



Change in Maternal Stress for Families in Treatment for their Children with Oppositional Defiant Disorder

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Published online: 4 April 2018

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Abstract

Our objective was to predict change in maternal stress over the course of a randomized clinical trial comparing the efficacy of two interventions for Oppositional Defiant Disorder (ODD): Parent Management Training and Collaborative & Proactive Solutions. In a secondary analysis of data collected from this randomized clinical trial, we examined whether children's self-reported positive relations with their parents impacted responsiveness to treatment, which in turn impacted maternal stress. One hundred thirty-four children and their parents (38.1% female, ages 7–14, M age = 9.51, SD = 1.77) were tracked across three time points: pre-treatment; one-week post-treatment; and six-month post-treatment. Hierarchical linear models tested change in children's reports of positive relations with parents, clinician reports of ODD severity, and maternal reports of parenting stress. Models then tested multilevel mediation from positive relations with parents, through ODD severity, onto maternal stress. Hypothesized indirect effects were supported such that children's reports of positive views toward parents uniquely predicted reductions in ODD severity over time, which in turn uniquely predicted reductions in maternal stress. Results highlight the promise of potential secondary benefits for parents following interventions for children with oppositional problems. Furthermore, results underscore the importance of the parent–child relationship as both a protective factor and as an additional target to complement interventions for child disruptive behaviors.

Keywords Oppositional defiant disorder · Parent–child relationship · Maternal stress

Oppositional defiant disorder (ODD) is a commonly diagnosed disruptive behavior disorder among children marked by hostile and defiant behavior (American Psychiatric Association 2013). Children with these behavioral problems tend to have poorer relations with their parents (e.g., Greene et al. 2002) and these problems are thought to contribute to stress in parents, as parents view children as more difficult to manage, view their relationship with children as more dysfunctional, and view themselves as inadequate parents

and overburdened in the parenting role (Abidin 1995; Anthony et al. 2005; Burke et al. 2008; Reitman et al. 2002; Sollie et al. 2016; Theule et al. 2013; Williford et al. 2007). Importantly, most interventions for disruptive behavior disorders include a focus on improving the relationship between children and their parents. In community contexts, children who report more positive relationships with their parents also report greater adjustment in social and behavioral areas (Larsen and Mooney 2008). Ultimately, youth who enter into clinical intervention with a more positive view toward parents might show greater responsiveness to treatments; subsequently, they might also show reduced ODD severity resulting in outcomes that have broader implications for parent outcomes, such as stress.

Parenting stress involves feelings of being overwhelmed, under-resourced, and frustrated in handling the everyday demands of parenting as well as commonplace, but frustrating, child behaviors such as talking back and engaging in disruptive behaviors in public (Crnic and Greenberg 1990). Parenting stress is an important area of focus as it is tied to detrimental or inconsistent parenting behaviors and attitudes (Deater-Deckard 1998; Deater-Deckard and Scarr 1996) and

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s10826-018-1089-1>) contains supplementary material, which is available to authorized users.

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to detrimental outcomes for both parents (i.e., increased risk for psychopathology; Perren et al. 2005) and their children (i.e., substance use [Nash et al. 2005]; behavior problems [(Benzies et al. 2004); Mackler et al. 2015]). Parenting stress, like broader perceptions of life stress, tends to be relatively stable (Crnic et al. 2005). Yet, if there are improvements in the home environment that make caregiving roles less frustrating for parents—such as improvements in children’s oppositional behaviors and parenting practices—parents’ perceptions of caregiving stress may decrease.

Children’s positive attitudes toward parents may be an informative predictor of parenting stress. Children who hold more positive views toward their parents may be more receptive to interventions requiring strong cooperation and collaboration with parents. Hence, these children may show greater improvements to ODD interventions and, ultimately, display fewer stress-inducing, oppositional behaviors in the home. In general, as children show improvements in externalizing symptoms over time through clinical intervention, parenting stress tends to be reduced (e.g., Campbell et al. 1996; Larsson et al. 2009; Nixon et al. 2003). Yet, no known studies have addressed children’s positive views of the relationship with their parents and the effects of these relationships on parent or family outcomes, such as parental stress. This child factor is of interest because interventions for disruptive behavior disorders often emphasize improved child responsiveness toward parent instruction and investment in problem-solving with parents (for review see Brestan and Eyberg 1998). However, reports of relationship quality among community, non-referred children have been linked to greater well-being and adjustment.

Booker et al. (2016) have previously shown that children’s positive views toward the relationship with their parents predict greater improvement in ODD symptoms following treatment (measured as ODD severity on a semi-structured diagnostic interview). The current study expanded efforts to test the implications of children’s positive relations with parents. A mediation model was tested considering children’s positive relations with parents as a predictor, maternal stress as an outcome, and improvements in ODD severity as a mediator. Children’s positive relations with toward their parents were expected to uniquely predict improvements in ODD severity following ODD intervention. ODD severity across time was expected to uniquely predict outcomes in maternal stress.

Method

Participants

Participants were 134 youth (38% female) and their mothers (84% Caucasian, 56% mothers with college-education) who

enrolled in a randomized clinical control trial (RCT) providing treatment for the child’s ODD symptoms (Ollendick et al. 2016). All participants were between the ages of 7–14 years of age ($M = 9.51$ years; $SD = 1.77$) and met DSM-IV criteria for ODD, as established by a semi-structured clinical interview (see below). Household income ranged from less than \$10,000 to \$180,000, with mean household income of \$66,780 ($SD = \$38,215$). Exclusion criteria included a diagnosis of intellectual disability, autism spectrum disorder, and/or psychosis, as determined by parent report during a telephone screener. Although considerable comorbidity was present in our sample, the behaviors associated with ODD were the reason for referral in all cases.

