Journal of Clinical Child & Adolescent Psychology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t775648094

Effects of Maternal Stimulant Medication on Observed Parenting in Mother-Child Dyads With Attention-Deficit/Hyperactivity Disorder

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Online publication date: 29 June 2010

To cite this Article Chronis-Tuscano, Andrea , Rooney, Mary , Seymour, Karen E. , Lavin, Heather Jones , Pian, Jessica , Robb, Adelaide , Efron, Lisa , Conlon, Charles and Stein, Mark A.(2010) 'Effects of Maternal Stimulant Medication on Observed Parenting in Mother-Child Dyads With Attention-Deficit/Hyperactivity Disorder', Journal of Clinical Child & Adolescent Psychology, 39: 4, 581 — 587
To link to this Article: DOI: 10.1080/15374416.2010.486326
URL: http://dx.doi.org/10.1080/15374416.2010.486326

Journal of Clinical Child & Adolescent Psychology, 39(4), 581–587, 2010

ISSN: 1537-4416 print/1537-4424 online
DOI: 10.1080/15374416.2010.486326

Routledge
Taylor & Francis Group

BRIEF REPORTS

Effects of Maternal Stimulant Medication on Observed Parenting in Mother–Child Dyads With Attention-Deficit/Hyperactivity Disorder

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This pilot study of 23 mothers with attention-deficit/hyperactivity disorder (ADHD) and their offspring with ADHD examined the effects of maternal stimulant medication on observed interactions. Parent–child interactions were observed using a structured protocol before and after mothers underwent a 5-week, double-blind stimulant titration. Despite dramatic effects of medication on adult ADHD symptoms, this small pilot and open label laboratory-based study did not identify maternal stimulant effects on observed parenting or child behavior. Given the documented impairments in parenting displayed by adults with ADHD, behavioral parenting interventions may be needed in conjunction with medication for mothers with ADHD to optimize family outcomes.

Despite the high rate of attention-deficit/hyperactivity disorder (ADHD) in mothers of children with ADHD (Chronis et al., 2003) and their key role in parenting and the administration of treatments to their children with ADHD, mothers with ADHD are rarely diagnosed or treated. In the absence of treatment, adults with ADHD have been characterized as having limited persistence, forgetfulness, disorganization, poor planning, and impulsive responding, all of which may contribute to compromised parenting and inconsistent administration of child psychosocial and pharmacological treatments.

This research was supported by an investigator-initiated grant from Ortho-McNeil Janssen Pharmaceuticals, Inc.

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Empirical studies have documented impaired parenting and family functioning associated with adult ADHD. For example, the presence of parental ADHD is associated with higher levels of family conflict and lower family cohesion (Biederman, Faraone, & Monteau, 2002). Likewise, fathers with elevated ADHD symptoms are more likely to engage in negative, critical, overreactive, and authoritarian discipline (Arnold, O'Leary, & Edwards, 1997). Mothers with ADHD report less consistency in their parenting and less monitoring or knowledge of their children's activities, and generate solutions to child behavior problems of lesser quality on an analogue task, compared to mothers without ADHD (Murray & Johnston, 2006). Thus, empirical evidence suggests that core symptoms of adult ADHD are associated with maladaptive and ineffective parenting behavior. However, these studies relied largely on self-report measures of parenting.

More recently, we utilized a multimethod approach to examine associations between maternal ADHD symptoms and parenting in families of 6- to 10-year-old children with ADHD (Chronis-Tuscano, Raggi, et al., 2008). Mothers with higher levels of ADHD symptoms reported lower levels of involvement and positive parenting and higher levels of inconsistent discipline. During observed parent–child interactions, maternal ADHD symptoms were inversely associated with positive parenting and positively associated with negative parenting and repeated commands before giving the child an opportunity to comply. Given that maladaptive parenting behavior robustly predicts negative developmental outcomes for children with ADHD (Chronis et al., 2007), these findings have important clinical implications for family-based assessment and treatment of ADHD.

