

# Longitudinal Associations between Oppositional Defiant Symptoms and Interpersonal Relationships among Chinese Children

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**Abstract** Children with oppositional defiant disorder (ODD) are at increased risk for developing poor relationships with people around them, but the longitudinal links between ODD symptoms and subsequent interpersonal functioning remain unclear. In the current study, we examined the bidirectional associations between ODD symptoms and children's relationships with parents, peers, and teachers. We included separate analyses for parent vs. teacher reports of ODD symptoms, with regard to subsequent interpersonal relationships. Participants included 256 children with ODD, recruited in China, along with their parents and teachers, assessed at three time points roughly two years apart. Parents and teachers reported child ODD symptoms at each time point, and children reported their perceptions of father– and mother–child attachment, peer relationships, and teacher–student relationships across the three time points.

ODD symptoms reported either by parents or teachers predicted impairments in interpersonal functioning. Meanwhile, child interpersonal impairments with peers and teachers predicted subsequent increase in teacher-reported ODD symptoms. These findings highlight the importance of transactional models of influence—and of considering early intervention for ODD in protecting children from developing further deficits and impairments. Additionally, we discuss the perspectives of multiple informants on ODD symptoms, including their different patterns of association with subsequent interpersonal relationships.

**Keywords** Oppositional defiant disorder · Parent–child attachment · Peer relationship · Teacher–student relationship · Longitudinal

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Oppositional defiant disorder (ODD) is among the most common developmental disorders among children, with community prevalence rates ranging between 2.6% and 15.6% (Boylan et al. 2007). Higher prevalence of ODD is frequently observed for boys as compared to girls (for a review, see Demmer et al. 2017). Children diagnosed with ODD struggle from a recurrent pattern of emotional and behavioral symptoms, including angry/irritable mood, argumentative/defiant behavior, and vindictiveness toward authority figures (American Psychiatric Association 2013). For a child to meet diagnostic criteria, these symptoms must negatively influence social, educational, or other important domains of functioning (APA 2013). Although social functioning has been implicated in the diagnostic criteria for ODD since its inception in 1980 (APA 1980), a gap exists in the literature with respect to the pattern of relations that exists between ODD symptoms and interpersonal functioning over time, particularly within the Chinese cultural context. Understanding such longitudinal relations could both deepen our understanding of the disorder and contribute to future intervention strategies.

Interpersonal harmony, which is emphasized in Confucianism, is still highly valued by many Chinese individuals and families (Wei and Li 2013). Unlike their well-behaved counterparts, children diagnosed with ODD tend to disrupt interpersonal harmony by displaying oppositional and aggressive behaviors (Leadbeater and Ames 2016; Tseng et al. 2011). Such disruption is not well tolerated in China and is intensely disliked by both other children and adults, placing these children at high risk for interpersonal impairment (Xu et al. 2004). Moreover, the consequences of such behavior patterns may render children with ODD at high risk for social isolation, potentially fueling a vicious cycle of escalating levels of oppositional behavior. In fact, even in the United States, Greene et al. (2002) found that children with ODD had even greater impairments in interpersonal functioning than children with bipolar disorder, major depression, or multiple anxiety disorders. Such interpersonal deficits are likely to be embedded in a transactional pattern of escalating deficits and interpersonal conflicts (Herres and Kobak 2015; Kochanska et al. 2015).

Given these severe consequences of ODD and its associated interpersonal problems, it is crucial to clarify the associations between ODD symptoms and different types of interpersonal relationships in order to help these high-risk children and to prevent further impairments related to ODD symptoms and interpersonal functioning. Through an investigation featuring a prospective longitudinal design, we aimed to examine the bidirectional influences between ODD symptoms and Chinese children's relationships with parents, peers, and teachers over a two-year period.

## ODD Symptoms and Parent–Child Relationships

It has been well documented that children with ODD often have impaired interactions with their parents. For example, a recent meta-analysis suggested that the majority of children and adolescents with conduct disorder (CD) or ODD had an insecure attachment to parents (Theule et al. 2016). A study of elementary school children in Taiwan also found that children with ODD showed problems in both father–child and mother–child relationships (Tseng et al. 2011). Under the influence of Confucianism, Chinese parents praise children who are modest, cooperative, and obedient by calling them “Guai Hai Zi” in Mandarin, which means “good” or “well-behaved” (Chen et al. 1998). In contrast, children who display ODD symptoms can be labeled as “bad children.” Harsh and even abusive parenting practices are pervasively related to such “bad children” among Chinese parents (Chuang and Su 2009; Leung et al. 2008). Thus, Chinese children with ODD are at particularly high risk of fostering and engaging in poor relationships with parents (Lin et al. 2016a; Tseng et al. 2011), but it remains unclear whether the relation between ODD symptoms and parent–child relationships is unidirectional or bidirectional.

Some research has explored the longitudinal links between child ODD symptoms and parent–child relationships. For instance, in a recent meta-analysis, Pinquart (2017) found that harsh parenting practices and child externalizing problems were bidirectionally related. Also, Burke et al. (2008) found bidirectional influences between parenting practices and ODD symptoms, further suggesting that the influence of child disruptive behaviors on parenting practices was greater than vice versa. Patterson's (1982) coercion model provides a theoretical explanation for these bidirectional links: children with disruptive problem behavior patterns elicit increasingly harsh discipline from their unskilled caregivers over time; however, these parenting practices, in turn, serve to further worsen children's adverse behaviors. Accompanying this vicious cycle, the quality of parent–child relationships would be expected to be dramatically impaired, which may also contribute to more severe ODD symptoms (Lin et al. 2016b).

## ODD Symptoms and Peer Relationships

Children with ODD symptoms also face problems with peer interactions (Munkvold et al. 2011). Although the targets of oppositional/defiant behaviors are officially defined as authority figures such as parents and teachers, disruptive behaviors are also directed toward peers (Taylor et al. 2006). Indeed, children with ODD display hostility toward peers (Frankel and Feinberg 2002), employ aggressive responses when solving peer-related problems (Coy et al. 2001; Matthys et al. 1999), and engage in conflictual interchanges with agemates

(Li et al. 2014). As a result, peer rejection and social isolation may ensue (Li et al. 2014). In fact, ODD symptoms in elementary-grade children predict poor peer relationships, the presence of few friends, and problems with coworkers in adulthood (Burke et al. 2014).

To date, no study to our knowledge has investigated the mutual influences between ODD symptoms and child peer relationships over time. For example, a cross-lagged study demonstrated that child internalizing problems and the experience of peer exclusion affected each other over time (Hoglund and Chisholm 2014). Also, Powers and Bierman (2013) found that child aggression in the first grade predicted higher levels of peer dislike in the second grade, which in turn contributed to increased aggression in the third grade (see also van Lier and Koot 2010). These studies indicate that ODD symptoms, which reflect a combination of internalizing and externalizing problems, may also have mutual relations with child peer relationships. Our second aim, therefore, was to examine the bidirectional links between ODD symptoms and peer relationships over time.

