



# Toward an exportable parent training program for disruptive behaviors in autism spectrum disorder

Karen Bearss\*<sup>1</sup>, Luc Lecavalier<sup>2</sup>, Noha Minshawi<sup>3</sup>, Cynthia Johnson<sup>4</sup>, Tristram Smith<sup>5</sup>, Benjamin Handen<sup>6</sup>, Denis G Sukhodolsky<sup>7</sup>, Michael G Aman<sup>8</sup>, Naomi Swiezy<sup>3</sup>, Eric Butter<sup>9</sup> & Lawrence Scahill<sup>1</sup>

### Practice points

- Parent training is an evidence-based treatment for typically developing children with disruptive behavior.
- Data indicate that disruptive behaviors have a negative impact on adaptive behavior in children with autism spectrum disorder (ASD). Reducing disruptive behavior promotes improvement in adaptive functioning in these children.
- When combined with medication, parent training has been shown to provide additional benefits for school-age children with ASD and serious behavioral problems.
- Parent training as a standalone treatment for disruptive behaviors has not been systematically studied in children with ASD.
- In our pilot studies we showed that parent training is acceptable to parents of children with ASD and disruptive behaviors and that it can be reliably delivered in the context of a clinical trial.
- These studies provide a model for psychosocial treatment development in ASD that includes compilation of effective techniques into a structured manual followed by feasibility and formal testing of efficacy.

**SUMMARY** Autism spectrum disorder (ASD) is a condition of early childhood onset characterized by profound deficits in social interaction, impaired communication and repetitive behavior. The prevalence of ASD is now estimated to be one in 100 children. As the number of identified cases of ASD has grown, so have the challenges of serving these

<sup>1</sup>Marcus Autism Center, Children's Healthcare of Atlanta, Department of Pediatrics, Emory University School of Medicine, 1920 Briarcliff Road, NE, Atlanta, GA 30329, USA

<sup>2</sup>Nisonger Center, UCEDD, 371-D McCampbell Hall, Ohio State University, 1581 Dodd Drive, Columbus, OH 43210, USA

<sup>3</sup>Riley Hospital for Children, Indiana University School of Medicine, 705 Riley Hospital Drive, Room 4300, Indianapolis, IN 46202, USA

<sup>4</sup>Department of Pediatrics, University of Pittsburgh School of Medicine, 3420 Fifth Avenue, Pittsburgh, PA 15213, USA

<sup>5</sup>Strong Center for Developmental Disabilities, Division of Neurodevelopmental & Behavioral Pediatrics, Department of Pediatrics, Saunders Research Building, University of Rochester Medical Center, 265 Crittenden Boulevard, Rochester, NY 14642, USA

<sup>6</sup>Merck Child Outpatient Program, Western Psychiatric Institute & Clinic, University of Pittsburgh School of Medicine, 1011 Bingham Street, Pittsburgh, PA 15203, USA

<sup>7</sup>Yale Child Study Center, 230 S Frontage Road, New Haven, CT 06520, USA

<sup>8</sup>The Nisonger Center UCEDD, Room 175, Ohio State University, 1581 Dodd Drive, Columbus, OH 43210-1257, USA

<sup>9</sup>Nationwide Children's Hospital, 187 W Schrock Road, Westerville, OH 43081, USA

\*Author for correspondence: Tel: +1 404 785 9544; Fax: +1 404 785 9063; karen.bearss@emory.edu

children and their families. Unfortunately, the empirical foundation for many interventions for this population is not firmly established. Thus, there is a pressing need to conduct trials that will expand the evidence base and guide clinical treatment. Investigators from the Research Units in Pediatric Psychopharmacology (RUPP; Indiana University, IN, USA; Ohio State University, OH, USA; University of Pittsburgh, PA, USA; and Yale University, CT, USA) followed a treatment development model outlined by an National Institute of Mental Health *ad hoc* committee to develop and test a parent training treatment manual for children with ASD accompanied by disruptive behavior problems. This article describes the process of manual development and cross-site therapist training, establishment and maintenance of treatment integrity, assessment of treatment acceptance by families as well as primary outcomes of three trials. Results suggest the structured parent training program can be delivered with a high degree of fidelity within and across therapists, is acceptable to parents and can produce significant reductions in disruptive behaviors in children with ASD.

Autism spectrum disorder (ASD) is a condition of early childhood onset characterized by profound deficits in social interaction, impaired communication and repetitive behavior. Recent estimates place the prevalence of ASD at 11.3 per 1000 children [1], which is similar to prior findings [2,3]. The increase in the detected prevalence is due, in large part, to better community sampling methods, broadening of the case definition and improved diagnostic precision [4].

Of the many available interventions, most psychosocial and psychopharmacological treatments for children with ASD lack a firm empirical foundation [10]. Thus, the increase in the detected prevalence of ASD and subsequent increased demand for services occurs against the backdrop of insufficient evidence for treatments, posing a major public health issue. There is a pressing need to conduct trials that will expand the availability of empirically supported, time-limited and cost-effective interventions for children with ASD.

Parent training (PT) for families of children with ASD warrants interest as a potential intervention model for several reasons. First, PT is considered an efficacious treatment for typically developing children with disruptive behavior [5–9]. Second, it is traditionally a time-limited approach (typically ten to 20 sessions) delivered during brief (1–1.5 h) weekly sessions. As such, it may be feasible to administer in a wide range of service settings. Third, it emphasizes the role of parents as the change agent. It is parents, after all, who confront the daily struggles that often come with rearing a child with ASD [10,11].

Available evidence suggests that as many as 70% of children with ASD have at least one additional psychiatric condition [12–15]. Additionally, clinically significant challenging behaviors are common and may include tantrums, aggression,

noncompliance with routine demands, self-injury, property destruction and hyperactivity, which require skillful responses from parents [13,16]. Most children with ASD also require assistance with accomplishing activities of daily living and many actively resist acquiring new skills or performing already acquired skills. Indeed, on measures of adaptive functioning, children with ASD are often a full standard deviation below their assessed cognitive ability [17,18]. To reduce noncompliance and improve adaptive functioning, parents may need specific instruction in behavioral interventions and procedures.

Disruptive behaviors also interfere with family quality of life [19]. Compared with parents of typically developing children, parents of children with ASD report a greater sense of helplessness and are more likely to avoid conflict when facing challenges of parenting [20]. Although the number of young children with ASD receiving special educational services has steadily increased, most school-based programs focus on the child and do not include PT [21].

