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ORIGINAL PAPER

Depressive Symptoms among Children with ODD: Contributions of Parent and Child Risk Factors in a Chinese Sample

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Abstract Oppositional Defiant Disorder (ODD) is a developmental disorder characterized by serious and persistent social impairment, especially stressful interactions with parents. Although previous studies demonstrated associations between parent mental health and children's ODD symptoms, less attention has been paid to integrating both parent and child risk factors. The purpose of the current study was to investigate the associations among parent emotion regulation, child emotion regulation, parental depression, and child depression in Chinese children with ODD. A total of 234 children with ODD ranging in age from 6 to 13 years, along with their fathers or mothers, completed questionnaires. Results indicated that: (1) Parent emotion regulation, parental depression and child emotion regulation were significantly correlated with children's depressive symptoms. (2) Parent emotion regulation was related to children's depression indirectly through parental depression and child emotion regulation. (3) Child emotion regulation fully mediated the relationship between parent emotion regulation and child depression, and also fully mediated the relationship between parental and child depression. These findings highlight the need to improve parent emotion regulation and pay attention to parental mental health, because both risk factors may exacerbate their children's emotion regulation difficulties and further associate the high level of depressive symptoms among children with ODD.

Keywords Oppositional defiant disorder · Parent emotion regulation · Parental depression · Child emotion regulation · Child depression

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Introduction

Oppositional Defiant Disorder (ODD) is a disruptive behavior disorder characterized as "a recurrent pattern of angry/irritable, negative, defiant, disobedient, and hostile behavior toward authority figures" (American Psychiatric Association [APA] 1994, 2013). Prevalence rates for ODD range from 1% to 16% in western countries (Hamilton and Armando 2008; Steiner and Remsing 2007) and between 5 and 8% in China (Sun et al. 2001; Yuan 2014). Substantial research has shown that ODD has high levels of comorbidity with ADHD and CD (Munkvold et al. 2011). However, the emotional problems of children with ODD have

often been overlooked. Indeed, children with ODD frequently suffer from co-occurring mood disorders (Loeber et al. 2000; Hamilton and Armando 2008) and have difficulty understanding emotional communications (Salmon et al. 2009). In addition, ODD has consistently been found to predict later depression (Burke et al. 2010; Copeland et al. 2009). Thus, co-occurring emotional problems of children with ODD might place them at elevated risk for more severe psychological outcomes. However, among children with ODD, oppositional defiant behavior often overshadows associated internalizing problems. Therefore, interventions for children with ODD have focused almost exclusively on their externalizing symptoms, with little attention to their co-occurring emotional problems (e.g., depression, anxiety). To better understand the heterogeneous clinical pictures of children with ODD and to develop useful interventions, it is necessary to identify risk factors that may exacerbate their emotional distress.

Previous research has shown that multiple risk factors and the interplay between them contribute to children's psychopathology symptoms (Moffitt 2005; Reiss et al. 1991). Among them, family factors stand out as having a critical influence on children's emotional problems (Lin et al. 2013). The main purpose of our study was to examine risk factors that contribute to depressive symptoms in children with ODD, in particular, risk factors characterizing both the individual child and his/her parents. For instance, parental psychopathology has been linked to poor mental health in children (Goodman et al. 2011). Moreover, parental beliefs about emotion expression play a key role in the development of children's emotion socialization (Katz et al. 2012). Additionally, child risk factors such as deficits in self-regulation and affective modulation have been linked to depressive symptoms (Joormann and Vanderlind 2014). Thus, in examining contributors to depressive symptoms among children with ODD, attention should be given to salient risk factors characterizing both children and parents.

Parents' levels of emotion regulation play an important role in the development of child psychopathology symptoms (Pouw et al. 2013; Yap et al. 2007). Emotion regulation is defined as strategic and automatic processes that influence the occurrence, magnitude, duration, and expression of an emotional response (Gross 2014). Optimal emotion regulation may involve either increasing or decreasing particular emotions, depending on the situational context (Gross 2002). Parents' frequent displays of dysregulated emotions have been linked to children's emotional problems, such as depression and anxiety (Han and Shaffer 2013). Suveg and colleagues (2011) also argued that deficits in parents' emotion regulation might affect the process and outcome of emotion socialization, contributing to poor psychological outcomes in their children. Conversely, mothers' positive beliefs about emotion coaching have been associated with fewer adolescent depressive symptoms (Katz and Hunter 2007). Thus, prior studies have shown associations between parents' emotion regulation and children's psychological depressive symptoms. However, most studies have been conducted with typically developing children (Bariola et al. 2011). To our knowledge, few investigators have examined relationships between parent emotion regulation and children's co-occurring ODD and depressive symptoms.