### ODD Symptoms and Teacher–Student Relationships

Finally, impaired teacher–student relationships have been observed in children with ODD symptoms (Henricsson and Rydell 2004). Because children with ODD often exhibit angry/irritable, defiant, disobedient, and hostile behaviors in school, it is not surprising that teachers describe major difficulties in managing these children (Dobbs and Arnold 2009; McClowry et al. 2013). Indeed, teachers in Chinese elementary schools report impaired relationships with children who meet diagnostic criteria for ODD (Li et al. 2014). A longitudinal study found that child externalizing problems in the first grade predicted increased levels of conflict and anger in teacher–child interactions, along with decreased quality of teacher–student relationships (Henricsson and Rydell 2004).

Yet bidirectional linkages are also possible in this domain. For example, Tsai and Cheney (2012) showed that teacher–student relationship quality had a major influence on child problem behavior. Moreover, high levels of teacher–student conflicts predict subsequent child externalizing problems, whereas low levels of teacher–student closeness are related to increased internalizing problems (O'Connor et al. 2012). Parallel findings indicate that low teacher–student closeness leads to problem behavior (Skalická et al. 2015). Thus, bidirectional links between child ODD symptoms and teacher–student relationships were examined in the present study as well.

### Informant Discrepancies

Although the majority of studies have relied exclusively on parent reports of child ODD symptoms (e.g., Burke et al.

2014), increasing studies have suggested that teachers are also reliable and valid reporters (Evans et al. 2016; Drabick et al. 2007; Ise et al. 2014). However, a growing body of literature has noticed that the agreement between parent and teacher reports of child ODD symptoms is at low to moderate levels (Lavigne et al. 2015; Strickland et al. 2012), with parents generally reporting more symptoms of ODD (Strickland et al. 2012). The discrepancy between parents' and teachers' reports may present a context-specific phenomenon, suggesting that ODD symptoms are source- or informant-specific (Drabick et al. 2007; Lavigne et al. 2015; Munkvold et al. 2009), reflected in DSM-5 (American Psychiatric Association 2013), which describes ODD as a source-specific disorder.

Supportive evidence shows that parent reports of ODD symptoms, as compared to teacher reports, are related to higher levels of maternal detachment and more parental harsh punishment (Drabick et al. 2007; Tung and Lee 2014). Also, Lavigne et al. (2015) found family factors such as parent hostility and family conflict to influence parent but not teacher reports of child ODD symptoms. On the other hand, when compared with parent reports of ODD symptoms, teacher reports are more related to social problems (Drabick et al. 2007) and provide greater predictive utility for co-occurring symptoms (i.e., CD and major depressive disorder) (Drabick et al. 2011). Understanding child ODD symptoms in different settings (e.g., family and school) and examining their associations with contextual factors may contribute to interventions relevant to the setting in which ODD symptoms occur. Therefore, we addressed the issue of whether longitudinal associations between ODD symptoms and later interpersonal relationships varied in terms of parent vs. teacher informant reports.

### The Present Study

Although the research reviewed above reveals ODD symptoms to be related to poor interpersonal relationships, a gap still exists regarding the full understanding of longitudinal, bidirectional associations between child ODD symptoms and interpersonal functioning. Moreover, parent vs. teacher informant perspectives are an important aspect of relevant research. Therefore, we aimed to examine (1) the bidirectional associations between ODD symptoms and a broad domain of interpersonal relationships perceived by children, including parent–child relationships (i.e., father– and mother–child attachment), peer relationships, and teacher–student relationships; and (2) whether ODD symptoms reported by parents and teachers would show different links with such relationships over time. Based on previous research (Burke et al. 2008; Drabick et al. 2007; Hoglund and Chisholm 2014; Skalická et al. 2015), we hypothesized that child ODD symptoms and

interpersonal relationships would influence each other over time (see Fig. 1, Model 4) and that parent reports of ODD symptoms would be more closely related to parent–child relationships whereas teacher-reported ODD symptoms would be more closely associated with peer and teacher–student relationships.

## Method

### Participants

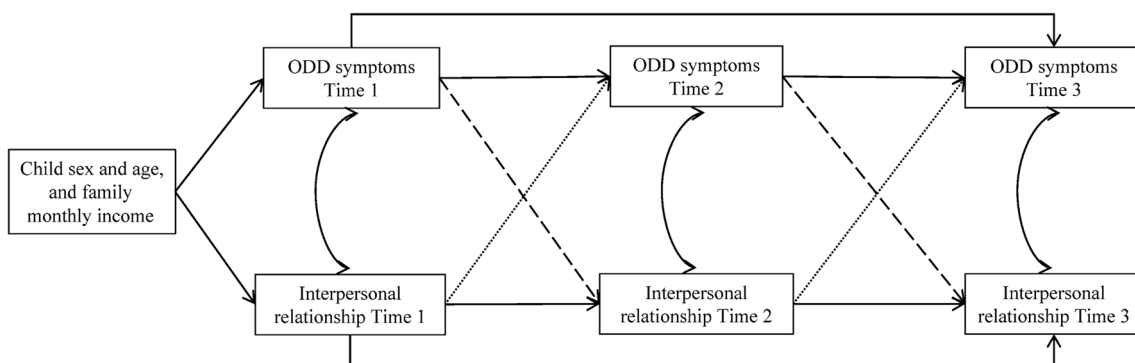
The participants included 256 children (186 boys, 69 girls, and 1 with missing sex information), along with their parents and teachers, drawn from a longitudinal study in China entitled “Family risk and protective factors of ODD.” Of the 256 families who participated at Time 1, 245 (95.70%) participated at Time 2, and 208 (81.25%) participated at Time 3. Most attrition was related to children moving to other schools. The age of children at Time 1 ranged between 6 and 13 years ( $M = 9.59$ ,  $SD = 1.58$ ); consistent with Chinese policy at the time, the clear majority (79.4%) were the only children in their families. Most mothers (77.0%) and fathers (79.5%) had high school diplomas or above. Families were from diverse socioeconomic levels: At Time 1, 56.1% families had a monthly income over 5000 Chinese Yuan (the average monthly income for Chinese urban families is about 5485 Chinese Yuan; National Health and Family Planning Commission of the PRC 2015). At Time 1, all children were diagnosed with ODD based on measures and interview with teachers. By Times 2 and 3, the percentages who continued to meet the 4-symptom diagnostic criteria for ODD via teacher reports were 48.8% and 42.7%, respectively. These percentages are consistent with other data revealing moderate stability of ODD diagnostic

status across different school years (Burke 2009; Nock et al. 2007).