To date, most research on parent-mediated interventions in this population has focused on helping parents treat core features of ASD, such as socialization and communication [22–28] or imitation skills [29]. Parents have been included in treatment and taught ways to enhance their child's eye contact, joint attention and play skills [26]. PT also has been studied as an adjunct to school-based programs for children with ASD [23,30]. The study by Dawson *et al.* included twice-monthly PT to augment intensive child-focused intervention targeting cognitive skills, adaptive behavior and core symptoms of ASD [23]. By contrast, PT for disruptive behavior in children with ASD provides instruction for parents to reduce problem behavior and increase compliance [31–35]. Examples of commonly used behavioral strategies include

the use of antecedent management (e.g., visual schedules, functional communication training and environmental manipulations), reinforcement procedures (e.g., differential reinforcement and contingency management), compliance training, teaching skills (e.g., task analysis and prompting procedures) and other approaches to consequences (e.g., time-outs).

The empirical support for PT for reducing disruptive behavior in children with ASD comes largely from single-subject design studies [36–39] and a handful of small randomized clinical trials (RCTs) [40–43]. For example, in a RCT, Tonge and colleagues compared outcomes of behavioral PT in 35 children with ASD with 35 children in parent psychoeducation [43]. These outcomes were compared with 35 children with ASD who received treatment as usual. Children in the behavioral PT group with greater adaptive delays at baseline showed significant improvements in adaptive behavior at the 6-month follow-up. Whittingham and colleagues conducted an RCT using the 9-week Stepping Stones Triple P Program in 59 families (29 intervention and 30 waitlist) in children aged 2–9 years with ASD [42]. Results demonstrated significant improvements in parent-reported child behavior problems for families participating in the Stepping Stones program, with treatment effects maintained 6 months post-treatment.

Although these studies offer proof of concept for PT, drawbacks of most include small sample sizes, nonrandom treatment assignment and poorly characterized samples. In addition, few studies used structured manuals, which hinders replication and dissemination of PT in ASD [39]. Rigorous study of PT as a standalone intervention for disruptive behavior in children with ASD remains limited, which leaves clinicians and families with inadequate guidance on treatment options.

This inadequate state of treatment development was identified by a National Institute of Mental Health (NIMH) *ad hoc* committee [42,44]. The committee cited two necessary prerequisites for conducting a large-scale RCT in ASD: the development of a treatment manual and a pilot study to confirm feasibility [39]. A treatment manual assembles validated techniques into a standardized format that guides consistent delivery of the intervention [45]. Pilot feasibility trials are used to demonstrate that the treatment is acceptable to families and to show that the manual can be delivered consistently by therapists at different sites [39].

Investigators from the Research Units in Pediatric Psychopharmacology (RUPP; Indiana University, IN, USA; Ohio State University, OH, USA; University of Pittsburgh, PA, USA; and Yale University, CT, USA) followed the model outlined by the NIMH *ad hoc* committee to develop and test a PT treatment manual for children (aged 4–13 years) with ASD accompanied by disruptive behavior problems [45–48]. The development of the manual is described in Johnson *et al.* [45]. Results of the pilot feasibility trial were published in the same year [46]. The manual was then used in a large-scale, multisite RCT comparing risperidone only versus risperidone plus PT for school-age children with ASD accompanied by serious behavioral problems [47,48]. This treatment development process was replicated in order to test PT as a standalone intervention in younger children with ASD (aged 3–6 years) [49]. This article describes the development of a structured PT program for children with ASD, therapist training, establishment and maintenance of treatment integrity, and assessment of treatment acceptance by families. It also summarizes the primary outcomes of the three trials.

## Methods

### ■ Settings & participants

All three trials were approved by the Human Investigation Committee at each site and all participating parents provided written informed consent prior to inclusion in the study. The three trials conducted by our group used similar versions of the treatment manual, therapist training methods, process measures and outcome measures. The first trial was an open-label pilot study of 17 school-age participants recruited from four sites [46]. The second study, also a multisite trial, enrolled 124 school-age children who were randomly assigned to medication only (risperidone) or risperidone plus PT [47,48]. The third trial was an open, single-site pilot trial of 16 preschool-age participants [49]. In all three trials, children were required to have an ASD diagnosis, moderate or greater behavioral problems, receptive language age equivalents greater than 18 months, and treatment with stable medication or no medication prior to entry.

### ■ Manual development

In the absence of an available ‘off-the-shelf’ manual, RUPP investigators constructed a treatment manual based on the principles of applied

behavior analysis [45]. Effective applied behavior analysis intervention rests on the principle that disruptive, noncompliant and explosive behaviors serve a function for the child. A key to understanding the function of a given behavior is to identify the situations that precede the behavior and the consequences that follow the behavior. The exploration of consequences in this context is used to identify how the behavior is being inadvertently reinforced. Another underlying assumption of the PT manual is that reduction of disruptive behavior is a prerequisite to participate in learning activities and to make gains in adaptive living skills. In order to get beyond blame for the child's maladaptive behavior, therapists are encouraged to remind parents that raising children with ASD involves particular challenges that require specialized parenting skills.

The manual consists of 11 core sessions, three optional sessions, three booster sessions (two via telephone, one face-to-face), as well as two home visits (Table 1). Core and optional sessions are delivered to the child's primary caregiver(s) over

16 weeks. This schedule is tolerant of cancellations and rescheduling in order to ensure that the full 'dose' of the PT program can be delivered. This flexible schedule also offers the opportunity for parents to practice the various skills provided in each session. The telephone and booster sessions focus on generalization and maintenance of skills.

The first few sessions focus on behavioral strategies designed to reduce the child's disruptive behavior. Later sessions provide strategies for teaching the child new skills and generalization of gains over time. This sequence is intended to make the child's disruptive behaviors more manageable, which then sets the stage for skill development.