Together, these studies suggest that a multipronged treatment approach in which the parent is assessed and treated may be necessary for families in which both parent and child have ADHD. Currently, the most common treatment for adult ADHD is pharmacotherapy with stimulants (Adler, 2009). In this small, uncontrolled pilot study, we examined the impact of OROS methylphenidate (MPH) in mothers with ADHD and evaluated effects on maternal ADHD symptoms and parenting (Chronis-Tuscano, Seymour, et al., 2008). We previously reported that increasing doses of OROS MPH were associated with improvements in self- and other-reported maternal ADHD symptoms and some improvements in mothers' self-reported parenting. On increasing doses of OROS MPH, mothers reported on the Alabama Parenting Questionnaire (APQ; Shelton, Frick, & Wooton, 1996) that they were more actively involved with their children, more consistent in their discipline, and less likely to use corporal punishment (Chronis-Tuscano, Seymour, et al., 2008). However, it is unclear, particularly in a clinical sample of mothers, whether these findings reflected true changes in parenting behavior or simply improvements in maternal *perceptions* of their parenting. Thus, MPH effects on observed behavior during parent–child interactions are the focus of this brief report.

METHOD

Participants

Participants were recruited from families who were previously seen in the ADHD specialty programs at the University of Maryland or Children's National Medical Center and from health professionals in the

TABLE 1
Baseline Characteristics of Participants

Characteristic	*Mother*	*Child*
Maternal Age, Years	39.78 (5.53)	8.74 (1.71)
Maternal Race/Ethnicity, *N* (%)		
White	21 (91.3)	21 (91.3)
Asian	1 (4.3)	1 (4.3)
Hispanic	1 (4.3)	1 (4.3)
Marital Status, *N* (%)		
Single	3 (13)	
Married	18 (78.3)	
Divorced	2 (8.7)	
Median Maternal Education Level	Bachelor's degree or equivalent	
Maternal ADHD Diagnosis, *N* (%)		
Combined Type	13 (56.5)	16 (69.6)
Inattentive Type	8 (34.8)	7 (30.4)
Hyperactive/Impulsive Type	2 (8.7)	0 (0)
Child Comorbid Externalizing Diagnoses, *N* (%)		
Oppositional Defiant Disorder		11 (47.8)
Conduct Disorder		0 (0)
Mother Self-Reported ADHD Symptom Score (CAARS)		
Inattention	76.09 (11.31)	
Hyperactivity/Impulsivity	59.45 (10.97)	
ADHD Index	64.45 (8.05)	
Mother Clinical Global Impressions-Severity Illness Score	4.30 (0.64)	
Collateral-Reported Mother ADHD symptom Score (CAARS)		
Inattention	56.80 (12.76)	
Hyperactivity/Impulsivity	52.20 (14.27)	
ADHD Index	55.25 (13.98)	

Note. ADHD = attention-deficit/hyperactivity disorder; CAARS = Conners Adult ADHD Rating Scale.

Washington, DC, metropolitan area. Twenty-three mothers and their 6- to 12-year-old offspring participated (Table 1).

Mothers met *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [*DSM–IV*]; American Psychological Association, 1994) criteria for adult ADHD according to assessment methods recommended by McGough and Barkley (2004), described next. Mothers were excluded based on Current Axis I disorders other than ADHD, scores greater than 16 on the Beck Depression Inventory–II (Beck, Steer, & Brown, 1996), severe tics, history of seizures or abnormal EEG, high blood pressure, narrowing/blockage of the gastrointestinal tract, current pregnancy or breastfeeding, positive urine drug screen, and concomitant psychotropic medication use. Maternal depression was an exclusionary criterion so that we could isolate the impact of medicating maternal ADHD in this first small study on this topic. Also, at the time this study was initiated, concerns existed regarding the safety of combining stimulant and anti-depressant medications.

Children were included if they met *DSM–IV* criteria for ADHD, were between the ages of 6 and 12, and had no prior diagnoses of pervasive developmental disorder or mental retardation. Participants receiving psychosocial interventions were required to suspend treatment.

Procedures

Interested mothers completed a telephone screen in which their suitability for the study was assessed. Mothers who passed this screen underwent a comprehensive evaluation for adult ADHD. Approval was obtained by the Institutional Review Boards at both institutions before study initiation. At the evaluation session, mothers provided written informed consent and children provided assent.

Mothers underwent a 5-week, double-blind titration to an optimal dose of OROS®, up to a maximum dose of 90 mg. Participants were titrated to their lowest optimal dose based on reductions in self- and collateral reports of ADHD symptoms on the Conners Adult ADHD Rating Scale (Conners et al., 1999) and impairment on the Clinical Global Impressions–Severity of Illness (National Institute of Mental Health, 1985), and their side effect profiles.

Measures

Parent attention deficit hyperactivity disorder. Mothers were administered the Structured Clinical Interview for *DSM–IV* (First, Spitzer, Gibbon, & William, 1996), supplemented with the Schedule for Affective Disorders for School-Aged Children (K-SADS) ADHD module modified to assess current and lifetime symptoms in adults (Biederman et al., 2002; Faraone, Biederman, Feighner, & Monteaux, 2000). Past and current collateral reports of ADHD symptoms were obtained from parents or spouses who could report on the participant's behavior. Report cards and discipline records from childhood were collected whenever possible. Symptoms were counted if endorsed by the participant or collateral informant on the K-SADS, documented in past school records, or observed during the assessment.