Procedure

Participants were recruited through university-affiliated clinics, school health services, pediatricians, child psychiatric services, and print advertisements. Children and their mothers participated in two pre-treatment assessment sessions. During the pre-assessment, parents and children completed a semi-structured diagnostic interview as well as questionnaires. Following the completion of these assessment sessions, participants were randomized to either PMT or CPS [see Ollendick et al. 2016, for further treatment details]. Briefly, PMT is an evidence-based treatment that is considered a “gold standard” intervention for youth with ODD (Brestan and Eyberg 1998). PMT emphasizes educating parents about oppositional and defiant behavior and training parents to better attend to and elicit compliant behaviors from children. CPS is an emerging intervention that emphasizes the identification of lagging emotion regulation and problem-solving skills that are relevant for oppositional and defiant behaviors (Greene 1998; 2010). This intervention encourages parents and children identify ways to collaborate toward problem-solving to promote these lagging skills. Participants in both treatment conditions received weekly, 75-min treatment sessions for up to 14 sessions with a mean of 10.28 (3.86) for PMT families and 9.87 (3.62) for CPS families. Subsequent assessment sessions were conducted one-week post-treatment and six-month post-treatment.

Measures

The Anxiety Disorders Interview Schedule for DSM-IV-Child and Parent Versions (ADIS-IV-C/P; Silverman and Albano 1996). Clinical diagnoses were assigned using the ADIS-IV-C/P, a semi-structured clinical interview that assesses a range of DSM-IV disorders. The ADIS-IV-C/P is a widely used clinical instrument used to ascertain the severity of the child’s ODD as well as assess for the

presence of co-occurring disorders. The use of the ADIS-IV as a reliable assessment tool has been well documented in samples of youth with ODD (Anderson and Ollendick 2012). Separate clinicians administered the ADIS-C and ADIS-P to the child and parent, respectively. Clinicians independently assigned severity ratings (CSR) on a 9-point scale ranging from 0 to 8, with a rating of ≥ 4 signifying clinical diagnosis. ADIS-IV interviews were administered at pre-treatment as well as at all subsequent assessments following treatment. All assessors were blind to the randomized treatment conditions, both prior to and following treatment. Reliability for the primary and secondary diagnoses was conducted for 20% of the interviews. Using Cohen's Kappa, agreement among clinicians on primary, secondary, and tertiary diagnoses were 0.77, 0.85, and 0.86, respectively (0.89 for ODD diagnoses). Meetings were held following each assessment to ascertain consensus diagnoses from the parent and child interviews. During these consensus meetings, both the parent and child assessors provided a summary of their assessment observations and justification for assigning their CSRs. Any discrepancies were resolved by the project director, a licensed clinical psychologist. Consensus agreement of the child's ODD CSR at each time point was the primary dependent measure of treatment outcome.

Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds and Kamphaus 2000). The BASC-2 was completed at each assessment point. For the present study, the 11-item *Relations with Parents* subscale was analyzed. Children reported on their perceptions of positive behaviors (e.g., "I like to be close to my parents") and the overall relationship quality (e.g., "I get along with my parents") with caregivers. BASC items are coded on a Likert scale ranging from 0 (*Never*) to 3 (*Always*). This scale was *T*-scored. Internal consistency was acceptable across assessments ($\alpha = 0.85\text{--}0.86$).

Parenting Stress Index-Short Form (PSI-SF; Abidin 1995). The PSI-SF is a 36-item parent-report measure which assesses general parental stress and stress due to the child-caregiver relationship. This scale examines three major dimensions of parenting stress: *distress* related to the various demands and obligations of the parental role (e.g., "I don't enjoy things as I used to"); *interactions with children as dysfunctional* or hostile (e.g., "My child makes more demands on me than most children"); and *children as difficult* to manage and raise (e.g., "Sometimes my child does things that bother me just to be mean"). Mothers completed the PSI-SF at all assessment points. Reports are on a 5-point scale ($1 = \text{Strongly Agree}$ to $5 = \text{Strongly Disagree}$). Higher scores indicate greater stress. For the total maternal stress score, internal consistencies were acceptable across assessments ($\alpha = 0.87\text{--}0.88$).

