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Predictors and Moderators of Parent Training Efficacy in a Sample of Children with Autism Spectrum Disorders and Serious Behavioral Problems

Cristan Farmer,

Ohio State University, McCampbell Hall, Rm. 305, 1581 Dodd Drive, Columbus, OH 43210, USA

Luc Lecavalier,

Ohio State University, McCampbell Hall, Rm. 305, 1581 Dodd Drive, Columbus, OH 43210, USA

Sunkyoung Yu,

Yale University, New Haven, CT, USA

L. Eugene Arnold,

Ohio State University, McCampbell Hall, Rm. 305, 1581 Dodd Drive, Columbus, OH 43210, USA

Christopher J. McDougle,

Indiana University, Bloomington, IN, USA

Lawrence Scahill,

Yale University, New Haven, CT, USA

Benjamin Handen,

University of Pittsburgh, Pittsburgh, PA, USA

Cynthia R. Johnson,

University of Pittsburgh, Pittsburgh, PA, USA

Kimberly A. Stigler,

Indiana University, Bloomington, IN, USA

Karen Bearss,

Yale University, New Haven, CT, USA

Naomi B. Swiezy, and

Indiana University, Bloomington, IN, USA

Michael G. Aman

Ohio State University, McCampbell Hall, Rm. 305, 1581 Dodd Drive, Columbus, OH 43210, USA

Luc Lecavalier: luc.lecavalier@osumc.edu

Abstract

The Research Units on Pediatric Psychopharmacology—Autism Network reported additional benefit when adding parent training (PT) to antipsychotic medication in children with autism spectrum disorders and serious behavior problems. The intent-to-treat analyses were rerun with putative predictors and moderators. The *Home Situations Questionnaire* (HSQ) and the Hyperactivity/Noncompliance subscale of the *Aberrant Behavior Checklist* were used as outcome

measures. Candidate predictors and moderators included 21 demographics and baseline measures of behavior. Higher baseline HSQ scores predicted greater improvement on the HSQ regardless of treatment assignment, but no other predictors of outcome were observed. None of the variables measured in this study moderated response to PT. Antipsychotic medication plus PT appears to be equally effective for children with a wide range of demographic and behavioral characteristics.

Keywords

Parent training; Pervasive developmental disorder; Autism; Risperidone; Predictor; Moderator

Beyond the simple question of efficacy or effectiveness, the ultimate goal of randomized clinical trials is to determine what treatment is most effective for whom, and under which set of circumstances. A moderator is a variable on which the relationship between treatment and outcome depends (Baron and Kenny 1986). In other words, moderators specify for which subgroups or under what conditions a treatment is effective (Kraemer et al. 2008). A predictor is associated with better or worse outcome, regardless of treatment assignment (Kraemer et al. 2008). In research, the elucidation of such variables may aid in uncovering masked treatment effects and in maximizing power in future trials. Clinically, these analyses help to match patients to appropriate treatments. For instance, the Multimodal Treatment Study of Children with Attention-Deficit/Hyperactivity Disorder (ADHD) cooperative group (MTA 1999) found that comorbid symptoms of anxiety interacted significantly with treatments in predicting outcome. Specifically, children with ADHD and anxiety responded better to behavioral treatment than did children without comorbid anxiety. Later analyses showed that parental symptoms of depression moderated the effect of treatment; children of parents with higher rates of depressive symptoms experienced less improvement (Owens et al. 2003). In the autism treatment literature, such analyses have been quite rare, possibly due to relatively small sample sizes and treatment effects. One exception includes a report by Arnold et al. (2010). In their study of risperidone in children with autism and irritable behavior, the researchers found that children with greater levels of irritability had a greater magnitude of response to risperidone than to placebo. This was the only moderator found out of the 35 variables tested. In the current report, we explored possible moderators and predictors of response to combined treatment with parent training and antipsychotic medication.