Sessions are 60–90 min in duration and are delivered individually to the primary caregiver by masters- or doctoral-level clinicians. Each session includes a therapist script and session-specific parent activity sheets (e.g., having parents identify antecedents and consequences of a problem behavior, or having parents develop a task analysis for a grooming skill). Sessions

**Table 1. Original Research Units in Pediatric Psychopharmacology parent training program.**

Session	Skills/activities
<b>Initial sessions: weeks 1–16</b>	
Behavioral model and functional assessment	Introduce overall treatment goals and concepts of behavioral functions, antecedents and consequences of behavior
Prevention I: antecedent management strategies	Discuss antecedents to behavior problems and develop preventive strategies
Home visit 1 (between prevention strategies and daily schedules sessions)	
Prevention II: use of schedules	Develop a daily schedule and identify points of intervention (including use of visual schedules) to decrease behavior problems
Reinforcement	Introduce concept of reinforcers to promote compliance, strengthen desired behaviors and teach new behaviors
Teaching compliance	Introduce elements of effective parental requests and the use of guided compliance in order to enhance compliance and manage noncompliance
Planned ignoring	Explore systematic use of extinction (via planned ignoring) to reduce behavioral problems
Functional communication skills	Through systematic reinforcement, teach alternative communicative skills to replace problematic behaviors
Teaching skills (two sessions)	Using task analysis, chaining and prompting, provide parents with tools on how to replace problem behaviors with appropriate behaviors, and promote new adaptive, coping and leisure skills
Generalization & maintenance (two sessions)	Generate strategies to consolidate positive behavior changes and establish new additional skills
Up to three optional sessions	Review session material or provide instruction on the following optional topics: toileting; feeding; sleep; time out; imitation skills; contingency contracting; and crisis management
<b>Booster sessions: weeks 16–24</b>	
Telephone booster	Week 18: review implementation of intervention strategies and troubleshoot new behaviors
In-person booster	Week 20: review implementation of intervention strategies and troubleshoot new behaviors
Home visit 2	
Telephone booster	Week 22: review implementation of intervention strategies and troubleshoot new behaviors

Modified with permission from [41].

use direct instruction, modeling and roleplaying to promote parental skill acquisition. Video vignettes are also used to illustrate skill implementation (e.g., demonstrating proper use of specific techniques such as guided compliance) or to show the connection between the antecedent and the consequence (e.g., one vignette shows that giving the child a cookie to quell a tantrum, which reinforces explosive behavior). The video vignettes are also used to test parent knowledge of materials covered in the session (e.g., having the parents identify which steps of ‘planned ignoring’ in the vignette were correctly or incorrectly implemented). Families are given homework assignments at the end of each session designed to practice new skills learned in the PT sessions. Although homework assignments parallel the session content, the targeted behaviors and the selection of strategies are individualized for each child. At the completion of each session, the therapist documents each of the targeted strategies in the child’s behavior support plan. This becomes a cumulative record of the individually designed techniques and procedures introduced in the program.

#### ■ Therapist training

A standardized therapist training program was developed to promote consistent delivery of the PT manual across therapists. All PT therapists were required to have a masters or doctoral degree in clinical psychology, behavior analysis or a related profession. Prior to working with study participants, new therapists received didactic training on the manual and watched a full set of video-recorded sessions delivered by an expert therapist. They also provided treatment to a non-study ‘training’ case and recorded all sessions from this case for review by the manual developers, who scored therapist’s fidelity to the manual. Therapists needed to deliver each session with a minimum of 80% fidelity in order to begin providing PT in the study. As a check on whether fidelity was maintained over the course of the trial, a 10% random sample of sessions from each therapist was reviewed. An individual remediation plan was created for any therapist who subsequently fell below the 80% criterion with a study patient.

Treatment fidelity was also supported through weekly therapist conference calls. On these calls, therapists could present new cases and discuss barriers to implementing PT. Problems with parental adherence or attendance were also discussed on these calls.

Discussions on calls frequently produced workable solutions and built up a body of precedents to handle future problems.

#### Process measures

In addition to commonly used outcome measures described below, our group developed new measures to assess therapist fidelity, parental adherence and parent satisfaction.

Therapist fidelity checklists were created for each PT session to be completed by the therapist after each session. The checklists indicate the therapist goals for each core and optional session. The therapist rates his or her adherence to each of the session’s goals on a scale of 0–2 (0 = goal not achieved; 1 = goal partially achieved; 2 = goal fully achieved). Therapist fidelity can be expressed as a percentage (e.g., a score of 2 on all goals for a given session equals 100% fidelity for that session).

Parent adherence to treatment was measured on a checklist specifically designed for each core and optional session. After each session, the therapist-rated parental attainment of the session-specific objectives. Each objective is rated on a 0–2 scale (0 = objective not achieved; 1 = objective partially achieved; 2 = objective fully achieved) based on observed parent behaviors in the session. Parent attainment of session objectives can also be expressed as a percentage (e.g., a parent with a score of 2 on each of the session objectives would receive a score of 100% adherence). Parent behaviors considered in the rating include evidence of homework completion (e.g., collecting data on a specific behavior), accurate responses to video vignettes and written scenarios, as well as demonstration of techniques such as use of effective commands in roleplay.

To rate therapist fidelity and parent adherence in the aggregate for a given trial, a random 10% sample of video recordings was scored by an independent rater. We defined acceptable therapist fidelity as 80% and acceptable parent adherence as 65%. These thresholds were intended to account for variability across therapists and parents over the course of the 6-month program.

A Parent Satisfaction Questionnaire was developed for the initial RUPP-PT feasibility pilot with slightly modified versions used in the subsequent trials. The questionnaire was administered at the end of the PT program. Items administered across all three trials included questions on the content of PT sessions, the number and length of sessions, the teaching tools (videotape vignettes,

in-session worksheets and homework) and the level of confidence for handling future behavioral problems. Parents were also asked to indicate how often they applied the behavior management principles in daily life, which aspects of the PT program were particularly valuable and which aspects were less useful.

### Outcome measures

Children were assessed at baseline, at specific time points throughout the trial and at end point (week 24).

The Aberrant Behavior Checklist (ABC; [50,51]) is a parent- and teacher-report measure with 58 items, each rated on a four-point Likert scale (with higher scores being more severe) on five subscales: irritability (tantrums, aggression and self-injury; 15 items); social withdrawal (16 items); stereotypies (seven items); hyperactivity (16 items); and inappropriate speech (four items) [50,52]. The primary outcome measure for the three trials was the commonly used parent-reported ABC-Irritability (ABC-I) subscale [53]. Normative data for ABC subscales are dependent on child age and gender [52]. For example, the mean ABC-I scores for school-age boys and girls range from 5.3 (6.1) to 11.1 (9.2). The RUPP-PI RCT required a minimum score of 18 on the ABC-I in order for a child to be included in the study.

The Home Situations Questionnaire (HSQ) is a parent-rated scale for child noncompliance across everyday situations [54]. This version includes 25 items that were rated 'yes' or 'no'; 'yes' items are then scored from 1 (mild) to 9 (severe). The total severity score is divided by 25 to obtain a per-item mean. This slightly modified version of the HSQ for children with ASD was used in all three trials and has been found to be reliable [55].