Data Analyses

Preliminary analyses

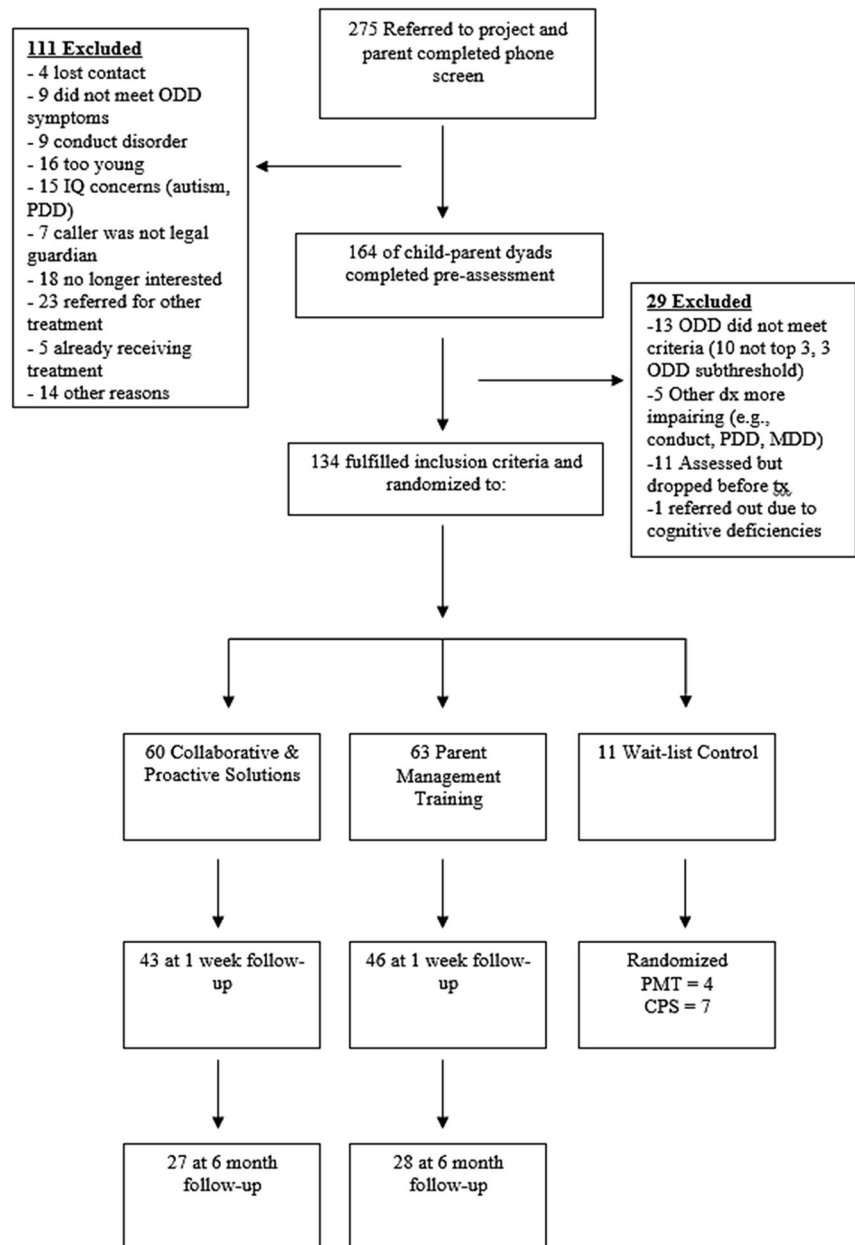
Following current guidelines of the Consolidated Standards of Reporting Trials (CONSORT), imputation was used to address missing outcome data (See Fig. 1; Moher et al. 2010). Using SPSS 24.0 (IBM, 2016), 100 imputations were computed for missing data at the post-treatment and six-month follow-up time points. Many imputations were conducted to minimize potential bias (see Graham et al. 2007). Bivariate correlations tested associations between variables across the three assessments (pre-treatment; one-week post-treatment; six-month post-treatment).

Hypothesis tests

Hierarchical linear models tested for within- and between-subjects differences for each clinical outcome of interest: children's reports of positive relations with parents; clinicians' reports of children's ODD severity; and mothers' reports of maternal stress (See the Supplemental Materials). The R statistical program (R Core Team 2016) and packages of *lme4* (Bates et al. 2015) and *lmerTest* (Kuznetsova et al. 2016) were used for modeling. Full estimation maximum likelihood was used for all models.

The first model tested for linear change of each outcome (Model 1). The second model tested effects of demographic (and time-invariant) covariates on each outcome—testing whether families showed average differences in outcomes given background characteristics (e.g., whether girls reported relations with parents at a higher level on average relative to boys). Then, controlling for significant covariates, models tested the direct effect of child-reported (and time-varying) relations with parents on ODD severity and maternal stress (Model 3). This model tested the effect of relations with parents on outcomes within assessments (e.g., whether higher reports of relations with parents coincided with lower reports of maternal stress within each assessment). Lastly, a model tested the effects of both time-varying relations with parents and time-varying ODD severity on maternal stress. This model addressed unique effects of ODD severity on maternal stress within each assessment.

To test for multilevel mediation, a final model tested effects on two "stacked", time-varying outcomes (see the Supplemental Materials): ODD severity as the mediator of interest and maternal stress as the dependent variable of interest. This approach attempts to limit concerns of confounds between lower- and upper-level effects (see Kenny et al. 2003; Zhang et al. 2009). This equation provides a covariance effect between the effect on the mediator and the effect on the dependent variable—something which is not

Fig. 1 Flow chart of participants across study phases

obtained in a product of coefficients test (e.g., Sobel test). The effects, their variances, and the covariance between effects were used to conduct Monte Carlo (percentile) confidence intervals for an indirect effect test (Selig and Preacher 2008). First, this model tested for the effect of child-reported relations with parents on time-varying ODD severity, controlling for pre-treatment ODD severity within families. Second, this model tested for the effect of clinician-reported ODD severity on mother-reported maternal stress, controlling for pre-treatment maternal stress and the effect of relations with parents. Because of the way these effects were tested in a single model, a covariance effect was calculated between the ‘a path’ effect of

relations with parents on ODD severity and the ‘b path’ effect of ODD severity on maternal stress.