The Research Units on Pediatric Psychopharmacology (RUPP) Autism Network reported the results of a 24-week trial of combined treatment with antipsychotic medication (risperidone, followed by aripiprazole if risperidone failed) and parent training (PT) versus risperidone alone in children with autism spectrum disorders (ASD) and serious behavioral problems (Aman et al. 2009; Scahill et al. 2009). All children received an antipsychotic and were randomized at a 2:1 ratio to receive additional PT. This unbalanced randomization scheme was based on the recruitment assumption that most families would prefer combined treatment and on the hope that a greater number in combined treatment would facilitate subgroup analyses. Because of chance, the actual randomization ratio was nearly 3:2. The PT was based on a structured treatment manual and was administered by doctoral or master's-level therapists who had met treatment fidelity training standards (Johnson et al. 2007; RUPP 2007). The PT package consisted of 11 core sessions, up to three optional sessions, and up to three booster sessions (maximum of 17 sessions). Sessions lasted 60–90 min and were delivered individually to families. The content of the core sessions included preventive approaches, use of reinforcement, compliance training, functional communication training and the teaching of other adaptive skills. Content of optional sessions included toileting difficulties, time-out, or token economy systems. Sessions used direct instruction, video vignettes, practice activities, and role playing. In addition, families

were given individualized homework between sessions. On average, families attended 10.9 sessions of PT.

The impact on the primary outcome measure [*Home Situations Questionnaire* (HSQ); Barkley et al. 1999] of risperidone in the medication only group (MED) was impressive (pre-post Cohen's $d = 2.3$). Intent-to-treat analyses showed additional benefit for the combined treatment (COMB), with a between-groups effect size of $d = 0.34$ on the HSQ (Aman et al. 2009). The addition of PT was also associated with a lower dose of risperidone; the COMB group had a 14% lower optimal dose than MED ($p = 0.04$). The Aman et al. (2009) trial was the first large scale RCT assessing both a psychosocial treatment and psychotropic medicine in children with ASDs. As such, we felt that identifying variables that played a predictive or moderating role would be informative for both researchers and clinicians. The predictor and moderator analyses in this paper were mainly exploratory and were done partially in the spirit of hypothesis generating advocated by Kraemer et al. (2008).

Empirical reports of moderators of behavioral treatment in children are scarce (Kazdin and Weisz 1998). Consequently, a number of variables were included based on the experience of the RUPP Autism Network investigators. Others were selected because of their known relationship in other populations. For instance, the MTA Cooperative Group (1999) reported that family strain (e.g., parent stress and socioeconomic variables) was associated with poorer treatment outcomes in general. As noted earlier, this group also found that co-occurring anxiety moderated the response to behavioral treatment in comparison to medication only. In light of this, several measures of co-occurring clinical characteristics were included as potential moderators. We suspected that PT could present a unique challenge to families. PT requires a certain level of activity and “buy in” not necessarily required of medication-only approaches, and may be rendered particularly ineffective by variables that create significant family strain. Therefore, we hypothesized that these variables would moderate the treatment effect.

We expected adherence to PT procedures (described below) to be associated with greater improvement within the COMB group. The remaining analyses were exploratory in nature and included the evaluation of other baseline variables (e.g., age, IQ, and adaptive behavior) as moderators or predictors of outcome. It is important to note that, because all children were receiving risperidone, the moderated effect is the impact of PT *in addition* to risperidone, while the predicted effect is that of risperidone with or without added PT.

In summary, in the current effort we aimed to determine if any measured baseline characteristics predicted or moderated the effect of combined treatment (medicine and PT) relative to antipsychotic medicine alone on noncompliance and symptoms of hyperactivity as reported by parents.