The Vineland Adaptive Behavior Scales – Interview Format (VABS) assesses adaptive functioning across several domains and relies on the primary caretaker to describe what the child actually does in the course of daily living [56]. The VABS provides standard scores (against population norms of  $100 \pm 15$ ) on four core domains (communication, daily living skills, socialization and motor skills), as well as an adaptive behavior composite. Since its reintroduction in 1984, the VABS has become the most commonly used measure of adaptive functioning in the developmental disabilities field [56]. The clinician-administered interview format was utilized across the trials.

Parent Target Problems is an individualized description of the child's two most pressing problems nominated by the primary caregiver [57]. After the parent identifies the two problems, the independent evaluator asks about the frequency (for episodic behaviors) or constancy (for problems such as hyperactivity that reflect more enduring patterns), intensity and impact of the behavior on the family. The descriptions are recorded in brief narratives. The target problem narrative at baseline is reviewed and revised at specific time points during the study. The independent evaluator uses this description along with all other available information to make the the Clinical Global Impression – Improvement Scale (CGI-I) rating.

CGI-I is a 7-point scale designed to measure overall improvement from baseline [58]. Scores range from 1 (very much improved) to 4 (unchanged) to 7 (very much worse). The CGI-I was used by the independent evaluator (IE) for each study. This is an individual who is uninvolved in the administration of the PT and does not discuss cases with the therapist. The IE's role is to assess overall response to treatment based on all available information (HSQ, ABC and Parent Target Problems). Participants who received CGI-I scores of 1 (very much improved) or 2 (much improved) at week 24 are classified as positive responders; all other participants are classified as nonresponders.

### Results

**Table 2** summarizes demographic, clinical and educational information for study participants across the three trials. As shown, most children had a diagnosis of autistic disorder, most were male and approximately a third had an IQ below 70.

**Tables 3 & 4** summarizes therapist fidelity and parent acceptability across the three trials. Based on the independent review of the 10% random sample of therapy sessions, therapist fidelity to the manual was very high, ranging from 93 to 95%. Parent acceptance of the PT program across the three trials was excellent, with parents attending between 84 and 93% of the core sessions and adhering to session materials and homework assignments at a rate of 80–89%. Attrition varied across the three trials, with the highest drop-out rate in the RUPP-PT trial (27%). In comparison, the two pilot trials had lower rates of drop out, ranging from 13 to 18%. Families reported a high level of satisfaction, with most

respondents indicating increased confidence in handling current and future behaviors and saying they would recommend the program to other parents who have children with similar problems.

**Table 5** summarizes within-group baseline and end point results across the three trials. Primary outcomes of interest included changes on the parent-rated ABC-I subscale and the HSQ. Secondary analyses included change on the VABS daily living skills subdomain as well as ratings of improvement on the CGI.

Statistically significant reductions in disruptive behavior were observed in all three studies. Standard scores in the daily living skills domain of the VABS did not improve significantly in any of the three trials, but indicated that children were at least keeping pace with the passage of time (i.e., no reduction in standard scores were observed over the course of the 6-month trials). Rates of treatment response, as measured by the CGI-I, varied across the three trials, with higher positive response found in the large-scale RCT (83%) and in the pilot trial of younger children (88%) compared with 53% for the original pilot study.

**Discussion**

Results across the three trials suggest that this structured PT program can be delivered with a high degree of fidelity within and across therapists, and that the intervention is acceptable to parents. Both therapist and parent scores from all trials were higher than the established benchmarks of 80% for therapist fidelity and 65% for parent adherence to treatment. The rate of drop-outs ranged from 13 to 27% across the three trials, with the highest rate of attrition occurring in the RCT of medication alone versus medication plus PT. The rate of drop outs in this trial included reasons apparently unrelated to the PT intervention (e.g., adverse medication effects) [47,48]. Taken together, these results demonstrate the successful design and delivery of a structured PT manual that is acceptable to families and ready for testing as a standalone treatment.

Results also indicate that the treatment can produce significant reductions in disruptive, explosive and noncompliant behaviors in children with ASD. Given the relatively low cost and time-limited format of this PT intervention, this series of studies suggests that PT could be implemented on a larger scale than more intensive and costly interventions. In addition to efficacy testing of PT as a standalone treatment, future

**Table 2. Demographic data for the three trials.**

Demographic variables	RUPP-PT pilot (n = 17)	RUPP-PT RCT (n = 75)	Pre K Pilot (n = 16)
<b>Age (years)</b>			
Range	4–13	4–13	3–6
Mean (SD)	7.7 (2.6)	7.4 (2.2)	4.9 (0.8)
<b>Gender; n (%)</b>			
Male	14 (82.4)	65 (86.7)	16 (100)
<b>Cognitive functioning; n (%)</b>			
≥70	†	46 (63.0)	10 (62.5)
<70	†	27 (37.0)	6 (37.5)
<b>Income (US\$); n (%)</b>			
<40,000	5 (29.4)	35 (46.7)	3 (18.8)
40,000–60,000	8 (47.1)	11 (14.7)	3 (18.8)
60,000–90,000	4 (23.5)	16 (21.3)	2 (12.5)
>90,000	0 (0.0)	13 (17.3)	8 (50.0)
<b>Ethnicity<sup>‡</sup>; n (%)</b>			
Caucasian	15 (88.2)	59 (78.7)	13 (81.3)
African–American	2 (11.8)	9 (12.1)	0 (0.0)
Hispanic	2 (11.8)	4 (5.3)	2 (12.5)
Other	1 (5.9)	3 (4.0)	1 (6.3)
<b>Diagnosis; n (%)</b>			
Autistic disorder	11 (64.7)	49 (65.3)	7 (43.8)
Asperger’s disorder	2 (11.8)	4 (5.3)	0 (0.0)
PDD-NOS	3 (17.6)	22 (29.3)	9 (56.3)
Missing	1 (5.6)	0 (0.0)	0 (0.0)
<b>School programming; n (%)</b>			
Special education class/school	1 (64.7)	27 (35.1)	7 (43.8)
Regular education with services	2 (11.8)	7 (9.1)	3 (18.8)
Regular education classroom	4 (23.5)	26 (33.8)	6 (37.5)
Home school/no school	0 (0.0)	17 (22.1)	0 (0.0)

†The RUPP pilot study reported mean IQ scores (mean: 55.9; SD: 22.3).  
<sup>‡</sup>In the RUPP-PT pilot, the total n is greater than 100% because 18% of the participants selected more than one race identification category.  
PDD-NOS: Pervasive development disorder not otherwise specified; Pre K: Prekindergarten; RCT: Randomized clinical trial; RUPP-PT: Research Units in Pediatric Psychopharmacology parent training program; SD: Standard deviation.

studies designed to evaluate the wider application of PT are needed to justify increased access to PT children with ASD and their families.