Results

An independent samples *t*-test did not reveal a difference in mean number of treatment sessions completed between treatment groups ($t(132) = 0.65$, $d = 0.11$, $p = .519$). Moreover, when only considering “completer” families with seven or more treatment sessions, there was no difference between treatment groups in the proportion of families who completed treatment ($\chi^2(1) = 0.18$, $p = .671$).

Table 1 Bivariate correlations and descriptives across time points

		Maternal stress			Relations with parents			ODD severity		
		Pre	Post	6 Mo.	Pre	Post	6 Mo.	Pre	Post	6 Mo.
Maternal stress	Pre	–	0.33**	0.17	–0.04	0.01	0.11	0.18	0.11	–0.04
	Post		–	0.36**	–0.10	–0.16	0.07	–0.04	0.34**	0.25**
	6 Mo.			–	–0.13	–0.10	–0.13	0.12	0.18	0.38**
Relations with parents	Pre				–	0.68**	0.56**	0.02	–0.21*	–0.03
	Post					–	0.48**	–0.10	–0.39**	–0.14
	6 Mo.						–	0.31**	–0.02	–0.19*
ODD severity	Pre							–	0.26**	0.03
	Post								–	0.27**
	6 Mo.									–
Mean		2.76	2.49	2.47	41.89	43.78	47.35	5.93	3.64	3.40
SD		0.45	0.25	0.20	11.48	10.27	13.82	1.02	1.73	1.46

Note: Maternal stress scores represent the mean item average. Relations was Parents scores are *T*-scores, standardized such that a score of 50 represents the expected average

* $p < .05$, ** $p < .01$

Table 2 Deviance test comparisons of model fit

	Relations with parents			ODD severity			Maternal stress		
	Δdf	$\Delta Dev.$	Sig.	Δdf	$\Delta Dev.$	Sig.	Δdf	$\Delta Dev.$	Sig.
Baseline growth model	–	–	–	–	–	–	–	–	–
Adding covariates	6	17.4	0.008	6	17.2	0.009	6	5.67	0.461
Removing <i>n.s.</i> covariates	4	4.5	0.349	4	7.5	0.112	6	5.67	0.461
Adding relations with parents effect	–	–	–	7	95.7	0.000	3	5.30	0.150
Adding ODD severity effect	–	–	–	–	–	–	1	50.64	0.000

Note: Dev. = the deviance score ($-2 * \text{model log-likelihood}$)

Table 1 presents study variable descriptives and bivariate correlations.

Hypothesis tests used hierarchical linear modeling to test associations while accounting for differences between families and within families over the three assessments (pre-treatment; one-week post-treatment; six-month post-treatment). A series of models was tested: unconditional change in each outcome; the effects of time-invariant demographic effects were added; the effect of time-varying relations with parents was added; and lastly the effect of time varying ODD severity was added. Demographic covariates that were not significant predictors were removed from successive models. Deviance tests suggested that removed effects did not significantly weaken model fit (See Table 2).

Table 3 presents HLM fixed effects for baseline growth models, added effects of covariates, the added effect of relations with parents, and the added effect of ODD severity. In baseline growth models, each outcome showed significant change within families from pre-treatment to six-month post-treatment. Positive relations with parents

significantly increased, whereas ODD severity and maternal stress decreased.

The next model series added fixed effects of demographic covariates. For maternal distress, there were no significant effects of demographics. For relations with parents, older children and children who eventually received more treatment sessions reported poorer relations with parents. For ODD severity, girls and older children had ODD severity scores on average.

Positive relations with parents had a significant, negative effect on maternal stress and a significant, negative effect on ODD severity. Within assessments, greater reports of relations with parents from children coincided with lower reports of maternal stress and less severe reports of ODD severity. ODD severity showed a positive, significant effect of maternal stress. Within assessments, when ODD Symptoms were reported as more severe, maternal stress was also reported as more severe. With the inclusion of ODD severity, relations with parents no longer had a significant and unique effect on maternal stress.

Table 3 Multilevel fixed effects of growth models for study outcomes

	Relations with parents				ODD severity				Maternal stress			
	Est.	S.E.	<i>d</i>	Sig	Est.	S.E.	<i>d</i>	Sig	Est.	S.E.	<i>d</i>	Sig
Baseline growth												
Intercept	41.43	0.96	–	0.000	5.59	0.11	–	0.000	2.70	0.04	–	0.000
Time	2.84	0.53	0.32	0.000	–1.26	0.09	–3.15	0.000	–0.14	0.02	–0.39	0.000
Added covariates												
Intercept	49.45	3.22	–	0.000	5.60	0.32	–	0.000	2.69	0.07	–	0.000
Gender	0.80	1.73	0.08	0.643	0.38	0.17	1.09	0.028	0.05	0.03	0.14	0.106
Age	–1.92	0.84	–0.20	0.023	0.18	0.08	0.52	0.036	0.01	0.02	0.03	0.526
Anxiety comorbidity	1.36	1.76	0.14	0.442	–0.33	0.17	–0.95	0.059	0.01	0.03	0.03	0.672
ADHD comorbidity	–1.99	1.84	–0.10	0.284	0.22	0.18	0.63	0.222	–0.03	0.04	–0.08	0.402
Intervention group	2.33	1.63	0.24	0.156	–0.05	0.16	–0.14	0.747	–0.02	0.03	–0.06	0.590
Completed sessions	–0.89	0.22	–0.09	0.000	–0.01	0.02	–0.03	0.660	0.00	0.00	0.00	0.719
Time	2.85	0.53	0.29	0.000	–1.26	0.09	–3.63	0.000	–0.14	0.02	–0.40	0.000
Added rel. w/ parents												
Intercept	–	–	–	–	5.41	0.13	–	0.000	2.70	0.04	–	0.000
Gender	–	–	–	–	0.30	0.17	0.83	0.072	–	–	–	–
Age	–	–	–	–	0.15	0.08	0.42	0.069	–	–	–	–
Rel. w/ parents	–	–	–	–	–0.28	0.08	–0.78	0.001	–0.03	0.01	–0.08	0.043
Time	–	–	–	–	–1.20	0.09	–3.33	0.000	–0.13	0.02	–0.37	0.000
Added ODD severity												
Intercept	–	–	–	–	–	–	–	–	2.36	0.04	–	0.000
Rel. w/ parents	–	–	–	–	–	–	–	–	–0.01	0.01	–0.04	0.178
ODD severity	–	–	–	–	–	–	–	–	0.06	0.01	0.15	0.000
Time	–	–	–	–	–	–	–	–	–0.06	0.02	–0.15	0.005