Methods

Participants

The design, assessment, and results of this RUPP Autism Network study have been reported elsewhere (Aman et al. 2009; Scahill et al. 2009). Briefly, participants were 124 children aged 4 to 14 years, inclusive (mean age 7.4 years), with a diagnosis of autistic disorder ($n = 81$, 65.3%), Asperger's disorder ($n = 8$, 6.5%), or pervasive developmental disorder-not otherwise specified ($n = 35$, 28.2%). Additionally, each child had significant disruptive behavior as measured by the *Aberrant Behavior Checklist* Irritability subscale (> 18). Seventy-five (60.5%) children were randomly assigned to COMB (risperidone plus PT) and 49 (39.5%) subjects received risperidone only.

Measures

Outcome Measures—The primary outcome measure for the trial, the HSQ, is a 25 item parent-rated scale of noncompliant behaviors in everyday situations (Barkley et al. 1999). Parents are asked to indicate how much trouble the child has following rules or directions in given situations such as while playing alone, while in public places, or while the parent is on the telephone. In order to make the scale more relevant to children with ASDs, five items (mostly tapping resistance to change in routines) were added to the original 20-item scale (Chowdhury et al. 2010). For example, the situation “When repetitive behavior is interrupted” was appended to the original instrument. Because of these additions, coefficient α was calculated to assess internal reliability of the revised scale (Aman et al. 2009). It was high (0.92), which suggested that all items tap a similar construct. Each item is scored from 0 (not a problem) to 9 (very severe), and the total score is divided by 25 to give the average rating. The HSQ was chosen as the primary outcome measure because PT focused on reducing noncompliance (Aman et al. 2009; Scahill et al. 2009). In addition to the HSQ, the Hyperactivity/ Noncompliance subscale of the parent-rated *Aberrant Behavior Checklist* (ABC; Aman et al. 1985) was explored as an outcome measure. This subscale has several noncompliance items, although the majority focuses on symptoms of hyperactivity. In the original study, the effect size on ABC Hyperactivity/Noncompliance of PT in addition to risperidone was 0.55 ($p = 0.04$). Therefore, results for both HSQ total score and ABC Hyperactivity/Noncompliance are reported.

Predictors/Moderators—In total, 21 variables were assessed as potential moderators or predictors. Demographic variables included age, IQ [as assessed by the *Stanford Binet Scales of Intelligence Fifth Edition* (Roid 2003), the *Leiter International Performance Scale* (Roid and Miller 1998), or the *Mullen Scales of Early Learning* (Mullen 1995)], family income, and mother’s education level. Age was evaluated as a continuous variable while family income and parent education were treated categorically. As child IQ was assessed by several instruments, scores were dichotomized at a cutoff of 70.

Several baseline child and parent characteristics were also included in the analyses. They included subscales from the ABC, *Child and Adolescent Symptom Inventory* (Gadow and Sprafkin 2002), *Parent Stress Index* (Abidin 1995), and the *Vineland Adaptive Behavior Scales* (Sparrow et al. 1984). Finally, the *Clinical Global Impressions-Severity* scale and the *Children’s Yale-Brown Obsessive Compulsive Scale for Pervasive Developmental Disorders* (Scahill et al. 2006) were also used. Clinicians were required to demonstrate reliability with the network before making ratings on the latter two scales (see Aman et al. 2009 or Scahill et al. 2009). Because they were available, age-based standardized scores were used for *Vineland* subscales; for all other instruments raw scores were used in the analyses.

Each of the variables was entered into a correlation matrix. It is common to combine variables that correlate at 0.5 or greater, in the interest of increasing statistical power. There were some instances of correlations exceeding this threshold. However, in most cases it appeared that the amount of shared variance was not significant enough to warrant the combination of subscales. Exceptions included the *Child and Adolescent Symptom Inventory* Inattentive and Hyperactive subscales, for which the Combined subscale score was substituted, and the HSQ subscales derived by Chowdhury et al. (2010), for which the Total Score was used.