### Procedure

At Time 1, during 2013–4, children were recruited from 8 elementary schools in Beijing, 2 elementary schools in Shandong Province, and 4 elementary schools in Yunnan Province, all in Mainland China. In China, class master teachers usually manage and teach students in one class throughout the six elementary years, providing the master teachers ample opportunity to observe child behaviors. Teachers are familiar with developmentally appropriate behaviors and they are exposed to a larger sampling of child behaviors than Chinese parents, most of whom have only one child (Strickland et al. 2012). Additionally, parents may not be honest about their children’s problems when interviewed face-to-face in school, as they may worry that teachers will have bad impressions of their children and show biased treatment of their children if diagnosed with ODD. Considering the symptoms of ODD are not required to present cross-situationally in the diagnostic criteria for ODD, and given that teachers are reliable and valid reporters of child ODD symptoms (Evans et al. 2016; Drabick et al. 2007; Ise et al. 2014), only the master teachers’ perspective was utilized in this study.

Master teachers were asked to nominate any students of their who might have ODD symptoms, based on the descriptive criteria in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; APA 2000). Only those children who were rated to display four or more symptoms could be considered as candidates for further investigation. Then, two clinical psychologists from XXX University interviewed class master teachers to individually confirm each candidate child’s ODD diagnosis, using a semi-structured interview. Inclusion criteria were the following: (a) the child exhibited four or more



**Fig. 1** The conceptual models: Examining longitudinal relationships between children’s ODD symptoms and interpersonal relationships. Model 1: Stability model with no cross-lagged paths; both dashed and dotted paths are dropped. Model 2: ODD-driven model with cross-lagged

paths from ODD symptoms to interpersonal relationship; dotted paths are dropped. Model 3: Relationship-driven model with cross-lagged paths from interpersonal relationship to ODD symptoms; dashed paths are dropped. Model 4: Reciprocal model with all paths included



symptoms of ODD described in DSM-IV-TR; (b) the child's identified symptoms had lasted for six months or more; and (c) the child demonstrated significant impairment across psychosocial functional domains. Children who met the diagnostic criteria for comorbidity of ODD and either CD or attention-deficit/hyperactivity disorder (ADHD) were also included, comprising the category of "inclusive ODD" (Maughan et al. 2004; Munkvold et al. 2011). Overall, 69 classes had one child meeting criteria for ODD, 75 classes had two children, and 9 classes had 3–4 children. The average class size of the 153 classes was 46.84 (range = 24–80). A comparison group of typically developing children was also recruited but was not included in the present study.

Data at Times 2 and 3 were collected approximately 1 and 2 years later, respectively. For each wave, invitation letters and informed consent were sent to parents and teachers. After obtaining written informed consent from parents and teachers and verbal assent from children, participating children, their parents, and their teachers were invited to fill out a set of questionnaires. The participating children were asked to forward a package containing a parent survey to either their mother or father. Parents were invited to fill out the survey and to return their completed surveys to the class master teachers within one week. Children completed questionnaires in conference rooms or music rooms on weekdays at school. Teachers completed questionnaires in their offices.

Opportunities for treatment of children and families were provided by Psychological counselors and a family therapist from the Center of Family Study and Therapy at Beijing Normal University and Psychiatrists from Anding Hospital when the participating families desired additional help. The study was conducted under the approval of the institutional review board at Beijing Normal University.

## Measures

**ODD symptoms.** Parents and teachers rated children's ODD symptoms with 8 items defined by the DSM-IV-TR (APA 2000). Parents and teachers responded on a dichotomous scale (0 = no, 1 = yes) by indicating the presence of ODD symptoms at each time point. The summed scores of 8 items were calculated and used as the indicator of ODD symptoms. Potential scores ranged from 0 to 8, with higher scores indicating greater numbers of ODD symptoms. This measure has shown good internal consistency in adolescents (Cronbach's  $\alpha = 0.93$ ; Lindhiem et al. 2015), and scores on this measure have been significantly correlated ( $r = 0.13 \sim 0.37$ ,  $ps < 0.05$ ) with child depression, anxiety, and ADHD symptoms in a sample of Canadian children less than 10 years old (Déry et al. 2017). In the current study, the reliability coefficients were calculated using the Kuder-Richardson Formula 20 (KR-20). Because ODD symptoms reported by teachers at Time 1 were used to

help diagnose ODD, the relevant scores ranged between 4 and 8 instead of 0–8, so the KR-20 Coefficient was not calculated at this time point for teacher data. The KR-20 Coefficient for the 8 items was 0.85 at Time 1, 0.83 at Time 2, and 0.85 at Time 3 for parent reports, and 0.90 and 0.91 at Times 2 and 3, respectively, for teacher reports.

**Parent–child attachment.** Parent–child attachment was measured by child reports of the Chinese Version Inventory of Parent and Peer Attachment (IPPA; Armsden and Greenberg 1987; Jin et al. 2011). The 15-item version of the IPPA was utilized to assess children's perceptions of both father–child and mother–child attachment. At each time point, children were asked to rate attachment with their mother and father respectively on Trust (5 items; e.g., "My father/mother respects my feelings"), Communication (5 items; e.g., "If my father/mother knows something is bothering me, he/she asks me"), and Alienation (5 items; e.g., "I am angry with my father/mother") using a 5-point scale (1 = never, 5 = always). A composite score was created for each father– and mother–child attachment by subtracting the scores of Alienation subscale from the sum scores of Trust and Communication subscales (Jin et al. 2011), with higher scores indicating stronger parent–child attachment. This measure has demonstrated moderate to good internal consistency (Cronbach's  $\alpha = 0.65 \sim 0.86$ ) and scores have been associated ( $r = -0.17 \sim -0.21$ ,  $ps < 0.01$ ) with interpersonal alienation in a sample of Chinese school children ages 12 to 17 (Jin et al. 2011). In the current study, the Cronbach's  $\alpha$  was 0.88, 0.84, and 0.89 for father–child attachment at Times 1, 2, and 3, respectively, and 0.88, 0.86, and 0.89 for mother–child attachment at Times 1, 2, and 3, respectively.

**Peer Relationships.** Child reports of the Children's Loneliness Scale (CLS; Asher et al. 1984) were used to measure children's satisfaction with their peer relationships at each time point. It includes 24 items, including 8 filler items that are not included in the scoring. Valid items include statements such as "I do not get along with other children" (reversed). All items were rated on a 5-point scale (1 = not true at all, 5 = always true). Scores of the 16 items were summed to create a composite score for peer relationships, with higher scores indicating better peer relationships. The CLS has shown good internal consistency (Cronbach's  $\alpha = 0.95$ ) and scores have been significantly associated ( $r = 0.31$ ,  $p < 0.001$ ) with peer acceptance in a sample of Chinese school children ages 8 to 12 (Chen et al. 2004). In this study, Cronbach's  $\alpha$  was 0.95, 0.90, and 0.93 at Times 1, 2, and 3, respectively.