Although this PT program includes modules on teaching parents how to promote daily living skills in their children, improvement on the VABS daily living skills domain was limited. We note that the two teaching skills sessions fall at the end of the program (typically between weeks 12 and 16) and focus on teaching one skill at a time (e.g., zipping zippers or brushing teeth). Thus, the full impact of teaching various daily living skills, based on systematic instructional techniques such as task analysis and prompting procedures may not become evident until after

**Table 3. Therapist fidelity and parent acceptability for the three trials.**

Fidelity and acceptability measures	RUPP-PT pilot (n = 17); %	RUPP-PT RCT (n = 75); %	Pre K Pilot (n = 16); %
<b>Therapist</b>			
Total fidelity	94	95	93
<b>Parent</b>			
Session adherence	80	89	87
Core session attendance	93	86	84
Attrition	18	27	13

Pre K: Prekindergarten; RCT: Randomized clinical trial; RUPP-PT: Research Units in Pediatric Psychopharmacology parent training program.

the 24-week assessment. Future studies should examine whether additional sessions on training new skills or placing the skill development sessions earlier in the treatment would improve outcomes on measures of adaptive behavior.

**Limitations**

Although this series of studies provides evidence for the feasibility and efficacy of PT in children with ASD and disruptive behavior, several limitations warrant mention. First, we do not have data from an RCT showing that PT as a standalone intervention is superior to a control condition. We have presented data on change from pre- to post-intervention within groups because two of the three trials did not include a comparison group. The third trial was an RCT that compared medication alone to medication plus PT. Although combined treatment was superior to medication alone, the study showed that medication also produced considerable benefit as well [47,48]. This RCT also enrolled children with serious behavioral problems for whom risperidone is an appropriate choice of treatment. In the absence of a rigorous test of PT as a standalone treatment, it is unknown whether it would be an effective intervention for participants with moderate levels of disruptive behavior for whom medication may not be appropriate.

**Future directions**

■ **Expanding target populations**

Outcomes from the three trials provide initial support for the utility of this treatment. The foundation is set, models for assessing both fidelity and

acceptability have been created, and the manual is now ready to be applied in a wider population of children with ASD. Our group is now engaged in evaluating whether PT is superior to parent education in 180 children (aged 3–6 years) with ASD accompanied by at least moderate disruptive behavior. This large-scale, multisite RCT is currently underway at six centers (Emory University, GA, USA; Indiana University, IN, USA; Ohio State University, OH, USA; University of Pittsburgh, PA, USA; University of Rochester, NY, USA; and Yale University, CT, USA) [102]. The current 24-week RCT does not include a medication arm. Families will be followed for up to 24 weeks post-treatment.

The control condition in this RCT is a structured psychoeducational program (PEP). PEP, which was created specifically for this RCT, provides parents with an up-to-date survey of topics related to ASD (e.g., differential diagnosis, genetics, available treatments and educational placement). It also includes strategies for parents to become effective advocates for their child with ASD. Given the age of the study sample, the diagnosis of ASD in the child may be new to many families. Thus, PEP is likely to be useful for families of affected children. However, PEP does not include any information on child behavior management. As with PT, PEP is delivered individually to parents by trained therapists in 13 sessions over 24 weeks. This comparison condition is designed to control for time and attention (i.e., parental contact with the therapist). Similar measures are being used to evaluate therapist fidelity and parent acceptance of the PEP program.

**Table 4. Parent satisfaction with treatment for the three trials.**

Satisfaction ratings	RUPP-PT pilot (n = 11); %	RUPP-PT RCT (n = 63); %	Pre K Pilot (n = 14); %
Increased confidence in handling current behaviors	100	91	100
Increased confidence in handling future behaviors	91	83	100
Would recommend program to another parent	91	91	100

Pre K: Prekindergarten; RCT: Randomized clinical trial; RUPP-PT: Research Units in Pediatric Psychopharmacology parent training program.

**Table 5. Parent ratings on the aberrant behavior checklist and home situations questionnaire.**

Outcome measure	RUPP-PT Pilot (n = 17)			RUPP-PT RCT (n = 75)			Pre K Pilot (n = 16) <sup>†</sup>		
	Baseline; mean (SD)	Week 24; mean (SD)	ES <sup>‡</sup>	Baseline; mean (SD)	Week 24; mean (SD)	ES <sup>‡</sup>	Baseline; mean (SD)	Week 24; mean (SD)	ES <sup>‡</sup>
ABC-I	24.3 (9.3)	16.1 (9.5)	0.88*	29.3 (7.0)	11.0 (6.6)	2.61**	16.0 (9.2)	7.4 (6.2)	0.94**
HSQ	3.6 (1.1)	2.2 (1.5)	1.27*	4.3 (1.7)	1.2 (1.4)	1.82**	3.0 (1.1)	1.4 (1.2)	1.44**
VABS DLS	38.3 (16.4)	45.2 (18.2)	0.42	50.8 (18.5)	55.7 (21.9)	0.26	67.2 (9.7)	67.3 (11.3)	0.01
<b>CGI-I; n (%)<sup>§</sup></b>									
Much/very much	9 (52.9)			62 (82.7)			14 (87.5)		
Minimal	5 (29.4)			10 (13.3)			0 (0.0)		
Nonresponder	3 (17.6)			3 (4.0)			2 (12.5)		

<sup>†</sup>Baseline data from two drop outs carried forward.  
<sup>‡</sup>Within subjects ES = (mean at baseline – mean at end point)/baseline SD.  
<sup>§</sup>Rating at last visit.  
<sup>\*</sup>p < 0.01; <sup>\*\*</sup>p < 0.001.  
 ABC-I: Aberrant Behavior Checklist – Irritability subscale; CGI-I: Clinical Global Impression – Improvement scale; ES: Effect size; HSQ: Home Situations Questionnaire; Pre K: Prekindergarten; RCT: Randomized clinical trial; RUPP-PT: Research Units in Pediatric Psychopharmacology parent training program; SD: Standard deviation; VABS DLS: Vineland Adaptive Behavior Scale daily living skills domain.