Adherence to Parent Training—In order to explore the relationship between adherence to PT procedures and outcome, the change between baseline and endpoint in the outcome measures was correlated with “adherence” variables within the COMB group ($n = 75$). Each session had between four and seven session-specific goals for the parent (e.g., “Parent will

suggest an appropriate prevention strategy for their own child's daily schedule"). These goals addressed parent understanding of concepts and other factors such as completion of homework and parents' participation in the development of intervention. Ratings were made by the therapist on a three-point scale: 0 ("Parent did not demonstrate skill or understanding"), 1 ("Parent understood or responded correctly to a few of the queries"), or 2 ("Parent understood and responded correctly to nearly all queries"). As the number of goals varied by session, adherence was represented by the proportion of points earned out of points possible for all sessions.

Measures of central tendency for each of the variables are presented in Table 1. Significant differences between groups were observed for the *Vineland*. Children assigned to the MED group were likely to have lower (worse) scores than the COMB group on the Communication [$M (SD)_{MED} = 53.2(19.9)$, $M (SD)_{COMB} = 61.1(20.9)$, $p = 0.04$], Daily Living Skills [$M (SD)_{MED} = 41.1(19.8)$, $M (SD)_{COMB} = 50.8(18.5)$, $p = 0.007$], and Socialization domains [$M (SD)_{MED} = 53.5(14.4)$, $M (SD)_{COMB} = 59.5(15.0)$, $p = 0.03$]. Although these differences were statistically significant, they likely do not represent meaningful behavioral differences in everyday life. Consequently, the *Vineland* variables were retained for predictor and moderator analyses.

Data Analysis

Random effects regression, including fixed effects for treatment, time, site, and their interactions, was used. Baseline values of the outcome variable were included as a covariate in the model. Quadratic and cubic functions of time were tested but the interactions of these terms with treatment were not significant and were therefore excluded. An intent-to-treat model was used to analyze the data, which means that data from all participants regardless of endpoint were considered in the model. In the current analysis, identical models as those used in the original publication (Aman et al. 2009) were employed and rerun with putative predictor and moderator variables included.

According to the seminal publication on moderators (Baron and Kenny 1986) and subsequent modifications (MacArthur Foundation Network: Kraemer et al. 2008), a moderator must (a) have temporal precedence to treatment (b) be reasonably independent from treatment, and (c) interact significantly with the treatment variable in predicting outcome. A predictor variable shares these criteria with the exception of (c): instead of an interaction, a predictor exerts a unique *main effect* on the outcome.

The three criteria for moderators and predictors were explored. Criteria (a) and (b) were implied by the study design; temporal precedence and independence of the variables was established by using baseline values that were necessarily measured prior to the onset of randomized treatment. Criterion (c) was evaluated by including the variable in the random effects regression model used for the primary analyses. In separate models, a main effect of the variable over time and its triple interaction with time and treatment were inserted. Due to the longitudinal nature of the data, the "main effect" of the variable was represented by the interaction of that variable with time. A significant *main effect* (time by treatment) is required of a predictor variable, while a significant *triple interaction* is required of a moderator.

Level of significance was set at $p < 0.01$ rather than 0.05 as partial correction for the number of comparisons, reducing the likelihood of Type I error at the expense of increasing the risk for Type II error. Each variable was centered before its inclusion in the model; continuous variables were centered at their respective medians, while binary variables were recoded as -0.5 and 0.5 (rather than 0 or 1). Centering refers to the practice of subtracting the overall median from each observation. Therefore, each variable is "zeroed" at its own median.

Centering the data aids interpretation and diminishes the effects of multicollinearity (Kraemer and Blasey 2004).