**Teacher–student Relationships.** Were reported by children at each time point via the Chinese version of

Student–Teacher Relationship Scale (STRS; Pianta 2001; Zou et al. 2007). Children rated their perceptions of teacher–student relationships on four aspects: Closeness (7 items; e.g., “I share an affectionate, warm relationship with teacher”), Conflict (7 items; e.g., “I feel teacher is unfair to me”), Supportiveness (6 items; e.g., “Teacher often listens carefully to my comments or suggestions”), and Satisfactoriness (3 items; e.g., “Overall, I am satisfied with the relationship with teacher”). All items were rated on a 5-point scale (1 = not true at all, 5 = always true). Total scores of STRS were calculated by subtracting the scores of Conflict subscale from the sum scores of Closeness, Supportiveness, and Satisfactoriness subscales (Zou et al. 2007). Higher total scores indicate better teacher–student relationships. This measure has demonstrated good internal consistency (Cronbach’s  $\alpha = 0.88$ ) and scores have been correlated ( $r = -0.16$ ,  $p < 0.01$ ) with child problem behavior in a sample of Chinese school children ages 9 to 12 (Huang et al. 2016). In the current study, the Cronbach’s  $\alpha$  of STRS was 0.94, 0.92, 0.92 at Times 1, 2, and 3, respectively.

### Data Analytic Plan

In preliminary analyses, attrition analyses—involving independent-samples *t* tests—revealed that families who completed three waves of data did not differ significantly from those with fewer than three waves of data in terms of demographic variables (i.e., child sex, family monthly income, and parental education level;  $ps > 0.05$ ), parent and teacher reports of ODD symptoms ( $ps > 0.05$ ), and interpersonal relationships (i.e., father– and mother–child attachment, peer relationships, and teacher–student relationships,  $ps > 0.05$ ) at Time 1. However, child age was a significant predictor,  $t(254) = 3.89$ ,  $p < 0.001$ , Cohen’s  $d = 0.58$ . Children who did not complete all three waves of data ( $M = 10.33$ ,  $SD = 1.68$ ) were older than completers ( $M = 9.40$ ,  $SD = 1.50$ ). Therefore, full information maximum likelihood was used to handle missing data (Enders 2010). Descriptive statistics and correlations among study factors were examined in SPSS 20.0.

All models were conducted using Mplus version 7.0 (Muthén and Muthén 2012) to test the bidirectional associations between ODD symptoms reported by parents or teachers (separately) and parent–child relationships, peer relationships, and teacher–student relationships. Indexes of the model fit included maximum-likelihood chi-square statistic ( $\chi^2$ ), the comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Model fit was considered acceptable when the values of  $\chi^2$  were not significant or if a ratio of  $\chi^2/df < 3.0$ , and CFI  $> 0.90$ , TLI  $> 0.90$ , RMSEA  $< 0.08$ , and SRMR  $< 0.08$  (Hu and Bentler 1999).

The fit of each of the six cross-lagged models (see Fig. 1, Model 4) was then compared with (a) the fit of stability model without any cross-lagged paths (see Fig. 1, Model 1), (b) the ODD-driven model with only cross-lagged paths from ODD symptoms to interpersonal relationships (see Fig. 1, Model 2), (c) a and relationship-driven model with only cross-lagged paths from interpersonal relationships to ODD symptoms (see Fig. 1, Model 3). Chi square difference testing was applied to compare their model fits (Kline 2005).

## Results

### Descriptive Analyses and Correlations

The means, standard deviations, and correlations among study variables are presented in Table 1. Paired-sample *t* tests revealed that teachers reported more ODD symptoms than parents at Time 1 ( $t(254) = 16.52$ ,  $p < 0.001$ , Cohen’s  $d = 1.39$ ), Time 2 ( $t(243) = 6.66$ ,  $p < 0.001$ , Cohen’s  $d = 0.56$ ), and Time 3 ( $t(206) = 3.91$ ,  $p < 0.001$ , Cohen’s  $d = 0.38$ ).

Significant negative correlations were observed between parent-reported ODD symptoms at Time 1 and the three types of interpersonal relationships at Times 1, 2 and 3. Teacher-reported ODD symptoms at Time 1 were negatively correlated with mother–child attachment and peer relationships at Times 2 and 3 and with teacher–student relationships at three time points. For parent-reported ODD symptoms at Time 2, significant correlations were found with father– and mother–child attachment and teacher–student relationships at Times 1 and 2, and peer relationships at all three time points, whereas teacher-reported ODD symptoms at Time 2 were correlated with three domains of interpersonal relationships at three time points. Finally, significant correlations were found between parent-reported ODD symptoms at Time 3 and interpersonal relationships at three time points: the parent reports were negatively correlated with father–child attachment at three time points, mother–child attachment and peer relationships at Times 2 and 3, and teacher–student relationships at Times 1 and 2. While the teacher reports were correlated with father–child attachment at Time 2 and 3, mother–child attachment at Time 1 and 2, peer relationships at Time 3, and teacher–student relationships at Time 2.

### Relations between ODD Symptoms and Interpersonal Functioning

Covariates including child age, child sex, and family income were included in the models below. The indexes of model fit are presented in Table 2; all models showed good fit. For the associations between parent-reported ODD symptoms and parent–child attachment, peer relationships, or teacher–student relationships, ODD-driven models did not show worse

**Table 1** Means, standard deviations, and correlations among study variables

	1	2	3	4	5	6	7	8	9
1. T1 parent-reported ODD symptoms	1								
2. T1 teacher-reported ODD symptoms	0.21**	1							
3. T2 parent-reported ODD symptoms	0.56***	0.16*	1						
4. T2 teacher-reported ODD symptoms	0.45***	0.41***	0.37***	1					
5. T3 parent-reported ODD symptoms	0.48***	0.14	0.38***	0.21**	1				
6. T3 teacher-reported ODD symptoms	0.37***	0.39***	0.28***	0.66***	0.31***	1			
7. T1 father-child attachment	-0.30***	-0.02	-0.20**	-0.19**	-0.19*	-0.12	1		
8. T1 mother-child attachment	-0.33***	-0.09	-0.25***	-0.20**	-0.10	-0.24**	0.70***	1	
9. T2 father-child attachment	-0.31***	-0.09	-0.33***	-0.25***	-0.29***	-0.20**	0.54***	0.39***	1
10. T2 mother-child attachment	-0.31***	-0.16*	-0.27***	-0.19**	-0.20**	-0.20**	0.41***	0.57***	0.67***
11. T3 father-child attachment	-0.18*	-0.09	-0.09	-0.23**	-0.33***	-0.18*	0.44***	0.33***	0.50***
12. T3 mother-child attachment	-0.19**	-0.19**	-0.14	-0.19**	-0.19**	-0.12	0.25**	0.44***	0.36***
13. T1 peer relationships	-0.31***	-0.08	-0.23**	-0.21**	-0.05	-0.13	0.36***	0.45***	0.22**
14. T2 peer relationships	-0.28***	-0.18*	-0.39***	-0.23**	-0.16*	-0.15	0.24**	0.26***	0.45***
15. T3 peer relationships	-0.26**	-0.20**	-0.32***	-0.32***	-0.20*	-0.21**	0.21**	0.35***	0.27**
16. T1 teacher-student relationships	-0.31***	-0.22**	-0.19*	-0.25***	-0.21*	-0.13	0.47***	0.44***	0.30***
17. T2 teacher-student relationships	-0.34***	-0.27***	-0.33***	-0.35***	-0.27***	-0.26**	0.27***	0.34***	0.48***
18. T3 teacher-student relationships	-0.25**	-0.23**	-0.15	-0.28***	-0.15	-0.15	0.16*	0.30***	0.27**
M	2.65	5.48	1.99	3.47	2.13	3.16	53.81	55.73	53.33
SD	2.53	1.38	2.28	2.96	2.39	3.04	11.81	12.13	13.38