It is necessary to take children's levels of emotion regulation into account when examining associations between parent emotion regulation and child depression. Both cross-sectional (Ramsden and Hubbard 2002) and longitudinal studies (Cunningham et al. 2009) suggest that parents' emotion regulation may have indirect effects on child psychopathology outcomes through children's individual levels of emotion regulation. Thus, children's emotion regulation difficulties may be a potentially important factor for understanding how parents' emotion regulation ability is linked with depressive symptoms in children with ODD. Notably, children's emotion regulation skills have been found to correlate with those of their parents. Children with parents who have emotion regulation difficulties may be unable to learn appropriate ways of regulating emotion (Zeman et al. 2012), possibly reflecting parents' inability to provide effective emotion socialization (Muhtadie et al. 2013). Indeed, child emotion regulation ability is thought to be acquired through interactions with parents (Thompson 1994). Children may imitate or internalize their parents' ways of regulating emotions via modeling or social referencing (Morris et al. 2007). Moreover, children's emotion regulation skills can be improved through parental emotion coaching (Dunsmore et al. 2013). Unfortunately, parental emotion coaching is less common in mothers of children with disruptive behavior problems than others (Dunsmore et al. 2013; Katz and Windecker-Nelson 2004). In addition, deficits in emotion regulation are diagnostic features of ODD (American Psychiatric Association 2013). Children with ODD have more difficulty regulating their negative emotions compared with other children (Dunsmore et al. 2013), which may contribute to their emotion-related problems. Considering the challenging life situations of children with ODD, it is necessary to confirm that whether parents' emotion regulation deficits is linked with children's poor emotion regulation development, then further exacerbating depressive symptoms in children with ODD.

In addition, a large body of research has shown that parental depression has been associated with a broad range of negative child outcomes from infancy to adolescence (Burns et al. 2010; Goodman et al. 2011; Jaser et al. 2005). For example, parental depressive symptoms have been linked with child depression (Thomassin et al. 2015) and anxiety (Goodman et al. 2011). McAdams and colleagues

(2015) found that associations between parental depression and child internalizing and externalizing problems still existed even after controlling for the role of shared genetic risk. Although associations between parental and child depression have well documented, relatively little research has focused on children with ODD and their parents.

Furthermore, depressed parents are believed to create a negative environment whereby their children learn maladaptive emotion regulation (Silk et al. 2006). Silk and colleagues (2006) confirmed that 4-year to 7-year-old children of depressed mothers tended to exhibit a more passive style of regulating emotion, compared to children of non-depressed mothers. A recent study showed that maternal depressive symptoms tended to exacerbate child emotional dysregulation, predicting higher levels of child depression (Thomassin et al. 2015). These results consistently highlighted the importance of child emotion regulation in the relationship between parental and child depression (Suveg et al. 2011).

Difficulties in emotion regulation have been associated with a range of emotional disorders such as depression and anxiety (Campbell-Sills and Barlow 2007; Hofmann et al. 2012). From this perspective, parents' deficits in emotion regulation might be associated with their own depression (Avanzato et al. 2013). As an outcome of impaired emotion regulation (Joormann and Gotlib 2010), parental depression was also identified as a significant predictor of child internalizing and externalizing problems (Fisher et al. 2015). Furthermore, as aforementioned, child emotion regulation played an important role in the relationship between parental and child depression (Suveg et al. 2011; Thomassin et al. 2015). Thus, child emotion regulation may mediate the association between parent risk factors and child depressive symptoms. However, little research has elucidated explanatory factors that account for associations between emotion regulation and emotion-related problems of parents and their children.

Children with ODD are more angry and irritable than others (DSM-5, 2013), and children who are unable to effectively manage their anger are more vulnerable to depression (Goodwin 2006; Zeman et al. 2002; Wolff and Ollendick 2011). Thus, children with ODD might have more difficulty in coping with their recurrent pattern of anger, which in turn has been associated with increased depressive symptoms. Therefore, we focused on children with ODD, and examined whether their emotion regulation deficits might be a risk factor that exacerbates the likelihood of developing depressive symptoms. Furthermore, the relationship between parent factors and depressive symptoms of children with ODD is not clear.