Results

Predictor Analyses

Main effects of the variables on HSQ Total Score and the ABC Hyperactivity/Noncompliance subscale are shown in Table 2. One variable was found to be a significant predictor of outcome on the HSQ Total Score: higher baseline values of the HSQ Total Score predicted a greater degree of improvement, regardless of treatment assignment [$F(1,548) = 7.23, p = 0.007$]. In the subgroup analysis based on median split, the “low” HSQ group had less average improvement [$M (SD) = 1.78(1.35)$] than the “high” HSQ group [$M (SD) = 3.71(1.58)$] (see Fig. 1). The Week 24 treatment difference shown in Fig. 1 for those with high initial severity on the HSQ had a large and significant effect size ($d = 0.81, p < 0.01$) compared to a slightly negative nonsignificant effect size for low initial severity, raising a question whether the previously reported significant advantage of added PT may be concentrated in those with high initial severity. However, the triple interaction of time, treatment, and initial severity was not significant ($p = 0.13$) at the pre-determined significance level ($p = 0.01$), so this cannot be considered evidence of moderation by the guidelines used in this report. No other variables were significant predictors of HSQ outcome, although older children experienced slightly more improvement than younger children [$F(1,546) = 4.96, p = 0.03$].

No significant main effects were observed on the ABC Hyperactivity/Noncompliance subscale, although the Communication [$F(1,556) = 5.04, p = 0.03$] and Composite [$F(1,556) = 4.56, p = 0.03$] subscales of the *Vineland* approached significance. In both cases, higher scores on the *Vineland* subscales predicted greater improvement on the ABC Hyperactivity/Noncompliance subscale, regardless of treatment assignment. The effect sizes associated with between-groups (high/low *Vineland*) change scores were moderate (Communication $d = 0.39$; Composite $d = 0.37$).

Ratings on parent adherence were available for 73 (97%) of the 75 families assigned to COMB. Parent adherence to PT was significantly correlated with outcome on the HSQ ($r = .32, p = 0.006$) but not with outcome on the ABC Hyperactivity/Noncompliance subscale ($r = .19, p = 0.10$). Although the magnitude of the relationship is modest, the results indicate that increased adherence to PT session goals was associated with greater improvement on the HSQ.

Moderator Analyses

Results from the moderator analyses are presented in Table 3, including the F value of the interaction terms with each potential moderator. No variables were found to moderate the relationship between PT and outcome on either the HSQ Total Score or the ABC Hyperactivity/Noncompliance subscale. None of the hypothesized moderators of the main outcome measure were substantiated: neither family income [$F(1,544) = 0.58, p = 0.45$], mother's education level [$F(1,548) = 0.08, p = 0.78$], nor parental distress [$F(1,547) = 0.05, p = 0.82$] were part of a significant triple interaction for predicting HSQ. Only one variable approached significance in moderating the effect of PT on the ABC Hyperactivity/Noncompliance subscale: the Oppositional-Defiant Disorder (ODD) subscale of the *Child and Adolescent Symptom Inventory* [$F(1,556) = 5.70, p = 0.02$]. The COMB treatment had a greater effect in the “high” ODD group ($d = 0.66$) than in the “low” ODD group ($d = 0.02$).

Discussion

Predictor Analyses

Of all the variables analyzed, only one (baseline HSQ score) predicted outcome. Regardless of treatment assignment (combined treatment or medicine alone), children with higher baseline HSQ scores (i.e., more significant noncompliance) experienced a greater degree of improvement than those with lower baseline HSQ Total Scores (i.e., less noncompliance). It is possible that this result is a statistical artifact due to those with higher baseline scores having more room to improve. However, the analogous model with the ABC Hyperactivity/Noncompliance subscale did not produce a significant predictor, suggesting that the phenomenon is not simply regression to the mean. Perhaps the HSQ measures qualities in a child that are more responsive to general treatment than those measured by the ABC. Regardless, the practical conclusion is relevant: children with more severe noncompliance stand to benefit more from treatment (antipsychotic with or without PT) than less impaired children. This is the same conclusion reached with risperidone on the ABC Irritability Subscale in the first RUPP autism study (RUPP Autism Network 2002) where there was a placebo control. Thus, this is essentially a replication with a different scale of the antipsychotic effect bringing all patients to approximately the same target symptom level regardless of initial severity.