Note: Rel. w/ parents = relations with parents. For Gender, girls are given the higher value. Child age and relations with parents were centered and standardized when included as model effects. The Added Rel. w/ Parents and Added ODD Severity models account for significant covariates

A final model combined two sets of effects to test support for mediation (based on Bauer et al. 2006). Table 4 presents the fixed effects for this model series. After accounting for pre-treatment ODD severity, reports of positive relations with parents had unique effects on ODD severity. Further, after accounting for pre-treatment maternal stress and reports of relations with parents, reports of ODD severity had unique effects on maternal stress. Using these effects and the covariance between the ‘a path’ effect on ODD severity and the ‘b path’ effect on maternal stress ($-6.92e-05$), Monte Carlo confidence intervals of an indirect effect were calculated using 20,000 resamples (Selig and Preacher 2008). An indirect effect was supported (Indirect Effect 95% CI: $-0.114, -0.024$). Children’s positive views on their relations with parents robustly predicted lower ODD severity (beyond the influence of starting values of

Table 4 Multilevel mediation model fixed effects for maternal stress

Maternal stress				
	Estimate	SE	<i>d</i>	Sig
<i>Outcome = ODD severity</i>				
Baseline ODD severity	0.36	0.03	0.88	0.000
Gender	0.23	0.17	0.56	0.164
Age	0.06	0.09	0.15	0.464
Relations with parents	–0.60	0.08	–1.46	0.000
<i>Outcome = maternal stress</i>				
Baseline maternal stress	0.18	0.06	0.44	0.009
Rel. w/ parents	–0.01	0.07	–0.02	0.977
ODD severity	0.11	0.03	0.27	0.001

Note: Rel. w/ parents = relations with parents. For Gender, girls are given the higher value. The overall intercept is not shown

ODD severity), and ODD severity robustly predicted poorer maternal stress (beyond the influence of starting values of maternal stress and time-varying relations with parents).

Discussion

Although maternal stress is recognized as an important factor that affects family harmony (e.g., Deater-Deckard and Scarr 1996; Mackler et al. 2015), positive child factors that may shape or alter parenting stress remain understudied. This gap in research is striking in the context of child interventions which rely heavily upon parents as the agents of treatment implementation. Parents may indirectly benefit from improvements in children's problematic behaviors, such that major concerns related to their ability to manage parenting tasks and the parent-child relationship may become lessened. Factors that help predict greater responsiveness to intervention, and hence greater improvements in problematic behaviors, could then be of interest to researchers and clinicians alike. Using a secondary analysis of a recently completed RCT (Ollendick et al. 2016), the current study examined change in maternal stress across the course of treatment for children with ODD. As with our previous findings (Booker et al. 2016), we expected children with more positive views toward parents to show greater improvements in severity of ODD symptoms over time. However, we expanded upon previous findings by testing whether children's positive views toward parents would predict improvements in maternal stress over time, and whether such an effect would be explained by reductions in children's ODD symptom severity over time. We tested for these improvements following intervention from two evidence-based parenting treatments (PMT and CPS).

Our primary hypothesis was supported. Using multilevel mediation, indirect effects were supported between children's positive relations with parents and maternal stress through clinician reports of ODD severity. Children who viewed the relationships with their parents as being higher quality were more responsive to both of the randomly-assigned ODD interventions and had mothers who experienced less stress over time. When considered alongside positive relations with parents, improvements in ODD symptoms predicted improvements in maternal stress, and the direct effect of relations with parents was no longer significant.

The current results underscore the potential importance of positive child factors as targets in ODD interventions. Children in the current sample showed within- and between-person variability in reported relations with parents, such that a significant number of children were not initially in the clinical range of poor relations with parents (16.7% had a score of 30 or lower at baseline), and children

on average showed improvements in reported relations with parents over time. Findings indicate that even in families with a child who has ODD, children's views toward their parents are not always negative, and that more positive child factors have indirect benefits for response to treatment and for parent adjustment. While it is possible that children's positive views of relationships with their parents are inflated or self-serving in some way (Hoza et al. 2002), their reports were associated with an improved outlook. Because these changes were associated with reduced parenting stress, it seems likely that children's perceptions, at least in part, reflected more positive parent-child interactions. These findings lend important—and thus far understudied—insight on the indirect benefits of child behavior interventions on additional family relationship outcomes.