Despite the robust literature on child depression, there are several important questions left unanswered. Particularly, it is essential to understand co-occurring depressive symptoms among children with ODD from the perspectives of both parent and child risk factors. In addition, the majority of the relevant research has been done with Western samples; questions remain as to whether previous findings generalize to children growing up in different cultural contexts. In the current study of Chinese children and families, the majority of children were the only child in their family. Generally, parents pay close attention to the only child's behaviors, particular poor adjustment in school settings. Similarly, parents may have high expectation for their only-child, and the child may bear the heavy burden of these expectations (Cameron et al. 2013). For emotion regulation, there are also differences across cultures. Chinese children are encouraged to inhibit emotion expression; conversely, children in western countries, such as United States, are encouraged to express emotion (Matsumoto et al. 2008).

The purpose of the current study was to examine how parent emotion regulation, parental depression, and child emotion regulation are associated with depressive symptoms among children with ODD in mainland China. Our research questions and hypotheses were as follows: First, to what extent are child emotion regulation, parent emotion regulation, and parental depression linked to depressive symptoms among children with ODD? Based on our review of the literature, we hypothesized that depressive symptoms in children with ODD would be significantly associated with impaired child and parent emotion regulation and parental depression. Secondly, what explanatory mechanisms that account for associations between parents' emotion regulation and children's depressive symptoms? Based on previous findings, we hypothesized that parents' levels of emotion dysregulation would be positively associated with high levels of depressive symptoms among children with ODD through associations with children's emotion regulation competence. Thirdly, what explanatory mechanisms account for associations between parental and child depression? We hypothesized that child emotion regulation would play an important role in the relationship between parental and child depression. Finally, we will explored whether parent emotion regulation would relate to children's depression indirectly through parental depression and child emotion regulation. We hypothesized that parents who reported poor emotion regulation may experience more severe depressive symptoms than others, which in turn would be positively associated with their children's emotion regulation difficulties and depressive symptoms.

Method

Participants

Data were collected in the context of a research program on children's Oppositional Defiant Disorder during 2013 and

2014. Participants were drawn from 14 elementary schools in northern (Beijing), eastern (Shandong province) and southwestern (Yunnan province) China. School psychologists in those 14 elementary schools sent invitation letters regarding the study to 187 class master teachers in grades one through six. The master teachers were asked to nominate children who might have ODD symptoms based on DSM-IV assessment criteria. Of the total 7966 children who were screened, 360 were identified as having probable ODD.

After the initial screening, two clinical psychologists worked with a school psychologist and a class master teacher to individually confirm each child's diagnosis. Using a semi-structured interview, class master teachers were interviewed by the clinical psychologists. The interview was based on the following DSM-IV diagnostic criteria: (a) the child exhibits four or more symptoms of ODD; (b) the child's identified symptoms have lasted for 6 months or more; (c) the child demonstrates significant impairment across psychosocial functional domains. Only children whose diagnostic status was verified by two clinical psychologists were recruited into the current study.

Ultimately, a total sample of 305 children with ODD was selected to participate in the research. Invitation letters and informed consent forms were sent to parents of children with ODD, and 282 pairs of parental consent and child assent were obtained. Finally, 259 pairs of father–child dyads or mother-child dyads completed the questionnaires. We deleted 25 participants who had missing data. Excluding invalid questionnaires, the final sample consisted of 234 parent–child dyads (from 156 classes), including 69 father–child dyads and 146 mother–child dyads (Note: there were 19 parents who did not indicate whether they were the father or mother of the child).

Procedure

After both parents and children signed informed consent forms, children were asked to deliver a package that contained a parent survey questionnaire to their father/mother. Parents (either mother or father) were asked to fill out the questionnaire and return it to the class master teachers in 1 week. Children, after being informed that all of them were selected randomly, were assembled in conference rooms or music rooms to complete the questionnaires in approximately 30 min. The researchers stayed in the room providing assistance or explaining the meaning of sentences when necessary. For benefit of the participants, psychiatrists from Anding Hospital, mental health counselors, and a family therapist from Center of Family Study and Therapy at Beijing Normal University offered opportunities for treatment.