These three trials included children with disruptive behavior across a range of developmental delays and autism-related disability. Although the studies included children across the range of intellectual disability, children with receptive language skills below 18 months were excluded. The basis of this exclusion criterion was twofold. First, the differential diagnosis of an autism spectrum disorder is increasingly more challenging as intellectual functioning decreased. Second, although children were not required to be verbal, PT in its present form requires at least rudimentary receptive language. Nonetheless, there is little doubt that children with receptive language below 18 months have disruptive behavior that diminishes the quality of life for the child and the family. As with revisions of the original PT program for school-age children [45], modifications to the PT program may also be required to serve low-functioning, nonverbal children for the preschool age group [49]. Future studies would be needed to evaluate the feasibility and efficacy of a modified PT program in this underserved population.

■ **Expanding outcome measures**

Paralleling the need to expand PT to a wider sampling frame of children is the need to measure the social disability and adaptive functioning in children with ASD. In all three studies, we used the survey edition of the VABS as an outcome measure. The VABS has a strong track record as a standardized measure of adaptive functioning that maps to intellectual ability. It has been used as an outcome measure in clinical

trials of children with ASD [23,48]. However, it is relatively time consuming and the normative properties suggest that it is unlikely to be useful as a change measure over brief periods of time. Thus, development of a shorter measure of adaptive functioning that is sensitive to change over relatively brief periods of time would be a valuable contribution.

Behavioral observation is often recommended to complement the current standard approach of relying on parent and clinician reports for assessing outcome. All three trials included the Standardized Observation Analogue Procedure (SOAP), which study investigators developed as a means to capture change in parent and child behaviors from baseline to week 24 across a series of four standardized behavior observation conditions [45,59]. While the SOAP captured changes in child and parent behavior from baseline to week 24 in the RUPP-PT trial, the observation generally failed to consistently capture the disruptive and noncompliant behaviors that were the target of intervention. For example, at baseline, children were compliant to 75% of requests during the demand condition. As the expectation will probably remain that well-designed RCTs include behavioral observation measures to assess outcome, there remains a need to identify a paradigm that reliably produces the target behaviors at baseline and is sensitive to change in both child and parent behaviors at the end of treatment.

Future studies could also consider the impact of interventions on parental skill acquisition. In the three studies reviewed here, parent

attainment of in-session objectives (based on therapist rating) and overall program participation (session attendance) was evaluated, we did not collect data from direct observations of parental proficiency in implementing the various techniques. Parent knowledge of skills is a necessary first step, but ‘doing’ not just ‘knowing’ the skills may be essential for short- and long-term behavioral change.

Another parental factor to be explored is the degree of parental engagement in therapy. Parents may have variable levels of interest, enthusiasm and attention during sessions, which may affect their ability to carry out interventions with their children. Future studies could examine whether the level of parent engagement affects observed behavior change in the child.

■ **Moderators of response to PT**

Finally, although improvements in disruptive behavior were noted in all three studies, we know very little about the clinical characteristics that predict benefit. Moderator analysis of the RUPP-PI study failed to identify any baseline characteristics that predicted positive response to treatment [60]. Additionally, the mean baseline ABC-I score in the preschool pilot study was 8–13 points lower than in the two RUPP trials [46,47]. One question is whether administration of the PT in the preschool years could prevent the emergence of more serious behavioral problems (e.g., aggression, severe tantrums and self-injury) and postpone or eliminate the need for medication as the child ages.

**Conclusion & future perspective**

Although definitive results on the efficacy of PT in children with ASD await the results of our ongoing trial, emerging results support that

it is acceptable to parents, relevant to the disruptive behavioral problems in this population, and can be reliably delivered by trained therapists. Thus, there is good reason to believe that PT will soon be ready for wider dissemination. Dissemination may take several forms. First, the participating centers in the current federally funded trial could provide regional workshops to clinicians on the application of PT in young children with ASD and disruptive behavior. Second, a cadre of PT experts from our centers could develop and present intensive workshops to a wider network of therapists. These intensive workshops would include discussion on patient selection and individual outcome measurement. Third, we note that the five centers that are conducting the current trial are in relatively large states with underserved rural and urban populations. Novel approaches to the delivery of PT, such as telehealth, may be used to provide the intervention in these underserved populations.

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*No writing assistance was utilized in the production of this manuscript.*

**References**

Papers of special note have been highlighted as:

■ of interest

1 Autism and Developmental Disabilities Monitoring Network Surveillance Year 2008 Principal Investigators; CDC. Prevalence of autism spectrum disorders – Autism and Developmental Disabilities Monitoring Network, 14 sites, United States, 2008. *MMWR Surveill. Summ.* 61(3), 1–19 (2012).

2 Baird G, Simonoff E, Pickles A *et al.* Prevalence of disorders of the autism spectrum in a population cohort of children in South

Thames: the Special Needs and Autism Project (SNAP). *Lancet* 368, 210–215 (2006).

3 Baron-Cohen S, Scott FJ, Allison C *et al.* Prevalence of autism-spectrum conditions: UK school-based population study. *Br. J. Psychiatry* 194, 500–509 (2009).

4 King MD, Bearman PS. Socioeconomic status and the increased prevalence of autism in California. *Am. Sociol. Rev.* 76, 320–346 (2010).

5 Kazdin AE. *Parent Management Training: Treatment for Oppositional, Aggressive, and Antisocial Behavior in Children and*

*Adolescents.* Oxford University Press, NY, USA (2005).

6 Lundahl B, Risser HJ, Lovejoy MC. A meta-analysis of parent training: moderators and follow-up effects. *Clin. Psychol. Rev.* 26, 86–104 (2006).

7 Reyno SM, McGrath PJ. Predictors of parent training efficacy for child externalizing behavior problems – a meta-analytic review. *J. Child Psychol. Psychiatry* 47, 99–111 (2006).