Our findings also revealed important roles of child gender and age in predicting parenting distress. Historically, boys are at higher risk for ODD than girls (Loeber et al. 2000)—a trend supported in the current sample. Hence, it is surprising to us that reports of maternal stress and ODD severity were higher for girls than boys in our sample. It is possible that parents have a lower tolerance for displays of oppositionality and anger among girls, as these defy gender norms (see Chaplin and Aldao 2013). Relatedly, previous studies of children with ADHD and additional conduct problems (Mikami and Lorenzi 2011) have shown the deleterious effect of oppositional behaviors on social adjustment to be stronger for girls than boys.

Similarly, as children mature, they are expected to display a stronger grasp on their abilities to anticipate and manage emotional experiences as well as adhere to display rules of anger and frustration, often by down-regulating or even masking experienced feelings (von Salisch 2001). For young adolescents, there is greater pressure to mask and downplay negative emotions in front of both peers and authority figures, with negative social repercussions for those who continue showing poorly regulated displays (see Booker and Dunsmore 2017 for a review). Unsurprisingly, findings in the current study reinforce these trends. Older children—otherwise expected to have more tools for managing negative affect—typically had more severe ODD symptom severity (involving excessive displays of anger and frustration) and older children reported poorer relations with parents.

The current findings are encouraging in that maternal stress was found to be malleable over the course of treatment and linked to improvements in child outcomes. Although PMT and CPS are unique interventions (Murrhly et al. 2010), both emphasize adaptive strategies for parents to use in anticipating, preventing, and responding to children's anger and disruptive behaviors. Hence, across both PMT—which focuses on training child adherence to parent instruction (Barkley 1997)—and CPS—which focused on

collaborative parent-child solutions to problems contributing to challenging behaviors (Greene 1998)—parents' insights and skills in working alongside children seemed to ultimately impact the views children hold toward parents. It is possible that these positive effects could emerge in other parent-centered interventions of ODD (e.g., Positive Parenting Program; Sanders 1999).

The support for an indirect effect from children's positive views onto maternal stress provides promising support for an understudied directional effect during clinical child interventions. There is often less interest on the possible child factors that may promote (or hinder) treatment response. Yet, given that even with well-tested clinical interventions, subsets of children are either initially unresponsive or do not sustain clinical gains over time (Kazdin 2005; Murrihy et al. 2010), it remains important to identify factors that improve the odds of intervention response. Further, because of the ways children's characteristics and behaviors shape their developmental contexts in the home and beyond (Lerner 1982), it is important to understand how referred children's pre-treatment and post-treatment characteristics and behaviors hold implications for their surrounding environments. Hence, these findings are exciting in that they consider child-to-parent effects in a clinical context and highlight a possible target variable in children that may come to inform treatment response outlook.

Limitations, Strengths, and Future Directions

The current study had several limitations of note. Regarding demographics, there was limited diversity in family ethnicity and socioeconomic status. Although this reflects broader challenges in recruitment of underrepresented groups and the challenges of time availability among lower income families, it also hinders generalizability of findings. There was also considerable family dropout at follow-up periods, requiring data approaches to address missing data. Further, reports of parenting stress were limited to mothers and restricted to self-reports. Fathers' perspectives are understudied and may offer unique insights that inform improvements to family intervention (Mitchell et al. 2007), as might behavioral interaction tasks that assess for parenting stress.

The current study also included several strengths. Analyses involved multiple reporters (child, mother, and clinician), reducing informant bias. The study was also longitudinal and used multilevel approaches to account for variance within and between families over time. In addition, this study is rare in emphasizing the influence of children's views on their treatment response. This work provides a

foundation for additional efforts to understand positive child-driven influences for broader family outcomes in clinical interventions.

Future studies will benefit from recruiting larger samples of families, samples with greater ethnic and racial diversity, and samples that better represent lower- and middle-income families. Future studies should also expand focus to better address family relationships and the broader family environment, considering father reports of parenting stress and sibling evaluations regarding the target child and parents. Ongoing efforts should also examine the effects of children's views of relationship quality on additional aspects of well-being. For example, to what extent are these views tied with social adjustment for oppositional children, and are such outcomes contingent on the accuracy or authenticity of these self-views? By placing greater focus on promising child factors, such as children's views and attitudes toward their families, there may be indicator or target variables from pre-treatment that inform the likelihood of treatment success and provide areas for refining evidence-based interventions, respectively. Such variables deserve attention to continue improving the outlook for children and families seeking assistance with disruptive, conduct problems.

Acknowledgements Funding was provided by R01 MH076141 from NIMH and by the Institute for Society, Culture, and Environment at Virginia Tech. We wish to express appreciation to the graduate students and research scientists who assisted us with various aspects of this project, including data reduction, assessment, and treatment of these youth. We also wish to extend thanks to the many undergraduate students at Virginia Tech who assisted us with data coding, entry, and verification. Finally, we are grateful to the youth and families who participated in this clinical research.

Author contributions J.A.B.: Conducted the data analyses and contributed to writing the paper. N.N.C.-H.: Contributed to data analyses and writing the paper. J.C.D.: Contributed to the study design and editing the paper. R.W.G.: Co-designed the study, contributed to editing the paper. T.H.O.: PI of the grant supporting this research, co-designed and executed the study, contributed to writing and editing the paper.

Compliance with Ethical Standards

Conflict of Interest R.W.G.: Received royalties related to work concerning Collaborative and Proactive Solutions. The remaining authors declare that they have no conflict of interest.