Measures

Parent emotion regulation (parent reported)

Parent emotion regulation was measured using the Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004). The DERS has previously been used with Chinese parents and the internal consistency (Cronbach's α) of the scale was 0.89 (Yan et al. 2016), which indicated that the DERS is a valid measure for Chinese participants. The DERS is a 36-item self-report measure used to assess six dimensions of emotion regulation: nonacceptance (6 items; e.g., "When I am upset, I become angry with myself for feeling that way"), goals (5 items; e.g., "When I am upset, I can still get things done"), impulse control (6 items; e.g., "When I am upset, I have difficulty controlling my behaviors"), strategies (8 items; e.g., "When I am upset, I believe that wallowing in it is all I can do"), clarity (5 items; e.g., "I am clear about my feelings"), and awareness (6 items; e.g., "I pay attention to how I feel"). Each item is rated on a 5-point scale (1 = never, 5 = very often) based on how participants believe each item pertains to them. Higher scores indicated more difficulties in emotion regulation. The internal consistency reliability of the DERS was 0.86 in the present study.

Parental depression (parent reported)

The Center for Epidemiological Studies-Depression Scale was used to assess parental depression (CESD; Radloff 1977). This scale has previously been used with Chinese parents (Chen et al. 2015; Zhang and Yi 2011), and validated with various Chinese populations (Wang 1993). Parents reported symptoms on a 4-point scale (0 = rarely or none of the time, 3 = almost or all of the time) for 20 items (e.g., "I feel lonely.") comprising six scales reflecting major facets of depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. Summed scores served as measures of parental depression, with higher scores indicating greater risk for developing depression. In the present study, the internal consistency reliability of this scale was 0.87.

Child emotion regulation (child reported)

The anger management subscale of the Children's Emotion Management Scales (CEMS) was used to assess children's emotion regulation (Zeman et al. 2001). The CEMS has previously been used with Chinese children and the internal consistency of the scale was 0.80 (Li et al. 2016). The CEMS thus can be considered an appropriate measure for

use in China. Using a 3-point scale (1 = hardly ever, 2 = sometimes, and 3 = often), children responded to 12 items that included anger inhibition (4 items; e.g., "I get sad inside but I don't show it"), coping with anger (4 items; e.g., "When I am feeling sad, I do something totally different until I calm down"), and dysregulated anger (3 items; e.g., "I say mean things to others when I am mad"). Higher scores indicated poorer levels of anger regulation. The internal consistency reliability of these 12 items was 0.74 in the current study.

Child depression (child reported)

Children's self-reports of depressive symptoms were measured using the Center for Epidemiological Studies Depression Scale for Children (CES-DC; Fendrich et al. 1990). The CES-DC has 20-item. Sample items include "I was bothered by things that usually don't bother me." Each item is rated on a 4-point scale (0 = not at all, 1 = a little, 2 = some, 3 = a lot). The CES-DC was translated into Chinese in the early 1990s and validated with various Chinese populations (Wang 1993). Summed scores were used as measures of children's depression, with higher scores indicating greater risk for developing depression. The internal consistency reliability of this scale was 0.86 in the present study.

Data Analyses

After excluding missing data, preliminary data analyses were performed using SPSS 20.0. First, descriptive statistics were computed on all demographic variables (i.e., child gender, child age, and educational years of parents). Second, observed variables (i.e., parent emotion regulation, parental depression, child emotion regulation, and child depression) were summarized using descriptive statistics and correlations between observed and demographic variables were computed in order to understand relations between them. Third, mediation models were examined using Mplus version 7.0 (Muthén and Muthén 2012) within a Structural Equations Modeling framework. Multiple group models were run to test for possible mediation effects. Model fit criteria used in this study were the chi-square statistic (χ^2), goodness-of-fit index (CFI), Tucker- Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR). A model is typically accepted as an adequate fit to the data when the CFI and TLI values are larger than 0.95, the RMSEA value less than 0.06, and the SRMR value is no greater than 0.08 (Hoe 2008).

Results

Participants Characteristics

Child participants included 166 boys (70.9%) and 68 girls (29.1%), ranging in age from 6 to 13 years ($M = 9.62$, $SD = 1.59$). Among these children, 79.5% were identified as the only child in the family. Fathers' age ranged between 25 and 54 years ($M = 38.44$, $SD = 5.03$) and mothers' age ranged between 26 and 53 years ($M = 36.66$, $SD = 4.09$). In regard to education, 39.4% of fathers and 36.5% of mothers had a bachelor's degree or above, 21.6% of fathers and 20.9% of mothers had a junior college diploma, 18.2% of fathers and 19.6% of mothers had a high school diploma or technical secondary school diploma, and 20.8% of fathers and 23.0% of mothers had a middle school diploma or less. Approximately 25.7% of the families reported living in households with a monthly income of more than 10,000 Chinese yuan (RMB, 6.90 RMB = $1), 31.3% had 5000 to 10,000 RMB, 35.2% had 2000 to 5000 RMB, and 7.8% had less than 2000 RMB.

