript. Mahnaz Mehrabizade Honarmand: responsible for study supervision, concept and design. Nasrin Arshadi: statistical analysis and interpretation of data.

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