	10	11	12	13	14	15	16	17	18
1. T1 parent-reported ODD symptoms	1								
2. T1 teacher-reported ODD symptoms	0.34***	1							
3. T2 parent-reported ODD symptoms	0.55***	0.63***	1						
4. T2 teacher-reported ODD symptoms	.24**	0.07	0.15*	1					
5. T3 parent-reported ODD symptoms	0.38***	0.13	0.25**	0.51***	1				
6. T3 teacher-reported ODD symptoms	0.22**	0.37***	0.34***	0.44***	.60***	1			
7. T1 father-child attachment	0.32***	0.24**	0.21**	0.42***	0.26**	0.15	1		
8. T1 mother-child attachment	0.51***	0.28**	0.35***	0.28**	0.51***	0.29***	0.44***	1	
9. T2 father-child attachment									1
10. T2 mother-child attachment									
11. T3 father-child attachment									
12. T3 mother-child attachment									
13. T1 peer relationships									
14. T2 peer relationships									
15. T3 peer relationships									
16. T1 teacher-student relationships									
17. T2 teacher-student relationships									

**Table 1** (continued)

	10	11	12	13	14	15	16	17	18
18. T3 teacher–student relationships	0.34***	0.36***	0.45***	0.12	0.25**	0.35***	0.40***	0.52***	1
M	56.24	53.99	56.88	64.35	65.25	66.41	45.98	45.8	42.02
SD	12.87	12.3	12	12.46	13.28	13.44	17.63	17.61	19.31

ODD, Oppositional defiant disorder; T1, Time 1; T2, Time 2; T3, Time 3. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.005$

model fits compared to reciprocal models. For the links between teacher-reported ODD symptoms and parent–child attachment, the relationship-driven model did not show a worse model fit than the reciprocal model. However, for the links between teacher-reported ODD symptoms and peer or teacher–student relationships, both ODD-driven and relationship-driven models decreased the model fits compared to reciprocal models. Because the overall pattern of findings for reciprocal models was the same as for the best fitting models, we present below the findings from the reciprocal models. The findings of the best fitting models can be found in the online supplementary material (see Online Supplementary Fig. 1–3).

As shown in Fig. 2, the autoregressive paths for parent-reported ODD symptoms were statistically significant from Time 1 to Time 2 and from Time 1 to Time 3, but they were not significant from Time 2 to Time 3 when Time 1 ODD symptoms were also covaried. The parallel autoregressive paths for teacher-reported ODD symptoms were significant at each time interval. Additionally, the autoregressive paths for all the three domains of interpersonal relationships were significant at each time interval, with the exception of the path from Time 1 to Time 3 peer relationships.

For the cross-lagged paths between parent-reported ODD symptoms and child perceptions of interpersonal relationships, a consistent pattern emerged. Specifically, parent-reported ODD symptoms at Time 1 significantly predicted Time 2 interpersonal relationships, including father– and mother–child attachment, peer relationships, and teacher–student relationships, with the corresponding interpersonal relationship at Time 1 covaried—but not vice versa (see Fig. 2a, b, and c). Regarding teacher reports of ODD symptoms, no cross-lagged effect was found with child attachment for either father or mother (see Fig. 2a). On the other hand, teacher-reported ODD symptoms at Time 1 significantly predicted peer and teacher–student relationships at Time 2 (see Fig. 2b and c), and such symptoms at Time 2 also predicted peer relationships at Time 3 (see Fig. 2b). Furthermore, with respect to bidirectional influences, peer and teacher–student relationships at Time 1 significantly predicted teacher reports of ODD symptoms at Time 2 (see Fig. 2b and c).

To examine the longitudinal stability of autoregressive and cross-lagged paths, additional models were conducted and compared with the reciprocal models (see Table 3) and with the best-fitting models. These results from the stability analyses were consistent when using the reciprocal models or the best fitting models as baseline models. As shown in Table 3, when the autoregressive path coefficients for parent-reported ODD symptoms were constrained to be equal across time, the model fits decreased compared to reciprocal models, indicating that the autoregressive path coefficient for parent-reported ODD symptoms was greater from Time 1 to Time 2 than from Time 2 to Time 3. Similar tests revealed that autoregressive



**Table 2** Indexes of the model fit for tested models

Model	$\chi^2$ (df)	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$ ( $\Delta$ df)	p
Parent-reported ODD symptoms and parent–child attachment							
Model 4: Reciprocal Model	40.08 (28)	0.99	0.97	0.04	0.04		
Model 1: Stability Model	53.84 (36)	0.98	0.96	0.04	0.05	13.76 (8)	> 0.05
Model 2: ODD-driven Model	43.99 (32)	0.99	0.97	0.04	0.04	3.91 (4)	> 0.05
Model 3: Relationship-driven Model	50.08 (32)	0.98	0.96	0.05	0.05	10.00 (4)	< 0.05
Teacher-reported ODD symptoms and parent–child attachment							
Model 4: Reciprocal Model	39.43 (28)	0.98	0.97	0.04	0.04		
Model 1: Stability Model	55.95 (36)	0.98	0.96	0.05	0.07	16.52 (8)	< 0.05
Model 2: ODD-driven Model	49.65 (32)	0.98	0.96	0.05	0.06	10.22 (4)	< 0.05
Model 3: Relationship-driven Model	45.65 (32)	0.99	0.97	0.04	0.05	6.22 (4)	> 0.05
Parent-reported ODD symptoms and peer relationships							
Model 4: Reciprocal Model	17.96 (14)	0.99	0.97	0.03	0.03		
Model 1: Stability Model	28.38 (18)	0.97	0.94	0.05	0.05	10.42 (4)	< 0.05
Model 2: ODD-driven Model	19.35 (16)	0.99	0.98	0.03	0.03	1.39 (2)	> 0.05
Model 3: Relationship-driven Model	26.63 (16)	0.97	0.93	0.05	0.05	8.67 (2)	< 0.05
Teacher-reported ODD symptoms and peer relationships							
Model 4: Reciprocal Model	21.63 (14)	0.98	0.95	0.05	0.04		
Model 1: Stability Model	46.54 (18)	0.92	0.85	0.08	0.08	24.91 (4)	< 0.05
Model 2: ODD-driven Model	32.96 (16)	0.95	0.90	0.06	0.06	11.33 (2)	< 0.05
Model 3: Relationship-driven Model	35.01 (16)	0.94	0.89	0.07	0.06	13.38 (2)	< 0.05
Parent-reported ODD symptoms and teacher–student relationships							
Model 4: Reciprocal Model	19.66 (14)	0.98	0.95	0.04	0.04		
Model 1: Stability Model	32.38 (18)	0.95	0.90	0.06	0.06	12.72 (4)	< 0.05
Model 2: ODD-driven Model	21.48 (16)	0.98	0.96	0.04	0.04	1.82 (2)	> 0.05
Model 3: Relationship-driven Model	30.39 (16)	0.95	0.89	0.06	0.05	10.73 (2)	< 0.05
Teacher-reported ODD symptoms and teacher–student relationships							
Model 4: Reciprocal Model	21.66 (14)	0.98	0.94	0.05	0.04		
Model 1: Stability Model	39.19 (18)	0.93	0.88	0.07	0.07	17.53 (4)	< 0.05
Model 2: ODD-driven Model	27.74 (16)	0.96	0.92	0.05	0.05	6.08 (2)	< 0.05
Model 3: Relationship-driven Model	31.97 (16)	0.95	0.90	0.06	0.06	10.31 (2)	< 0.05