Associations Among Variables of Parent and Child

Table 1 presents the mean and standard deviation for each observed and demographic variable. Around 46.58% of parents' and 44.02% of children's depression scores were more than 16, which indicated that those parents and children had strong risk for developing depression. Considering that the data were collected from either fathers or mothers, independent *t*-tests were conducted to compare fathers' and mothers' reports on observed variables. There were no significant differences between fathers' and mothers' reports of emotion regulation ($M = 74.82$, $SD = 13.53$ for fathers, and $M = 77.41$, $SD = 14.04$ for mothers), t (215) = −1.27, $p = 0.20$, and depressive symptoms ($M = 16.45$, $SD = 6.34$ for fathers, and $M = 17.43$, $SD = 6.78$ for mothers), t (215) = −1.01, $p = 0.31$. Thus, the data from the father's and mothers' reports were combined.

Some studies have suggested that parent characteristics (e.g., parent gender and age) and child characteristics (e.g., child gender and age) may be associated with our parent and child study variables (Lavigne et al. 2012; Munkvold et al. 2011). Therefore, correlations between demographic (i.e., the age of parents and child, parent gender, child gender, and only child) and study variables are presented in Table 1. As expected, measures of parents' emotion regulation, depressive symptoms and children's emotion regulation and depressive symptoms were significantly intercorrelated. Children and parents who reported more difficulty in emotion regulation also reported significantly higher levels of depressive symptoms than others. Parents who reported higher levels of depressive symptoms and emotion

Table 1 Means, standard deviations, and correlations among observed variables and demographic variables

	M (*SD*)	1	2	3	4	5	6	7	8	9
1. Parent emotion regulation	77.26 (14.13)									
2. Parental depression	17.38 (6.76)	0.691**								
3. Child emotion regulation	22.73 (4.27)	0.142**	0.221*							
4. Child depression	36.41 (10.28)	0.148*	0.177**	0.292**						
5. Paternal age	38.44 (5.03)	−0.113	−0.041	0.068	0.077					
6. Maternal age	36.66 (4.09)	−0.116	−0.106	0.119	0.008	0.806**				
7. Child age	9.62 (1.59)	0.037	−0.054	0.017	0.012	0.172**	0.236**			
8. Parent gender	0.32 (0.47)	−0.087	−0.069	0.056	0.107	0.135*	0.128	0.177**		
9. Child gender	0.71 (0.46)	−0.083	−0.032	0.052	0.177**	0.193**	0.157*	−0.009	0.114	
10. Only child	0.79 (0.41)	−0.157*	−0.07	0.047	0.045	−0.012	−0.117	−0.081	−0.07	0.046

Parent gender (0 = female, 1 = male), child gender (0 = girl, 1 = boy), and only child (0 = non-only child, 1 = only child) were coded as dummy variables

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

regulation difficulties tended to have children who reported higher levels of depressive symptoms and emotion regulation difficulties. In addition, child gender was significantly associated with child depression and being an only child was correlated with parent emotion regulation; thus, these two variables were controlled in further analyses. Since the correlation between parents' emotion regulation and depressive symptoms was substantial ($r = 0.691$), we decided to assess the degree of multicollinearity of these variables using the variance inflation factor (VIF). VIF is a measure of the amount of multicollinearity in a set of multiple regression variables; VIF values > 10 or the tolerance values < 0.1 indicate collinearity. The results of the VIF and tolerance values showed there was no multicollinearity (VIF values < 1.1, tolerance values > 0.9).

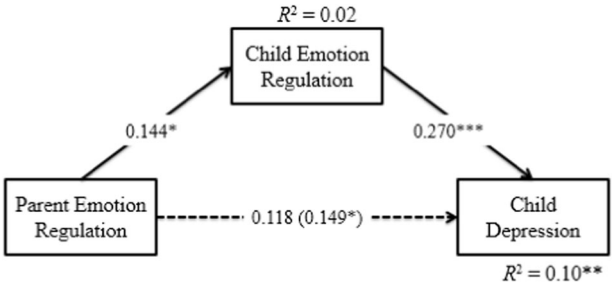

Fig. 1 Model of child emotion regulation mediating the relationship between parent emotion regulation and child depression. *Note:* Children's gender and only child (not shown) are controlled in the model. * $p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Relationship among Parent Emotion Regulation, Child Emotion Regulation, and Child Depression