Ethics Statement All procedures performed in this study were in accordance with the ethical standards of the overseeing institutional review board and with the 1964 Helsinki declaration and its later amendments.

Informed Consent All participating families completed informed consent and informed assent before participating.

References

- Abidin, R. R. (1995). *Parenting stress index-short form*. Charlottesville, VA: Pediatric Psychology Press.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, D.C: American Psychiatric Association.
- Anderson, S. R., & Ollendick, T. H. (2012). Diagnosing oppositional defiant disorder using the anxiety disorders interview schedule for DSM-IV: Parent version and the diagnostic interview schedule for children. *Journal of Psychopathology and Behavioral Assessment, 34*, 467–475.
- Anthony, L. G., Anthony, B. J., Glanville, D. N., Naiman, D. Q., Waanders, C., & Shaffer, S. (2005). The relationships between parenting stress, parenting behaviour and preschoolers' social competence and behaviour problems in the classroom. *Infant and Child Development, 14*, 133–154. <https://doi.org/10.1002/icd.385>.
- Barkley, R. A. (1997). *Defiant children: A clinician's manual for parent training* (2nd ed.). New York: Guilford Press.
- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*, 1–48.
- Bauer, D. J., Pracher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods, 11*, 142–163. <https://doi.org/10.1037/1082-989X.11.2.142>.
- Benzies, K. M., Harrison, M. J., & Magill-Evans, J. (2004). Parenting stress, marital quality, and child behavior problems at age 7 years. *Public Health Nursing, 21*, 111–121.
- Booker, J. A., & Dunsmore, J. C. (2017). Affective social competence in adolescence: Current findings and future directions. *Social Development, 26*, 3–20. <https://doi.org/10.1111/sode.12193>.
- Booker, J. A., Ollendick, T. H., Dunsmore, J. C., & Greene, R. W. (2016). Perceived parent-child relations, conduct problems, and clinical improvement following the treatment of oppositional defiant disorder. *Journal of Child and Family Studies, 25*, 1623–1633. <https://doi.org/10.1007/s10826-015-0323-3>.
- Brestan, E. V., & Eyberg, S. M. (1998). Effective psychosocial treatments of conduct-disordered children and adolescents: 29 years, 82 studies, and 5,272 kids. *Journal of Clinical Child Psychology, 27*, 180–189. https://doi.org/10.1207/s15374424jccp2702_5.
- Burke, J. D., Pardini, D. A., & Loeber, R. (2008). Reciprocal relationships between parenting behavior and disruptive psychopathology from childhood through adolescence. *Journal of Abnormal Child Psychology, 36*, 679–692.
- Campbell, S., Pierce, E., Moore, G., Marakovitz, S., & Newby, K. (1996). Boys' externalizing problems at elementary school age: Pathways from early behavior problems, maternal control, and family stress. *Development and Psychopathology, 8*, 701–719.
- Chaplin, T. M., & Aldao, A. (2013). Gender differences in emotion expression in children: A meta-analytic review. *Psychological Bulletin, 139*, 735–765.
- Core Team, R. (2016). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Crnicek, K. A., Gaze, C., & Hoffman, C. (2005). Cumulative parenting stress across the preschool period: Relations to maternal parenting and child behaviour at age 5. *Infant and Child Development, 14*, 117–132. <https://doi.org/10.1002/icd.384>.
- Crnicek, K., & Greenberg, M. (1990). Minor parenting stresses with young children. *Child Development, 61*, 1628–1637.
- Deater-Deckard, K. (1998). Parenting stress and child adjustment: Some old hypotheses and new questions. *Clinical Psychology: Science and Practice, 5*, 314–332.
- Deater-Deckard, K., & Scarr, S. (1996). Parenting stress among dual-earner mothers and fathers: Are there gender differences? *Journal of Family Psychology, 10*, 45–59.
- Graham, J. W., Olchowski, A. E., & Gilreath, T. D. (2007). How many imputations are really needed? Some practical clarifications of multiple imputation theory. *Prevention Science, 8*, 206–213.
- Greene, R. W. (1998). *The explosive child*. New York: Harper Collins.
- Greene, R. W., Biederman, J., & Zerwas, S. (2002). Psychiatric comorbidity, family dysfunction, and social impairment in referred youth with oppositional defiant disorder. *American Journal of Psychiatry, 159*, 1214–1224.
- Greene, R.W. (2010) Collaborative problem solving. In R. C. Murrihy, A. D. Kidman, & T. H. Ollendick (Eds.), *Clinical handbook of assessing and treating conduct problems in youth* (pp. 193–220). New York: Springer.
- Hoza, B., Pelham, W. E., Dobbs, J., Owens, J. S., & Pillow, D. R. (2002). Do boys with attention-deficit/hyperactivity disorder have positive illusory self-concepts? *Journal of Abnormal Psychology, 111*, 268–278.
- IBM Corp. (2016). *IBM SPSS Statistics for Windows*, Version 24.0. Armonk, NY: IBM Corp.
- Kazdin, A. E. (2005). *Parent management training: Treatment for oppositional, aggressive, and antisocial behavior in children and adolescents*. New York: Oxford University Press.
- Kenny, D. A., Korchmaros, J. D., & Bolger, N. (2003). Lower level mediation in multilevel models. *Psychological Methods, 8*, 115–128.
- Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2016). lmerTest: Tests in linear mixed effects models. R package version 2.0.-.30. <https://CRAN.R-project.org/package=lmerTest>.
- Larsson, B., Fossum, S., Clifford, G., Drugli, M. B., Handegård, B. H., & Mørch, W.-T. (2009). Treatment of oppositional defiant and conduct problems in young Norwegian children. *European Child & Adolescent Psychiatry, 18*, 42–52.
- Laursen, B., & Mooney, K. S. (2008). Relationship network quality: adolescent adjustment and perceptions of relationships with parents and friends. *American Journal of Orthopsychiatry, 78*, 47–53.
- Lerner, R. M. (1982). Children and adolescents as producers of their own development. *Developmental Review, 2*, 342–370.
- Loeber, R., Burke, J. D., Lahey, B. B., Winters, A., & Zera, M. (2000). Oppositional defiant and conduct disorder: A review of the past 10 years, part I. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 1468–1484.
- Mackler, J. S., Kelleher, R. T., Shanahan, L., Calkins, S. D., Keane, S. P., & O'Brien, M. (2015). Parenting stress, parental reactions, and externalizing behavior from ages 4 to 10. *Journal of Marriage and Family, 77*, 388–406.
- Mikami, A. Y., & Lorenzi, J. (2011). Gender and conduct problems predict peer functioning among children with attention-deficit/hyperactivity disorder. *Journal of Clinical Child and Adolescent Psychology, 40*, 777–786.
- Mitchell, S. J., See, H. M., Tarkow, A. K. H., Cabrera, N., McFadden, K. E., & Shannon, J. D. (2007). Conducting studies with fathers: Challenges and opportunities. *Applied Developmental Science, 11*, 239–244.
- Moher, D., Hopewell, S., Schulz, K. F., Montori, V., Gøtzsche, P. C., Devereaux, P. J., & Altman, D. G. (2010). CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trials. *Journal of Clinical Epidemiology, 63*, 1–37.