Parent adherence was associated with greater improvement on the HSQ Total Score, but not with outcome on the ABC Hyperactivity/Noncompliance subscale. This discrepancy is somewhat intuitive, given that the items on the HSQ were likely to be more directly addressed by the PT. The correlation was smaller than expected, but it may have been due to the limited range of points awarded for parent adherence. Although scores ranged from 46% to 100%, the standard deviation was relatively small (9.5%). It is important to note that adherence cannot be considered a predictor because the analysis prevents conclusions regarding causality; it may be that efficacy boosted the parents' interest and effort in PT rather than adherence predicting outcome (reverse causality) or that the families who were capable of adherence had resources that supported child improvement through other avenues (no causal link). Overall, however, this result supports the intuitive conclusion that effective implementation by parents is associated with a greater degree of PT efficacy.

Moderator Analyses

None of the variables measured in this study moderated the effect of behavioral treatment in children with ASDs taking risperidone for severe disruptive behavior. The lack of significant findings in a moderator analysis has a different meaning than in other types of analyses. The lack of differential response across subgroups suggests that the treatment efficacy was not significantly affected by the socio-demographic characteristics and co-occurring conditions measured in this sample. Thus, our results suggest that PT is appropriate for a wide range of children with ASDs, regardless of parent education or income, child age or IQ, symptom severity, or comorbid symptomatology. Although the lack of significant findings may be disappointing from a scientific perspective, it is encouraging for clinical practice, suggesting that practitioners can confidently suggest PT for families regardless of socio-demographic characteristics and co-occurring conditions.

Unlike this analysis, one of the few moderator analyses of *behavioral* intervention in the literature (MTA Cooperative Group 1999) did find moderators in a population of children with ADHD, including co-occurring anxiety. Substantial differences in the populations, treatments, and study design may well have played a role in the different outcomes. One of these is the difference in sample size, with the MTA sample being almost five times as large, with correspondingly greater power. Moderators speak to the nature of the treatment effect

in a *specific population*, so it is possible that comparison between the MTA (ADHD) and the current study (ASD) is not appropriate. One other moderator analysis has been conducted in children with ASDs and severe disruptive behavior treated with risperidone only (Arnold et al. 2010). Those analyses also yielded few significant moderators of risperidone treatment. Perhaps the broader population of children with ASDs and severe problem behavior is homogenous enough to preclude meaningful moderators for effective behavioral or pharmacologic treatment. Of course, failing to find evidence of moderation does not *prove* that no moderators exist; however, null results in moderator analyses are inherently interesting in that they suggest a wide range of efficacy for a treatment. Certainly, more research is needed to elucidate the answers to these questions.

This study had several limitations. It is not possible to rule out Type II error (false negatives). The trial was not designed to determine the effect of moderators and/or predictors of outcome. Therefore, the composition of the sample relative to each putative moderator/predictor may not have been optimal. Although we selected significance level of 0.01 as a reasonable balance between the risk of Type I and Type II error, it is possible that the marginal and significant findings are a statistical artifact of multiple tests. However, the small effect sizes observed for most variables indicated that larger sample sizes would not have had great impact on the statistical significance of the findings. Subgroup analysis was used to explore the marginal and significant moderators and predictors. Although a subgroup analysis does not provide direct evidence that the effects in the high and low groups were different (Hayes and Matthes 2009), it does indicate in which direction the effect lies.

Conclusion

We found no significant evidence of moderators of response to PT in children with ASDs and significant behavioral disturbance who were being treated with an antipsychotic. The results of these analyses suggest that combined treatment is superior to medication alone, but there is no apparent subgroup that is more or less likely to respond to combined treatment. The only general predictor of response was the baseline score of the HSQ, which was also the outcome measure. As the effect was present in both treatment groups, this could possibly be attributed to a statistical artifact, but it is compatible with a similar result reported from a placebo-controlled trial. We encourage other researchers to explore those findings that were marginally significant. These include ODD symptoms as moderators, as well as adaptive behavior and age as predictors of response to this type of treatment package.