Firstly, we determined whether child emotion regulation mediated associations between parents' emotion regulation and children's depressive symptoms. The model revealed a good fit to the data, $\chi\ (2)^2 = 2.82$, $p = 0.24$, CFI = 0.97, TLI = 0.89, RMSEA = 0.04 (90% CI = [0, 0.14]), SRMR = 0.03. The model with standardized path coefficients is presented in Fig. 1. Parent emotion regulation was not directly associated with children's depressive symptoms, $\beta = 0.118$, $p = 0.065$; however, we found a significant indirect effect via child emotion regulation, $\beta = 0.039$, $p = 0.045$, 95% CI = [0.001, 0.078]. Child emotion regulation mediated the relationship between parents' emotion regulation and children's depressive symptoms.

Relationship among Parental Depression, Child Emotion Regulation, and Child Depression

Second, we found support for our hypothesis that child emotion regulation mediated associations between parents' and children's depressive symptoms. The model fit the data very well, $\chi\ (2)^2 = 2.21$, $p = 0.33$, CFI = 0.99, TLI = 0.98, RMSEA = 0.02 (90% CI = [0, 0.13]), SRMR = 0.02. As shown in Fig. 2, parental depressive symptoms was not directly associated with child depressive symptoms, $\beta = 0.121$, $p = 0.074$; however, child emotion regulation played an important role as a mediator in the links between parents' and children's depressive symptoms, $\beta = 0.058$, $p = 0.018$, 95% CI = [0.010, 0.106]. Therefore, child emotion regulation fully mediated the association between parents' and children's depressive symptoms.

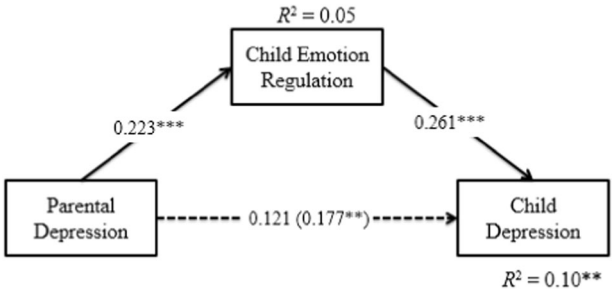

Fig. 2 Model of child emotion regulation mediating the relationship between parental depression and child depression. *Note:* Children's gender and only child (not shown) are controlled in the model. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

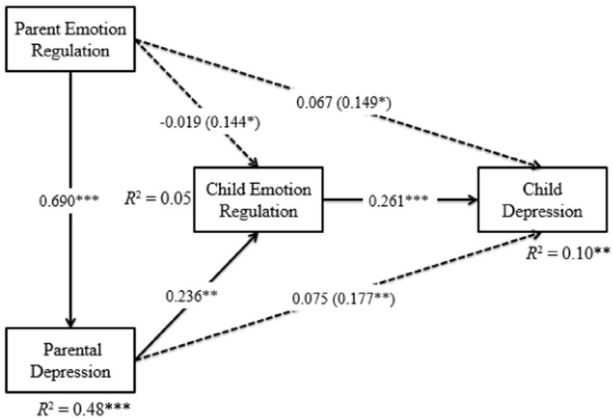

Fig. 3 Model of parental depression and child emotion regulation mediating the relationship between parent emotion regulation and child depression. *Note:* Children's gender and only child (not shown) are controlled in the model. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Relationship among Parent Emotion Regulation, Parental Depression, Child Emotion Regulation, and Child Depression

Further, we computed a two-step sequential model showing the effect of both parent emotion regulation and depressive symptoms on child depression, as mediated by child emotion regulation. In this model, the mediating role of parental depression was also tested. The model fit the data very well, $\chi\ (4)^2 = 4.03$, $p = 0.40$, CFI = 1.00, TLI = 0.99, RMSEA = 0.01 (90% CI = [0, 0.10]), SRMR = 0.03. As shown in Fig. 3, parent emotion regulation was indirectly related to child emotion regulation, with parental depression mediating links between parent and child emotion regulation, $\beta = 0.163$, $p = 0.008$, 95% CI = [0.043, 0.283]. Parental depression was not directly associated with child depression, but was indirectly associated via child emotion regulation, $\beta = 0.062$, $p = 0.033$, 95% CI = [0.005, 0.118]. In sum, results of the model indicated that the association between parent emotion regulation and child depression was mediated by parental depression and child emotion regulation, $\beta = 0.042$, $p = 0.036$, 95% CI = [0.003, 0.082].