8 Webster-Stratton C, Reid MJ. The Incredible Years Program for children from infancy to

- pre-adolescence: prevention and treatment of behavior problems. In: *A Clinician's Handbook for the Assessment and Treatment of Conduct Problems in Youth*. Murrilhy M, Kidman A, Ollendick T (Eds). Springer, NY, USA, 139–162 (2010).
- 9 Zisser A, Eyberg SM. Treating oppositional behavior in children using parent–child interaction therapy. In: *Evidence-Based Psychotherapies for Children and Adolescents (2nd Edition)*. Kazdin AE, Weisz JR. (Eds). Guilford Press, NY, USA, 179–193 (2010).
  - 10 Kogan MD, Strickland BB, Blumberg SJ, Singh GK, Perrin JM, Van Dyck PC. A national profile of the health care experiences and family impact of autism spectrum disorder among children in the United States, 2005–2006. *Pediatrics* 122, 1149–1158 (2008).
  - 11 Tonge BJ, Brereton AV, Kiomall MC, Mackinnon AJ, King NJ, Rinehart NJ. Effects on parental mental health of an education and skills training program for parents of young children with autism: a randomized controlled trial. *J. Am. Acad. Child Adolesc. Psychiatry* 45, 561–569 (2006).
  - 12 Brereton AV, Tonge BJ, Einfeld SL. Psychopathology in children and adolescents with autism compared to young people with intellectual disability. *J. Autism Dev. Disord.* 7, 863–870 (2006).
  - 13 Hartley SL, Sikora DM, McCoy R. Prevalence and risk factors of maladaptive behaviour in young children with autistic disorder. *J. Intellect. Disabil. Res.* 52, 819–829 (2008).
  - 14 Simonoff E, Pickles A, Charman T, Chandler S, Loucas T, Baird G. Psychiatric disorders in children with autism spectrum disorders: prevalence, comorbidity, and associated factors in a population-derived sample. *J. Am. Acad. Child Adolesc. Psychiatry* 47, 921–929 (2008).
  - 15 Rosenberg RE, Kaufmann WE, Law JK, Law PA. Parent report of community psychiatric comorbid diagnoses in autism spectrum disorders. *Autism Res. Treat.* 2011, 405849 (2011).
  - 16 Lecavalier L. Behavioral and emotional problems in young people with pervasive developmental disorders: relative prevalence, effects of subject characteristics, and empirical classification. *J. Autism Dev. Disord.* 36, 1101–1114 (2006).
  - 17 Carter AS, Volkmar FR, Sparrow SS *et al.* The Vineland Adaptive Behavior Scales: supplementary norms for individuals with autism. *J. Autism Dev. Disord.* 28, 287–302 (1998).
  - 18 Paul R, Miles S, Cicchetti D *et al.* Adaptive behavior in autism and pervasive developmental disorder-not otherwise specified: microanalysis of scores on the Vineland Adaptive Behavior Scales. *J. Autism Dev. Disord.* 34, 223–228 (2004).
  - 19 Herring S, Gray K, Taffe J, Tonge B, Sweeney D, Einfeld S. Behaviour and emotional problems in toddlers with pervasive developmental disorders and developmental delay: associations with parental mental health and family functioning. *J. Intellect. Disabil. Res.* 50, 874–882 (2006).
  - 20 Pisula E, Kossakowska Z. Sense of coherence and coping with stress among mothers and fathers of children with autism. *J. Autism Dev. Disord.* 40, 1485–1494 (2010).
  - 21 United States Government Accountability Office. *Special Education: Children with Autism (GAO Publication No. 05-220)*. United States Government Accountability Office, DC, USA (2005).
  - 22 Aldred C, Green J, Adams C. A new social communication intervention for children with autism: pilot randomized controlled treatment study suggesting effectiveness. *J. Child Psychol. Psychiatry* 45, 1420–1430 (2004).
  - 23 Dawson G, Rogers S, Munson J *et al.* Randomized, controlled trial of an intervention for toddlers with autism: the Early Start Denver Model. *Pediatrics* 125, e17–e23 (2010).
  - 24 Drew A, Baird G, Baron-Cohen S *et al.* A pilot randomised control trial of a parent training intervention for pre-school children with autism: preliminary findings and methodological challenges. *Eur. Child Adolesc. Psychiatry* 11, 266–272 (2002).
  - 25 Green J, Charman T, McConachie H *et al.* Parent-Mediated Communication-Focused Treatment in Children with Autism (PACT): a randomised controlled trial. *Lancet* 375, 2152–2160 (2010).
  - 26 Kasari C, Gulsrud AC, Wong C, Kwon S, Locke J. Randomized controlled caregiver mediated joint engagement intervention for toddlers with autism. *J. Autism Dev. Disord.* 40, 1045–1056 (2010).
  - 27 Oosterling I, Visser J, Swinkels S *et al.* Randomized controlled trial of the focus parent training for toddlers with autism: 1-year outcome. *J. Autism Dev. Disord.* 40, 1447–1458 (2010).
  - 28 Carter AS, Messinger DS, Stone WL, Celimli S, Nehmias AS, Yoder P. A randomized controlled trial of Hanen's 'More Than Words' in toddlers with early autism symptoms. *J. Clin. Psychol. Psychiatry* 52(7), 741–752 (2011).
  - 29 Ingersoll B, Gergans S. The effect of a parent-implemented imitation intervention on spontaneous imitation skills in young children with autism. *Res. Dev. Disabil.* 28, 163–175 (2007).
  - 30 Landa RJ, Holman KC, O'Neill AH, Stuart EA. Intervention targeting development of socially synchronous engagement in toddlers with autism spectrum disorders: a randomized controlled trial. *J. Child Psychol. Psychiatry* 52, 13–21 (2011).
  - 31 Anderson CM, McMillan K. Parental use of escape extinction and differential reinforcement to treat food selectivity. *J. Appl. Behav. Anal.* 34, 511–515 (2001).
  - 32 Ducharme JM, Drain TL. Errorless academic compliance training: Improving generalized cooperation with parental requests in children with autism. *Am. Acad. Child Adolesc. Psychiatry* 43, 163–171 (2004).
  - 33 Lerman DC, Swiezy N, Perkins-Parks S, Roane HS. Skill acquisition in parents of children with developmental disabilities: interaction between skill type and instructional format. *Res. Dev. Disabil.* 21, 183–196 (2000).
  - 34 Moes DR, Frea WD. Contextualized behavioral support in early intervention for children with autism and their families. *J. Autism Dev. Disord.* 32, 519–533 (2002).
  - 35 Wahler RG, Vigilante VA, Strand PS. Generalization in a child's oppositional behavior across home and school settings. *J. Appl. Behav. Anal.* 37, 43–51 (2004).
  - 36 Campbell JM. Efficacy of behavioral interventions for reducing problem behavior in persons with autism: a quantitative synthesis of single-subject research. *Res. Dev. Disabil.* 24, 120–138 (2003).
  - 37 Horner R, Carr EG, Strain PS, Todd AW, Reed HK. Problem behavior interventions for young children with autism: a research synthesis. *J. Autism Dev. Disord.* 32, 423–446 (2002).
  - 38 Odom SL, Brown WH, Frey T, Karasu N, Smith-Canter LL, Strain PS. Evidence-based practices for young children with autism: contributions from single-subject design research. *Focus Autism Other Dev. Disabil.* 18, 166–175 (2003).
  - 39 Smith T, Scahill L, Dawson G *et al.* Designing research studies on psychosocial interventions in autism. *J. Autism Dev. Disord.* 37, 354–366 (2007).
- **Step-wise model for systematically validating and disseminating interventions for autism spectrum disorders is reviewed with a focus on initial efficacy studies**