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Fig. 1.

Baseline HSQ predicts improvement on the HSQ regardless of treatment assignment. Lines represent mean HSQ Scores at each week within groups determined by median split of the BL HSQ score. BL baseline, HSQ Home Situations Questionnaire Total Score, MED medication-only, COMB medication plus parent training

Table 1

Potential predictors and moderators of response

	All, <i>N</i> = 124		MED, <i>n</i> = 49	COMB, <i>n</i> = 75
	<i>M</i> (SD/%)	Median	<i>M</i> (SD)	<i>M</i> (SD)
Income (USD) [<i>n</i> (%)]				
<20,000	26 (21.1)		12 (25.0)	14 (18.7)
20,001–40,000	35 (28.5)		14 (29.2)	21 (28.0)
40,001–60,000	21 (17.1)		10 (20.8)	11 (14.7)
60,001–90,000	23 (18.7)		7 (14.6)	16 (21.3)
>90,000	18 (14.6)		5 (10.4)	13 (17.3)
Mother's education [<i>n</i> (%)]				
<8th grade	5 (4.0)		1 (2.0)	4 (5.3)
Some high school	7 (5.7)		4 (8.2)	3 (4.0)
High school graduate/GED	33 (26.6)		15 (30.6)	18 (24.0)
Some college or 2 year degree	45 (36.3)		17 (34.7)	28 (37.3)
College graduate	22 (17.7)		10 (20.4)	12 (16.0)
Advanced degree	12 (9.7)		2 (4.1)	10 (13.3)
IQ [<i>n</i> (%)]				
<70	53 (42.7)		26 (53.1)	27 (37.0)
70	69 (55.6)		23 (47.0)	46 (63.0)
Child's age	7.4 (2.4)	7.0	7.5 (2.8)	7.4 (2.2)
ABC Irritability	29.5 (6.6)	30.0	29.7 (6.1)	29.3 (7.0)
ABC Hyperactivity/Noncompliance	35.6 (8.4)	37.0	36.1 (6.9)	35.3 (9.3)
CGI Severity	5.0 (0.8)	5.0	5.1 (0.8)	4.9 (0.8)
CASI ADHD-Combined	37.9 (8.8)	38.0	37.9 (8.3)	37.8 (9.2)
CASI Oppositional Defiant Disorder	12.9 (5.5)	13.0	12.1 (5.3)	13.3 (5.6)
CASI Generalized Anxiety Disorder	7.5 (3.8)	7.0	7.5 (3.7)	7.5 (3.9)
CASI Mood Disorder	3.7 (4.0)	2.0	2.9 (3.3)	4.3 (4.3)
CASI Pervasive Developmental Disability	22.5 (7.4)	22.0	23.2 (7.0)	22.0 (7.7)
CYBOCS Total Score	15.3 (2.8)	15.0	16.2 (2.5)	14.7 (2.9)
HSQ Total Score	4.2 (1.6)	4.3	4.2 (1.5)	4.3 (1.7)
PSI Parental Distress	32.6 (9.7)	33.0	35.7 (9.0)	30.6 (9.8)
PSI Total Stress	111.2 (19.1)	112.5	115.8 (18.1)	108.3 (19.3)
Vineland Daily Living	47.0 (19.5)	48.0	41.1 (19.8)	50.8 (18.5)
Vineland Socialization	57.2 (15.0)	55.0	53.5 (14.4)	59.5 (15.0)
Vineland Communication	58.0 (20.8)	58.5	53.2 (19.9)	61.1 (20.9)
Vineland Composite	50.3 (15.9)	51.5	45.8 (15.5)	53.1 (15.7)
Adherence to PT, % total points	n/a		78.8 (9.6)	n/a