Child attention deficit hyperactivity disorder. Children were diagnosed with ADHD using well-established assessment methods (Pelham, Fabiano, & Massetti, 2005). The K-SADS parent diagnostic interview (Kaufman et al., 1997; Orvaschel & Puig-Antich, 1995) was administered and the parent and teacher versions of the Disruptive Behavior Disorders symptom rating scale were completed (Pelham et al., 2005).

Dyadic Parent–Child Interaction Coding System (DPICS; University of Washington Parenting Clinic, 2000). Parent–child interactions across 5-min free play, 10-min homework, and 5-min clean-up tasks were observed before titration and at the participants' optimal dose (i.e., Week 5). These tasks have been widely used in the ADHD literature and are sensitive to treatment effects (Danforth, Barkley, & Stokes, 1991). Parents and children were told that these tasks would be used to evaluate "how the family was doing."

Interactions were coded using the current revised version of the DPICS (Eyberg & Matarazzo, 1980; Eyberg, Nelson, Duke, & Boggs, 2009; Robinson & Eyberg, 1981). The DPICS yielded the following parenting categories: Positive Parenting (DPICS–PP; includes praise, positive affect, and physical positive); Negative Parenting (DPICS–NP; includes negative commands, critical statements, and physical negative); Total Commands (DPICS–TC; includes indirect and direct commands); and, to evaluate child effects on observed parenting, Total Child Deviance (DPICS–CD; includes whine/cry/yell, physical negative, smart talk, destructive, and noncompliance; Eyberg et al., 2001; Webster-Stratton, 1998; Webster-Stratton & Spitzer, 1992). In addition, we included the "No Opportunity for Child to Comply" category (DPICS-NOCC), which is counted each time the mother gives a command but reissues another command before 5 s have elapsed, regardless of whether the child has begun complying. These categories were selected on the basis of their hypothesized relationship to maternal ADHD symptoms.

A team of two undergraduate coders was trained in the use of the DPICS by an advanced doctoral student until 80% agreement was attained. Coders were unaware of medication dose. Reliability was assessed throughout the study and 30% of the interactions were double-coded to assess interrater reliability. Consistent with prior studies using the DPICS, reliability was computed by calculating percent agreement (Agreements/Agreements + Disagreements; Eyberg et al., 2009; University of Washington Parenting Clinic, 2000). Reliability coefficients from these studies typically range from 0.65 to 1.0, depending on behavioral category. In the current study, interobserver agreement coefficients were 0.83 for DPICS–PP, 0.80 for DPICS–NP, 0.82 for CD, and 0.82 for DPICS–NOCC.

The APQ (Shelton et al., 1996) is a 42-item, psychometrically sound measure on which mothers in this study were asked to indicate at baseline and Week 5 the frequency with which they implemented the following parenting practices: Involvement, Positive Parenting, Poor Monitoring/Supervision, Inconsistent Discipline, and Corporal Punishment. Items are rated on a 5-point scale, ranging from 1 (*never*) to 5 (*always*).

RESULTS

Twenty of the 23 participants completed the titration. The disposition of participants is presented in Figure 1. At Week 5, 5% of the participants ($n = 1$) received 54 mg, 25% ($n = 5$) received 72 mg, and 70% ($n = 14$) received 90 mg.

Intent-to-treat analyses were utilized. Dose effects from baseline to Week 5 (i.e., posttitration) on observed parenting and child behavior were examined using General Linear Models repeated measures analyses in SPSS 15.0. Separate analyses were run for each observational category for each of the three parent–child interaction tasks. Given the small sample, we report effect size (d) to provide an estimate of the magnitude of within-subjects dose effects. Effect size was calculated by subtracting the mean score of each observed parenting variable at Week 5 from the mean score at baseline and dividing the difference by the pooled standard deviation. An effect size of 0.2 is considered small, 0.5 medium, and 0.8 large (Cohen, 1988). Results are presented in Table 2.