- followed by manual development and pilot testing, culminating in randomized clinical trials to assess efficacy and effectiveness of interventions in community settings.
- 40 McConachie H, Diggle T. Parent implemented early intervention for young children with autism spectrum disorder: a systematic review. *J. Eval. Clin. Pract.* 13, 120–129 (2007).
- 41 Sofronoff K, Leslie A, Brown W. Parent management training and Asperger syndrome: a randomized controlled trial to evaluate a parent based intervention. *Autism* 8, 301–317 (2004).
- 42 Whittingham K, Sofronoff K, Sheffield J, Sanders MR. Stepping stones triple P: an RCT of a parenting program with parents of a child diagnosed with an autism spectrum disorder. *J. Abnorm. Child Psychol.* 37, 469–480 (2009).
- 43 Tonge B, Brereton A, Kiomall M, Mackinnon A, Rinehart NJ. A randomised group comparison controlled trial of ‘preschoolers with autism’: a parent education and skills training intervention for young children with autistic disorder. *Autism* doi:10.1177/1362361312458186 (2012) (Epub ahead of print).
- 44 Lord C, Wagner A, Rogers S *et al.* Challenges in evaluating psychosocial interventions for autism spectrum disorders. *J. Autism Dev. Disord.* 35, 695–708 (2005).
- 45 Johnson CR, Handen BL, Butter E *et al.* Development of a parent training program for children with pervasive developmental disorders. *Behav. Interv.* 22, 201–221 (2007).
- 46 Research Units on Pediatric Psychopharmacology Autism Network. A pilot study of parent management training in children with pervasive developmental disorder. *Behav. Interv.* 22, 179–199 (2007).
- **Pilot study of a manualized parent training (PT) protocol that was conducted in preparation for a large-scale randomized clinical trial of risperidone versus risperidone plus PT. Seventeen families received the PT protocol with results indicating the program was delivered consistently by therapists across multiple sites, received favorably by study parents and produced reductions in targeted disruptive behaviors.**
- 47 Aman MG, McDougle CJ, Scahill L *et al.* Medication and parent training in children with pervasive developmental disorders and serious behavior problems: results from a randomized clinical trial. *J. Am. Acad. Child Adolesc. Psychiatry* 48, 1143–1154 (2009).
- **Large-scale randomized clinical trial of 124 children that tested whether risperidone and PT is superior to medication alone in improving severe behavioral problems in children with pervasive developmental disorders. Medication plus PT resulted in a greater reduction of serious maladaptive behavior than medication alone in children with pervasive developmental disorders, with a lower risperidone dose.**
- 48 Scahill L, McDougle CJ, Aman MG *et al.* Effects of risperidone and parent training on adaptive functioning in children with a pervasive developmental disorders and serious behavioral problems. *J. Am. Acad. Child Adolesc. Psychiatry* 51, 136–146 (2012).
- 49 Bearss K, Johnson C, Handen B, Smith T, Scahill L. A pilot study of parent training in young children with autism spectrum disorders and disruptive behavior. *J. Autism Dev. Disord.* doi:10.1007/s10803-012-1624-7 (2012) (Epub ahead of print).
- **Pilot study that presents feasibility and initial efficacy data on a structured PT program as a ‘standalone’ intervention for 16 children (aged 3–6 years) with autism spectrum disorders and disruptive behavior. The program was found to be acceptable to parents, and children were rated as experiencing significant improvements in disruptive behavior.**
- 50 Aman MG, Singh NN, Stewart AW, Field CJ. The aberrant behavior checklist: a behavior rating scale of the assessment of treatment effects. *Am. J. Mental Defic.* 89(5), 485–491 (1985).
- 51 Aman MG, Singh NN, Stewart AW, Field CJ. Psychometric characteristics of the aberrant behavior checklist. *Am. J. Mental Defic.* 89(5), 492–502 (1985).
- 52 Brown EC, Aman MG, Havercamp SM. Factor analysis and norms for parent ratings on the aberrant behavior checklist – community for young people in special education. *Res. Dev. Disabil.* 23, 45–60 (2002).
- 53 Research Units on Pediatric Psychopharmacology Autism Network. Risperidone in children with autism for serious behavioral problems. *N. Engl. J. Med.* 347, 314–321 (2002).
- 54 Barkley RA, Murphy KR. *Attention Deficit Hyperactivity Disorder: A Clinical Workbook (2nd Edition)*. Guilford Press, NY, USA (1998).
- 55 Chowdhury M, Aman MG, Scahill L *et al.* The home situations questionnaire-PDD version: factor structure and psychometric properties. *J. Intellect. Disabil. Res.* 54, 281–291 (2010).
- 56 Sparrow SS, Balla DA, Cicchetti DV. *Vineland Adaptive Behavior Scales: Survey Form Manual*. American Guidance Service, Circle Pines, MN, USA (1984).
- 57 Arnold EL, Vitiello B, McDougle C *et al.* Parent defined target symptoms respond to risperidone in RUPP autism study: customer approach to clinical trials. *J. Am. Acad. Child Adolesc. Psychiatry* 42(12), 1443–1450 (2003).
- 58 Guy W. *ECDEU Assessment Manual for Psychopharmacology: Publication ADM 76-338*. US Department of Health, Education, and Welfare, DC, USA 218–222 (1976).
- 59 Handen BL, Johnson CR, Butter EM *et al.* Use of a direct observational measure in a trial of risperidone and parent training in children with pervasive developmental disorders. *J. Dev. Phys. Disabil.* doi:10.1007/s10882-012-9316-y (2013) (Epub ahead of print).
- 60 Farmer C, Lecavalier L, Yu S *et al.* Predictors and moderators of response to behavioral treatment in children with autism spectrum disorders and serious behavioral problems. *J. Autism Dev. Disord.* 42, 1037–1044 (2012).
- **Websites**
- 101 John M. Eisenberg Center for Clinical Decisions and Communications Science. Therapies for children with autism spectrum disorders: a review of the research for parents and caregivers (2011). [www.effectivehealthcare.ahrq.gov/ehc/products/106/709/aut\\_fin\\_to\\_post.pdf](http://www.effectivehealthcare.ahrq.gov/ehc/products/106/709/aut_fin_to_post.pdf)
- 102 ClinicalTrials.gov. Randomized trial of parent training for young children with autism (RUBI) (2012). <http://clinicaltrials.gov/ct2/show/NCT01233414?term=NCT01233414&rank=1>