Equivalence Test for Boys' and Girls' Models

To explore whether the influences of parent and child factors on children's depressive symptoms were similar for boys and girls, multiple group analyses were conducted. Since the conceptual model presented in Fig. 3 was a more comprehensive model and has included all the observed variables as well as models 1 (Fig. 1) and 2 (Fig. 2), we conducted the multiple group analyses in all models but only reported model 3 (Fig. 3). First, results showed that both boys' and girls' models fit the data very well, $\chi\ (2)^2 = 3.01$, $p = 0.22$, CFI = 0.99, TLI = 0.97, RMSEA = 0.06 (90% CI = [0, 0.17]), SRMR = 0.03; $\chi\ (2)^2 = 2.03$, $p = 0.36$, CFI = 0.99, TLI = 0.99, RMSEA = 0.01 (90% CI = [0, 0.24]), SRMR = 0.03, for boys and girls, respectively. Then, parameter estimates were allowed to differ across genders, $\chi\ (4)^2 = 5.04$, $p = 0.28$, CFI = 0.99, TLI = 0.97, RMSEA = 0.05 (90% CI = [0, 0.16]), SRMR = 0.03, and were constrained to be equal across genders, $\chi\ (11)^2 = 11.26$, $p = 0.42$, CFI = 0.99, TLI = 0.99, RMSEA = 0.01 (90% CI = [0, 0.10]), SRMR = 0.05. Both models revealed a good fit to the data. Besides, the constrained model did not show a significant decrement in fit, $\Delta\chi\ (7)^2 = 6.22$, $p > 0.05$. The results showed that the constrained models were as good as the free models, indicating that the models may be similar for boys and girls. Multiple group analyses revealed that the effects of parent and child individual risk factors on depressive symptoms among children with ODD were similar between boys and girls.

Discussion

We examined parent and child risk factors in relation to heightened depressive symptoms among children with Oppositional Defiant Disorder. In light of the scanty research on this topic, our objectives were to provide a perspective for understanding co-occurring depressive symptoms among children with ODD, potentially providing guidance to families with children who fit this common symptom profile. Findings clarified pathways of association between parent emotion regulation, parental depression, child emotion regulation, and depressive symptoms among children with ODD in mainland China. Indeed, child emotion regulation mediated not only the relationship between parent emotion regulation and child depression, but also associations between parental and child depressive symptoms. In addition, parents who reported poor emotion regulation also experienced more severe depressive symptoms than others, which may have exacerbated their children's emotion regulation difficulties and depressive

symptoms. Our findings highlighted the value of investigating co-occurring depressive symptoms in children with ODD from the perspectives of both parent and child risk factors, providing unique insights into explanatory mechanisms. Further, in previous studies, child emotion regulation has been found to mediate associations between parent factors and children's depressive symptoms (Cunningham et al. 2009; Suveg et al. 2011; Thomassin et al. 2015). Our study revealed that these findings generalize to parents and children in mainland China.

Parents' emotion regulation difficulties predicted poorer child emotion regulation, which in turn was associated with heightened depressive symptoms among Chinese children with ODD. This finding was consistent with previous studies of Western families showing that parents' emotion regulation has indirect effects on child psychopathology outcomes through its direct effect on children's emotion regulation (Cunningham et al. 2009; Ramsden and Hubbard 2002). One possible explanation for the indirect association is that parents were unable to regulate their emotions effectively and adaptively, and children tended to imitate their parents' ways of regulating emotions via means of modeling or social referencing (Morris et al. 2007). In this situation, children might be unable to learn appropriate ways of regulating emotion (Meyer et al. 2014). This finding further confirmed that parents play a critical role in the development of children's emotion regulation competence (Carrère and Bowie 2012). Moreover, the majority of children with ODD manifest negative affect and deficits in emotion regulation (Dunsmore et al. 2013; Wolff and Ollendick 2011). Child emotion regulation, as a core self-protective factor, should be vitally emphasized in preventing depressive symptoms, especially for children with ODD. Together with previous findings (Dunsmore et al. 2013), our study highlighted the need to improve emotion regulation competence in children with ODD, because emotion regulation difficulties were associated with more depressive symptoms among children with ODD.