ODD, Oppositional defiant disorder

path coefficients for father– and mother–child attachment decreased over time. However, the autoregressive paths coefficients for teacher-reported ODD symptoms, peer relationships, and teacher–student relationships were stable over time.

The cross-lagged path coefficients were significantly different across time intervals for paths from parent-reported ODD symptoms to father–child attachment, from peer relationships to teacher-reported ODD symptoms, and from teacher-reported ODD symptoms to teacher–student relationships. The cross-lagged effects from parent-reported ODD symptoms to mother–child attachment and from teacher–student relationships to teacher-reported ODD symptoms were comparable across time intervals, but the path coefficients were not significant when constrained to be equal. The cross-lagged influences from parent-reported ODD symptoms to peer or teacher–student relationships or from teacher-reported ODD symptoms to peer

relationships were comparable and significant when constrained to be equal across time intervals.

### Discussion

To our knowledge, the present research is the first attempt to examine the bidirectional, longitudinal associations between child ODD symptoms and three main domains of interpersonal relationships in a Chinese cultural context. As expected, results indicated that more severe ODD symptoms reported by parents predicted child poorer relationships with father, mother, peers, and teachers, when prior levels of such interpersonal relationships were statistically adjusted. In terms of teacher reports of ODD symptoms, the main longitudinal associations were with later peer relationships and teacher–

student relationships. Reciprocally, lower quality of peer or teacher–student relationships predicted increased ODD symptoms as reported by teachers. These influences suggest that early intervention for children with ODD symptoms may be especially helpful for preventing future impairments in their interpersonal relationships, as well as future escalation of ODD symptoms. Finally, the different predictive pathways we found for parents vs. teacher reports of ODD symptoms highlight the importance of using multiple informants to examine ODD symptoms.

The overall prospective finding showed support for the cross-lagged effects from ODD symptoms to child interpersonal relationships, indicating that children with symptoms of ODD were highly likely to develop poor relationships with parents, peers, and teachers. Moreover, such ODD-driven effects were stable over three time points for peer and teacher–student relationships. These findings are consistent with previous cross-sectional research (Li et al. 2014; Tseng et al. 2011) and provide support for the “spillover” hypothesis (see Nelson et al. 2009) by showing the widening impact of ODD symptoms across a range of interpersonal domains (see Coy et al. 2001; Burke et al. 2014; Theule et al. 2016). Particularly in the Chinese culture, as described in the Introduction, such symptoms may seriously damage interpersonal harmony. Because parents, peers, and teachers are the main sources of children’s social support, poor relationships may isolate children from support systems, which may place them at even higher risk for subsequent problems (Herres and Kobak 2015; Kochanska et al. 2015).