N = 124 (*n* = 2 had missing IQ data)

USD US dollar, GED general education diploma, IQ intelligence quotient, ABC Aberrant Behavior Checklist, CGI Clinical Global Impressions, CASI Child and Adolescent Symptom Inventory, ADHD attention deficit/hyperactivity disorder, CYBOCS Children's Yale-Brown Obsessive-Compulsive Scale, HSQ Home Situations Questionnaire, PSI Parent Stress Index, PT parent training

Table 2

Predictor analyses

Variable	HSQ Total Score		ABC Hyperactivity/Noncompliance	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Demographic variables				
Income	0.02	0.88	1.02	0.31
Mother's education	0.40	0.53	0.02	0.89
Child's age	4.96	0.03	3.23	0.07
IQ	3.18	0.08	3.43	0.06
Aberrant Behavior Checklist				
Irritability	1.13	0.29	0.02	0.87
Hyperactivity/Noncompliance	0.36	0.55	0.31	0.58
CGI severity	0.08	0.78	0.21	0.65
Child and adolescent symptom inventory				
ADHD-Combined	0.02	0.89	0.30	0.58
Oppositional Defiant Disorder	0.06	0.81	0.00	0.96
Generalized Anxiety Disorder	0.77	0.38	0.17	0.68
Mood Disorder	0.84	0.36	0.04	0.85
PDD	0.11	0.75	2.47	0.12
CYBOCS Total Score	0.42	0.52	0.38	0.54
Home Situations Questionnaire	7.23	0.01	0.29	0.59
Parent Stress Index				
Parental Distress	0.20	0.65	0.54	0.46
Total Stress	0.78	0.38	0.84	0.36
Vineland Adaptive Behavior Scale				
Daily Living	0.18	0.67	3.62	0.06
Socialization	0.34	0.56	1.45	0.23
Communication	0.58	0.45	5.04	0.03
Composite	0.60	0.44	4.56	0.03

N = 124

IQ intelligence quotient, *CGI* Clinical Global Impressions, *ADHD* attention deficit/hyperactivity disorder, *PDD* pervasive developmental disorder, *CYBOCS* Children's Yale-Brown Obsessive-Compulsive Scale

Table 3

Moderator analyses

Variable	HSQ Total Score		ABC Hyperactivity/Noncompliance	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Demographic variables				
Income	0.58	0.45	0.07	0.80
Mother's education	0.08	0.78	0.67	0.42
Child's age	0.43	0.51	0.65	0.42
IQ	0.04	0.83	0.96	0.32
Aberrant Behavior Checklist				
Irritability	0.08	0.78	0.04	0.84
Hyperactivity/Noncompliance	0.15	0.69	0.46	0.50
CGI Severity	0.32	0.57	2.13	0.14
Child and Adolescent Symptom Inventory				
ADHD-Combined	0.01	0.93	0.73	0.39
Oppositional Defiant Disorder	3.38	0.07	5.70	0.02
Generalized Anxiety Disorder	0.43	0.51	0.84	0.36
Mood Disorder	1.14	0.29	1.92	0.17
PDD	0.39	0.53	0.08	0.78
CYBOCS Total Score	1.96	0.16	1.60	0.21
Home Situations Questionnaire	2.27	0.13	1.02	0.31
Parent Stress Index				
Parental Distress	0.05	0.82	0.01	0.92
Total Stress	0.11	0.74	0.00	0.99
Vineland Adaptive Behavior Scale				
Daily Living	0.12	0.73	0.09	0.76
Socialization	0.00	0.97	0.09	0.77
Communication	0.00	0.95	0.22	0.64
Composite	0.12	0.73	0.04	0.83

N = 124

IQ intelligence quotient, *CGI* Clinical Global Impressions, *ADHD* attention deficit/hyperactivity disorder, *PDD* pervasive developmental disorder, *CYBOCS* Children's Yale-Brown Obsessive-Compulsive Scale