Further, child emotion regulation fully mediated the relationship between parent and child depression. This finding converged with other work which suggested that depressed parents might exacerbate child emotion dysregulation, further exacerbating levels of children's depressive symptoms (Thomassin et al. 2015). Our study extended this finding to children with ODD, and illuminated indirect pathways between parental risk factors and children's depressive symptoms. The indirect effect of parental depression on child depression might reflect the family contexts in which children live (Feng et al. 2009). Depressed parents tend to use more maladaptive emotion regulation strategies than others (Joormann and Vanderlind 2014). Thus, children living in such families might learn maladaptive coping strategies from their parents. Consistent with previous studies (Suveg et al. 2011), our findings highlighted the importance of child emotion regulation in relationships between parents' and children's depressive symptoms. Therefore, paying attention to parents' mental health and improving parent emotion regulation are critical steps toward facilitating the development of healthy emotion regulation in children, further reducing the occurrence of depressive symptoms in children with ODD.

Finally, our results extended previous findings by illustrating how parent and child emotion regulation were linked (Carrère and Bowie 2012), especially in relation to associations between parent and child depressive symptoms (Goodman et al. 2011; Jaser et al. 2005). Importantly, our study suggested that among children with ODD, parent and child risk factors were associated with child depressive symptoms via a complex processing chain. Specifically, parents' emotion regulation difficulties are linked with their own depressive symptoms (Avanzato et al. 2013), and high levels of parental distress may exacerbate emotion regulation difficulties among children with ODD, placing them at risk for depressive symptoms (Dunsmore et al. 2013; Katz and Windecker-Nelson 2004). Importantly, given that emotion regulation deficits are defining features of ODD, we verified the vital significance of child emotion regulation in associations between parental factors and depressive symptoms among children with ODD. Thus, attention should be paid to improving children's emotion regulation skills with the goal of decreasing the occurrence of depressive symptoms in children with ODD. When considering the stressful family situations of children with ODD, clinical attention should also be paid to improving parental risk factors, especially improving emotion regulation and mental health. These risk factors have been frequently underestimated.

Limitations

We wish to note several limitations of our study. First, we collected maternal or paternal data, rather data from both parents of the same child. Thus we could not address the unique contributions of mothers vs. fathers in relation to children's functioning. Although there were no significant differences in fathers' and mothers' reports of emotion regulation and depression in the current study, analyzing both parents' reports may provide a stronger test of the model and offer a new perspective by comparing potential similarities and differences between parents. Second, child emotion regulation was solely reported by children themselves. In future studies, multi-informant approaches involving children's, parents', and teachers' perspectives would provide a more comprehensive assessment of this important construct. In addition, emotion-related tasks may be another valuable way of assessing children's emotion

regulation competence. Third, the cross-sectional design of our study prevented us from providing a developmental and dynamic prospective analysis of the studied relationships. This limited our ability to examine whether parental and child risk factors associated with depressive symptoms among children with ODD were lasting or reciprocal (Maxwell and Cole 2007). Longitudinal studies are needed to explore the development and long-term sequelae of associations between parent and child depressive symptoms and emotion regulation. Finally, some ODD cases might have not been detected. Although class master teachers were familiar with children's performance at school, they were not professional clinicians trained to assess children's psychopathology symptoms.

Instead of focusing solely on parent or child risk factors, our study offered novel insights into how both parent and child risk factors were associated with depressive symptoms among children with ODD. Further research efforts could be devoted into multiple levels of family factors to provide a comprehensive framework of how factors at the whole family, dyadic, and individual levels are related to internalizing and externalizing symptoms of children (Lin et al. 2016). Besides, both concurrent (Ramsden and Hubbard 2002) and longitudinal (Cunningham et al. 2009; Gottman et al. 1996) studies suggest that teaching parents how to respond appropriately to their child's emotional expressions may have indirect effects on children's adjustment outcomes through enhancing their emotion regulation skills. Child emotion regulation, as a core self-protective factor, should be vitally emphasized in preventing depressive symptoms, especially for children with ODD. Clinicians who wish to prevent depressive symptoms in children with ODD and researchers in this field should pay attention to children's family environment, especially their parents' emotion coaching.

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Author Contributions X.L. as the first author wrote the paper; X.L. as the corresponding author designed the study and revised the paper; S.X. assisted with the data analyses and wrote part the section of results; S.L.O. edited the final manuscript and polished the language expression; Y.L. collaborated with conducting study and writing of the paper; H.D. collaborated with the design and writing of the study.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

Informed Consent In the current study, children aged from 6–13 years old and their fathers or mothers participated. Before the study began, parents signed informed consent forms for themselves and their children.

Ethical Approval Prior to conducting the study, the Institutional Review Board of Beijing Normal University in China approved the research protocol, including the consent procedure.

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