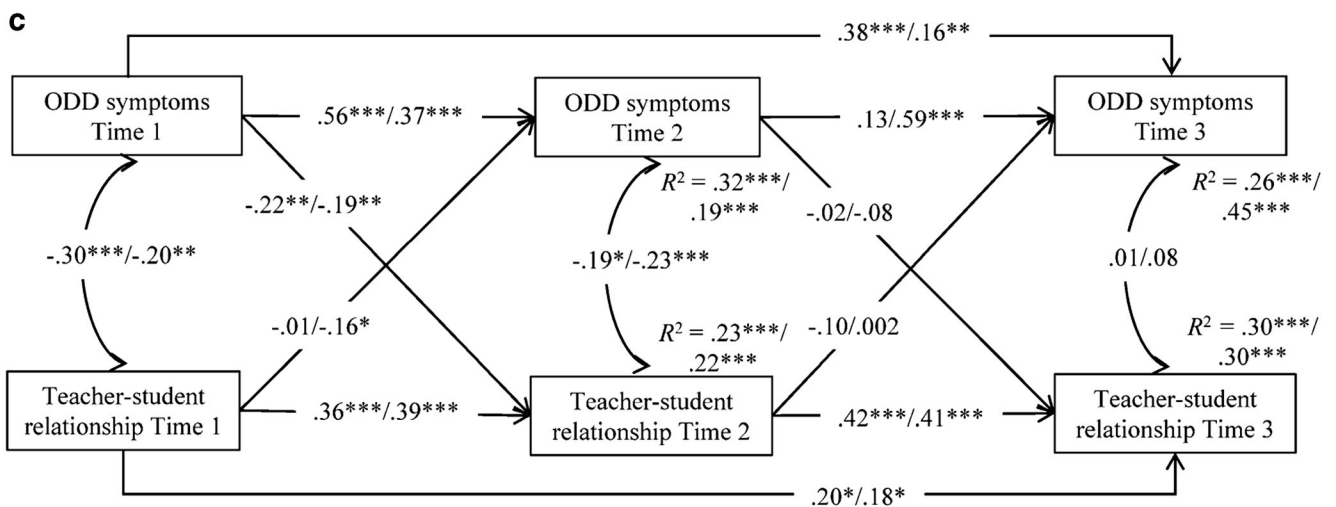
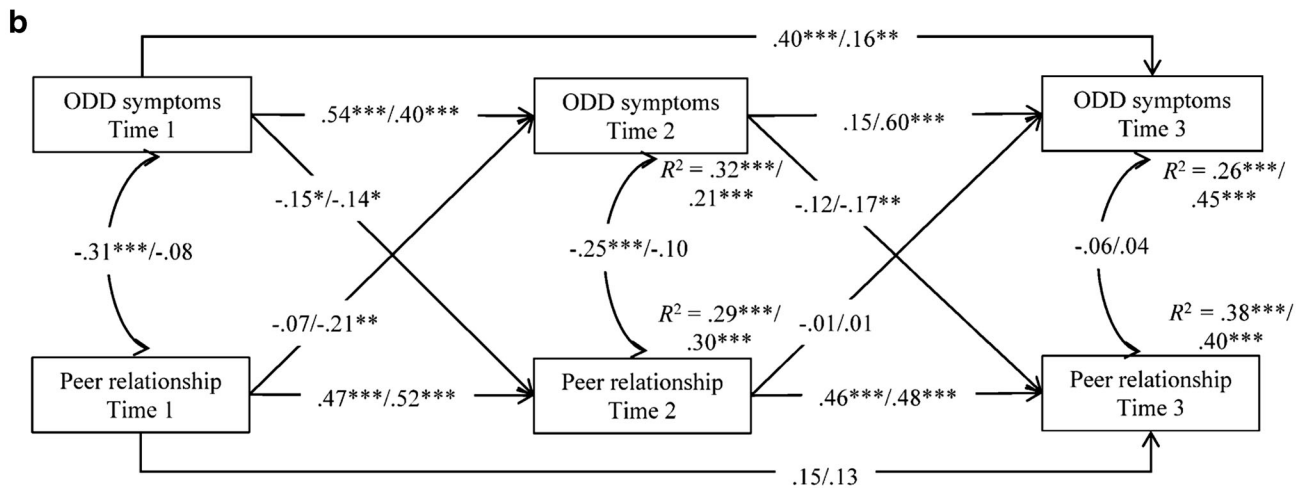
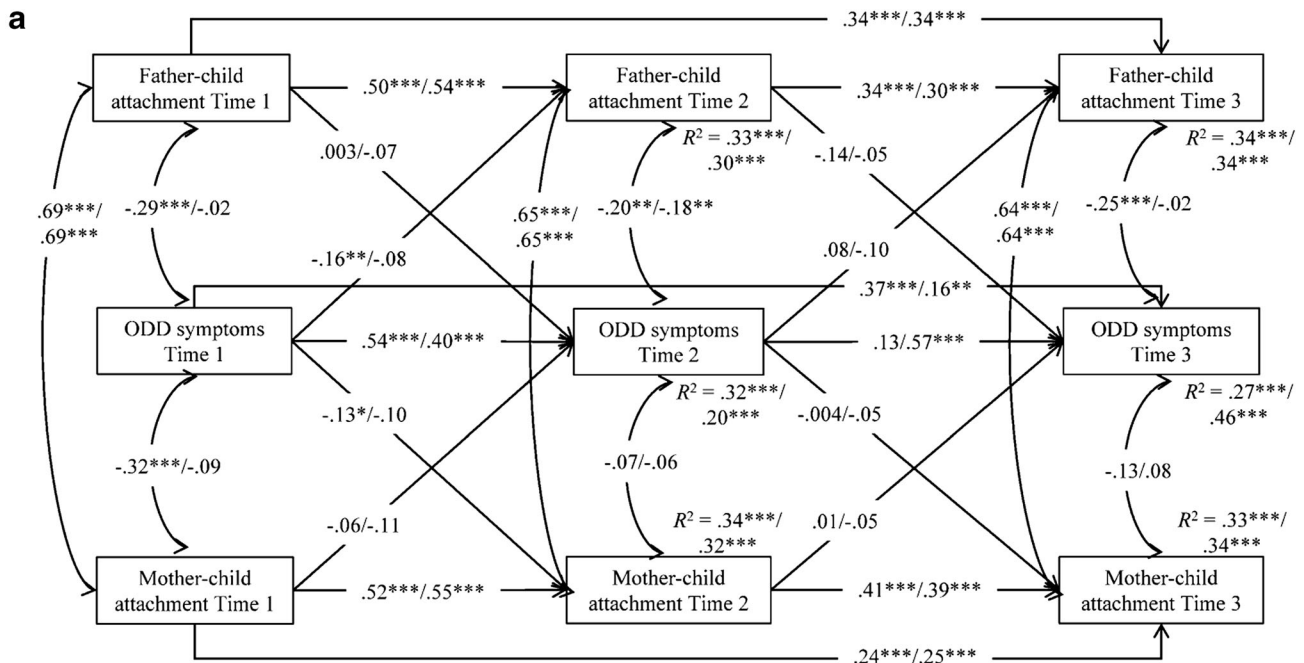
Importantly, the data for teacher-reported ODD symptoms and child interpersonal relationships also showed support for the relationship-driven model, suggesting that children’s experience of poorer relationships with peers or teachers increased the likelihood of subsequent ODD symptoms as reported by teachers. However, such relationship-driven effects were not stable over time, as peer or teacher–student relationships at Time 2 did not affect teacher reports of ODD symptoms at Time 3 after covarying previous ODD symptoms. A possible explanation for this finding is that as the severity of ODD symptoms declines over time, interpersonal relationships are no longer a significant predictor of child ODD symptoms. Alternatively, parents, teachers, and children may learn skills aiming to reduce child ODD symptoms and help improve child interpersonal relationships, either via formal clinical training programs or informal ways such as watching educational videos (note that treatment for disruptive disorder is still rare in China). Such intervention may influence child ODD symptoms and interpersonal relationships as well as their linkages. Our findings of reciprocal influences between interpersonal functioning and ODD symptoms have precedent (Hoglund and Chisholm 2014; Skalická et al. 2015). Such dynamic and reciprocal effects may indicate that the relations

**Fig. 2** Cross-lagged models of links between children’s ODD symptoms and their perceived relationships with parents (2a), peers (2b), and teachers (2c). Covariates are child sex, age, and family monthly income at Time 1 (not shown). Standardized path coefficients are shown. Path coefficients and values of  $R^2$  separated by a slash (/) represent coefficients for ODD symptoms reported by parents (before the slash) and teachers (after the slash). \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.005$

between ODD symptoms and interpersonal functioning are likely to be complex. Considering such vicious cycles may be of particular relevance for justifying early intervention for ODD.

As hypothesized, the source of information regarding ODD symptoms was influential in our findings. Specifically, the ODD-driven model was found to be the best fitting model for parent-reported ODD symptoms and all three domains of interpersonal relationships. Yet the relationship-driven model fitted the data best for teacher-reported ODD symptoms and parent–child attachment although the predicting effect of parent–child attachment was not found for ODD symptoms. Additionally, the reciprocal model was the best-fitting model for teacher-reported ODD symptoms and peer or teacher–student relationships. These results indicate that ODD symptoms reported by parents tend to have a unidirectional effect on child interpersonal relationships, whereas teacher-reported ODD symptoms are more likely to be reciprocally related to interpersonal relationships. Such findings provide support for context-specific effects of ODD behavior patterns and highlight the importance of considering different informants of ODD symptoms separately when examining their relations with important impairments (Lavigne et al. 2015; Munkvold et al. 2009). Specifically, in the school setting, a child may be observed to have more conflicts and exhibit more disruptive behaviors in the interactions with peers or teachers if this child has negative relationships with them, leading to a higher score of ODD symptoms reported by teachers. However, parents have less opportunity to observe child behaviors in peer and teacher–student interactions, then the two domains of relationships are less likely to influence child ODD symptoms perceived by parents. Additionally, in a family setting, although parents observe child behaviors during their interactions, the parenting behaviors such as warm or harsh parenting practices rather than parent–child attachment may be more likely to impact child development and the severity of ODD symptoms (Burke et al. 2008; Tung and Lee 2014).