No significant medication effects were detected on observed parent or child behavior, despite effects on adult ADHD symptoms and self-reported parenting reported previously (Chronis-Tuscano, Seymour, et al., 2008). Examination of the magnitude of effects revealed small effects of maternal stimulant medication on DPICS–TC and DPICS–NOCC during free play, DPICS–PP and DPICS–CD during cleanup, and DPICS–NP during homework (see Table 2). However, it must be noted that effect size estimates in within-subjects studies are generally larger than in between-group studies (Fabiano et al., 2009). In addition, in some instances, maternal behavior worsened at the posttitration assessment compared to baseline (Table 2).

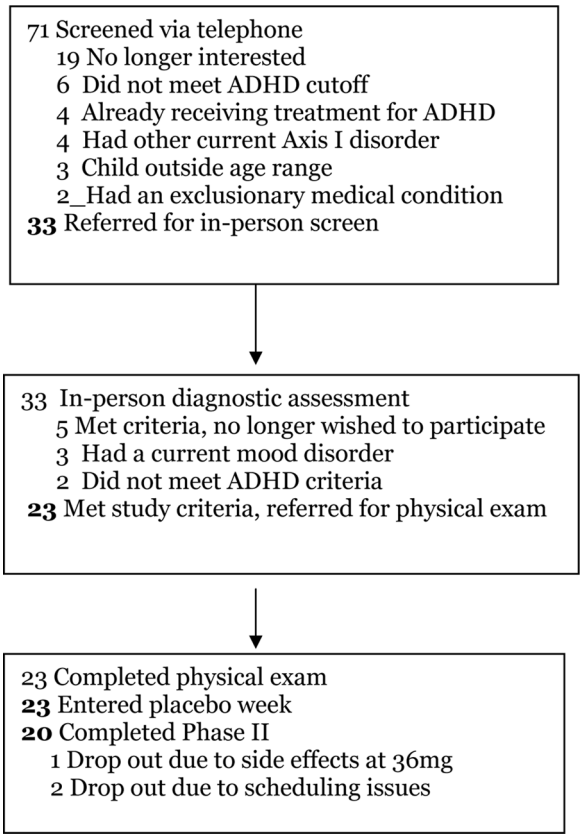

FIGURE 1 Disposition of participants.

Correlations between baseline observational and reported measures of parenting and child behavior were also examined. Only one parenting dimension was represented on both the APQ and the DPICS: Positive Parenting. APQ Positive Parenting was not significantly correlated with DPICS–PP during any of the observational tasks. Although no other overlapping parenting dimensions were measured using both methodologies, correlational analyses were conducted to further explore relationships between observed and self-reported parenting. APQ Involvement was significantly negatively correlated with DPICS–NP during cleanup ($r = -.530$, $p < .01$); APQ Inconsistent Discipline was significantly negatively correlated with DPICS–PP during homework ($r = -.429$, $p < .05$) and was positively correlated with DPICS–NP during cleanup ($r = .492$, $p < .05$).

TABLE 2
Effects of Oros® on Observed Parenting and Child Behaviors

	Dose						
	Baseline		*Week 5*				
Variable	*M (SD)*	*Range*	*M (SD)*	*Range*	*df*	*F*	*Effect Size (d)*
Free Play Task							
Positive Parenting	9.56 (5.67)	19.56	9.55 (5.18)	20.85	1,19	.034	.03
Negative Parenting	4.65 (4.74)	16.00	4.38 (3.81)	12.00	1,19	.166	.06
Total Commands	10.69 (8.32)	30.10	7.23 (6.87)	30.00	1,19	2.041	.45
No Opportunity to Comply	5.70 (5.21)	18.06	3.82 (5.07)	20.00	1,19	1.575	.37
Child Deviance	2.35 (2.84)	10.24	1.88 (2.38)	10.00	1,19	1.548	.14
Cleanup Task							
Positive Parenting	13.94 (11.85)	54.00	9.57 (5.57)	19.90	1,18	1.992	.47
Negative Parenting	2.55 (3.16)	8.03	3.06 (2.50)	8.18	1,18	.130	–.18
Total Commands	18.15 (16.55)	76.25	16.83 (19.71)	62.00	1,18	.051	.07
No Opportunity to Comply	8.94 (10.89)	48.00	10.98 (15.15)	50.00	1,18	.639	.15
Child Deviance	4.70 (4.84)	18.00	3.25 (3.49)	10.20	1,18	.877	.34
Homework Task							
Positive Parenting	13.48 (7.73)	30.00	13.33 (8.90)	25.84	1,19	.175	.02
Negative Parenting	4.40 (3.94)	13.13	5.77 (5.00)	19.00	1,19	.719	–.30
Total Commands	20.06 (15.89)	73.00	20.21 (17.71)	76.00	1,19	.011	–.01
No Opportunity to Comply	9.45 (8.21)	35.00	10.17 (10.43)	45.00	1,19	.050	–.08
Child Deviance	7.30 (7.34)	30.00	7.45 (8.91)	32.00	1,19	.016	.02

DISCUSSION

This study examined the effects of treating maternal ADHD on observed parenting in mother–child dyads with ADHD. Results suggested no significant effects of stimulant medication on observed parenting or child behavior. These results stand in contrast to our previous report (Chronis-Tuscano, Seymour, et al., 2008) suggesting that stimulants improved these mothers' ADHD symptoms and perceptions of their parenting.