- Murrihy, R. C., Kidman, A. D., & Ollendick, T. H. (2010). *Clinical handbook of assessing and treating conduct problems in youth*. New York: Springer.
- Nash, S. G., McQueen, A., & Bray, J. H. (2005). Pathways to adolescent alcohol use: Family environment, peer influence, and parental expectations. *Journal of Adolescent Health, 37*, 19–28.
- Nixon, R. D. V., Sweeney, L., Erickson, D. B., & Touyz, S. W. (2003). Parent-child interaction therapy: A comparison of standard and abbreviated treatments for oppositional defiant preschoolers. *Journal of Counseling and Clinical Psychology, 71*, 251–260.
- Ollendick, T. H., Greene, R. W., Austin, K. E., Fraire, M. G., Hall-dorsdottir, T., Allen, K. B., & Wolff, J. C. (2016). Parent management training and collaborative & proactive solutions: A randomized control trial for oppositional youth. *Journal of Clinical Child and Adolescent Psychology, 45*, 591–604. <https://doi.org/10.1080/15374416.2015.1004681>.
- Perren, S., von Wyl, A., Burgin, D., Simoni, H., & von Klitzing, K. (2005). Depressive symptoms and psychosocial stress across the transition to parenthood: Associations with parental psychopathology and child difficulty. *Journal of Psychosomatic Obstetrics and Gynecology, 26*, 173–183. <https://doi.org/10.1080/01674820400028407>.
- Reitman, D., Currier, R. O., & Stickle, T. R. (2002). A critical evaluation of the parenting stress index-short form (PSI-SF) in a head start population. *Journal of Clinical Child & Adolescent Psychology, 31*, 384–392.
- Reynolds, C. R., & Kamphaus, R. W. (2000). *Behavior assessment system for children* (2nd ed.). Circle Pines, MN: American Guidance Service.
- Sanders, M. R. (1999). Triple P-positive parenting program: Towards an empirically validated multilevel parenting and family support strategy for the prevention of behavior and emotional problems in children. *Clinical Child and Family Psychology Review, 2*, 71–90.
- Selig, J. P., & Preacher, K. J. (2008, June). Monte Carlo method for assessing mediation: An interactive tool for creating confidence intervals for indirect effects [Computer software]. <http://quantpsy.org/>.
- Silverman, W. K., & Albano, A. M. (1996). *Anxiety disorders interview schedule for DSM-IV: Child and parent versions*. San Antonio, TX: Psychological Corporation.
- Sollie, H., Mørch, W.-T., & Larsson, B. (2016). Parent and family characteristics and their associates in a follow-up of outpatient children with ADHD. *Journal of Child and Family Studies, 25*, 2571–2584.
- Theule, J., Wiener, J., Tannock, R., & Jenkins, J. M. (2013). Parenting stress in families of children with ADHD: A meta-analysis. *Journal of Emotional and Behavioral Disorders, 21*, 3–17.
- von Salisch, M. (2001). Children's emotional development: Challenges in their relationships to parents, peers, and friends. *International Journal of Behavioral Development, 25*, 310–319. <https://doi.org/10.1080/01650250143000058>.
- Williford, A. P., Calkins, S. D., & Keane, S. P. (2007). Predicting change in parenting stress across early childhood: Child and maternal factors. *Journal of Abnormal Child Psychology, 35*, 251–263.
- Zhang, Z., Zyphur, M. J., & Preacher, K. J. (2009). Testing multilevel mediation using hierarchical linear models: Problems and solutions. *Organizational Research Methods, 12*, 695–719. <https://doi.org/10.1177/1094428108327450>.