Surprisingly, parents reported lower levels of ODD symptoms than teachers, which is inconsistent with previous research suggesting higher scores from parents than teachers (Strickland et al. 2012). The main reason, we believe, is that children with ODD were screened out primarily based on teachers’ reports. Because the agreement between parents and teachers with respect to child ODD symptoms was at best



**Table 3** Longitudinal stability of autoregressive and cross-lagged paths

Path coefficients constrained to be equal <sup>a</sup>	$\Delta\chi^2(1)$ <sup>b</sup>	p	B <sup>c</sup>	SE
<b>Autoregressive paths</b>				
Parent-reported ODD symptoms	10.17~12.85	< 0.05		
Teacher-reported ODD symptoms	1.73~3.65	> 0.05		
Father-child attachment	8.54~15.67	< 0.05		
Mother-child attachment	4.95~7.43	< 0.05		
Peer relationships	0.17~0.52	> 0.05		
Teacher-student relationships	0.33~0.92	> 0.05		
<b>Cross-lagged paths</b>				
Parent-reported ODD symptoms— > Father-child attachment	7.09	< 0.05		
Parent-reported ODD symptoms— > Mother-child attachment	1.93	> 0.05	−0.37	0.22
Parent-reported ODD symptoms— > Peer relationships	0.06	> 0.05	−0.74**	0.25
Parent-reported ODD symptoms— > Teacher-student relationships	3.23	> 0.05	−1.02**	0.37
Teacher-reported ODD symptoms— > Peer relationships	0.96	> 0.05	0.90***	0.25
Peer relationships— > Teacher-reported ODD symptoms	7.14	< 0.05		
Teacher-reported ODD symptoms— > Teacher-student relationships	4.39	< 0.05		
Teacher-student relationships— > Teacher-reported ODD symptoms	3.32	> 0.05	−0.01	0.01

ODD Oppositional defiant disorder

<sup>a</sup> Autoregressive or cross-lagged paths were not included without significant effects at any time interval

<sup>b</sup> All models were compared with Model 4 (reciprocal models)

<sup>c</sup> Unstandardized coefficient when specific cross-lagged path coefficients were constrained to be equal

\*\*p < 0.01, \*\*\*p < 0.005

moderate in previous research (Drabick et al. 2007; Lavigne et al. 2015), it is expected that children rated as exhibiting high levels of ODD symptoms by teachers are not rated to have so many ODD symptoms by their parents. A second possible explanation is that because most participating families have only one child (an “only child”) due to the one-child policy in China (a policy that was phased out in 2016), Chinese parents may not have much experience with understanding or contextualizing child problem behavior. Lacking contrasts between children with defiant symptoms and typically developing siblings, such parents may subjectively underestimate child ODD symptoms. Alternatively, Chinese children who spend most of their daytime at school on weekdays have a lot of social interactions with peers and teachers, which can provide increased opportunities for master teachers to observe student problem behavior and emotion. Therefore, teachers rather than parents may be more likely to have encountered and endorsed child ODD symptoms in the present investigation.

### Limitations

A key limitation of this study is that we did not examine the parent or child sex differences. Because only one parent (either mother or father) was asked to complete the research

measures, we could not exclude the possibility that the effects tested in this study were discrepant between father and mother reports (We did find, however, that fathers and mothers reported similar levels of child ODD symptoms at Time 1,  $t(254) = 0.10$ ,  $p > 0.05$ ). Moreover, the relatively small sample of girls ( $n = 69$ ) prevented further examination of sex differences in the associations between child ODD symptoms and interpersonal functioning. Future research may benefit from extending these analyses in a larger sample and further examining whether these effects are different in different parent–child dyads (i.e., father–son, father–daughter, mother–son, and mother–daughter).

Another concern, noted above, is that most families in this study had only one child. Thus, we could not explore the associations between child ODD symptoms and sibling relationships. Moreover, it is unknown whether these findings could be generalized to families with more than one child. Because the sibling plays a special role in a child’s life, it is interesting for future research to extend these findings to families with more than one child.

A third limitation is that we did not exclude children who also met diagnostic criteria for ADHD or CD, so effects may not be specific to ODD symptoms. Yet the comorbidity is sufficiently high across these domains (e.g., Boylan et al.



2007; Nock et al. 2007) that enforcing such exclusions would have resulted in an unrepresentative sample.

Fourth, the diagnosis of ODD at Time 1 mainly relied on teachers' reports. This screening procedure may include the biased of including children whose ODD symptoms are primarily exhibited in the school setting. Findings in the current study may not generalize to children who prominently display ODD symptoms in other settings such as the family setting. Multiple informants, including teachers, parents, peers, and children themselves, may be useful to provide a more comprehensive assessment of child behavior across different settings.

Finally, over half of children did not meet the 4-symptom diagnostic criteria for ODD via teacher reports at Times 2 and 3. Although this decline is consistent with previous research suggesting relatively low or moderate ratios of children identified with ODD who continue to meet diagnostic criteria in the following years (Burke 2009; Nock et al. 2007), we could not exclude the possibility that some of the children and their families received treatment during our research. Unfortunately, this information was not collected in this study. Such treatment effect should be considered in future research.

## Implications

Despite these limitations, the empirical findings of the mutual influences between ODD symptoms and child interpersonal functioning emphasize the importance of identifying and intervening with children displaying serious ODD symptoms at an early age. It is highly likely that vicious cycles develop, through which more severe ODD symptoms impair interpersonal relationships, which, in turn, escalate the severity of ODD symptoms over time. Therapies aimed at improving parent–child, peer, or teacher–student relationships may help decrease the severity of ODD symptoms. More specifically, the small to moderate correlations between parent and teacher reports of ODD symptoms found in this and previous research indicate that ODD symptoms may be context-specific (Drabick et al. 2007; Lavigne et al. 2015; Munkvold et al. 2009). Therefore, clarifying the setting in which children display ODD symptoms prominently—and constructing interventions target context-specific processes—may be especially important for future research (Strickland et al. 2012). For example, a school-based intervention designed to reduce child ODD symptoms and improve child peer relationships and teacher–student relationships may be beneficial. Furthermore, interventions that target the family setting may be helpful for children who are diagnosed with ODD based on parent reports.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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