There are several possible explanations for these results. First, parent–child observations provide rich objective data relatively free of potential reporting biases; however, behavioral observations are based on a limited sample of behavior that may be influenced by the artificial context in which behavior is assessed. Yet these very same tasks have been used in numerous ADHD treatment studies and have been sensitive to changes in maternal and child behavior (Chronis et al., 2007; Danforth et al., 1991). Moreover, the DPICS coding system has been widely utilized and well validated (Eyberg et al., 2001; Robinson & Eyberg, 1981; Webster-Stratton & Hammond, 1990).

Second, in this study, time and repetition of the tasks were confounded with maternal methylphenidate. Of note, 61% of the children in this sample received ADHD medications, which may have reduced the variability in child behavior and, consequently, maternal behavior during these interactions. Exploratory analyses that considered child medication status revealed similar patterns for mother–child dyads in which the child was and was not medicated. However, cell sizes were too small to adequately examine this possibility. Also, because child medication was not manipulated in this study, it is unclear whether children were effectively or optimally medicated. Thus, it remains unknown how child medication impacted results presented here.

Third, patterns of negative parent–child interactions are well-established by the time children reach the ages of 6 to 12 years, and it is perhaps unrealistic to expect meaningful changes in these long-standing patterns of negative parenting and parent–child interactions to result from a 5-week medication titration. Effects of sustained maternal stimulant medication on parenting and parent–child interactions may take much longer to detect.

This study is obviously limited by its small sample with limited ethnic diversity and its uncontrolled design. Moreover, all mothers in this study underwent the stimulant titration, and we could therefore not disentangle the effects of time and medication. However, one would expect that familiarity with the parent–child interaction tasks and mothers' perceived improvements on medication would result in *greater* improvements in observed parenting behavior than might be found in a controlled study. We found the opposite; even under uncontrolled conditions, observed mother and child behavior remained the same or worsened over time.

This small, uncontrolled laboratory study therefore provides preliminary support that medicating ADHD mothers with stimulants has no significant impact on observed parenting or child behavior. Of course, a larger, randomized placebo-controlled trial is needed to further explore the effects of medicating mothers with ADHD on parenting behavior.

Implications for Research, Policy, and Practice

Similar to the MTA results, it may be the case that, although maternal medication has large effects on core symptoms of adult ADHD, combined behavioral-pharmacological treatments may be needed to affect broader areas of impairment (e.g., Owens, Hinshaw, & Kraemer, 2003). Given their significant impairments in parenting and the negative long-term impact of maladaptive parenting on child development, it is likely that evidence-based behavioral parenting interventions are needed in conjunction with medication for mothers with ADHD to teach effective parenting skills and therefore optimize treatment effects on parenting and family outcomes.

At the same time, maternal ADHD symptoms likely interfere with successful outcomes following behavioral parent training. For instance, Sonuga-Barke, Daley, and Thompson (2002) reported that mothers who had more ADHD symptoms reported less child symptom reduction following behavioral parent training than mothers with fewer ADHD symptoms. Our recent study found that maternal ADHD symptoms were associated not only with attenuated treatment effects on parenting and child disruptive behavior but also with impaired treatment participation (2010). Similarly, children of parents with higher ratings of inattention improved less on ADHD symptoms and impairment at the MTA 3-year follow-up regardless of initial treatment group assignment (Jensen et al., 2007). These studies demonstrating that parental ADHD symptoms predict poor child treatment response highlight the need to examine the efficacy of parental ADHD treatment to optimize evidence-based treatment effects for their children with ADHD.

Future studies should therefore examine the combined, sequential, and perhaps synergistic effects of maternal stimulant medication and behavioral parent training on mother, child, and parenting outcomes. It is possible that optimizing and stabilizing maternal stimulant medication prior to beginning parent training might allow mothers with ADHD to benefit more from parent training interventions, both by improving their active participation in treatment sessions and their consistent implementation of behavioral techniques with their children outside of sessions.

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