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A Social Adjustment Enhancement Intervention for High Functioning Autism, Asperger's Syndrome, and Pervasive Developmental Disorder NOS

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This paper reports the findings of a 20-week social adjustment enhancement curriculum for boys aged 8–12. The curriculum was designed to address three areas hypothesized to be deficient in persons with HFA, AS, and PDDNOS: emotion recognition and understanding; theory of mind; and executive functions/real life type problem solving. Parents attended a semi-structured concurrent psychoeducational training meeting during children's sessions. Statistically significant improvements in facial expression recognition, and problem solving were reported for intervention group children compared to waiting list control group children. For the intervention group (the only group for whom data were available), older and less cognitively able boy's scores on a depression inventory decreased significantly more than younger children's. Mother's depression scores tended to decrease and there were significant reductions in child problem behaviors reported. Results are discussed in the context of individual differences in participant cognitive levels and profiles, symptom severity, and affect-related variables.

KEY WORDS: High functioning autism; Asperger's syndrome; PDDNOS; social skills; intervention; training groups.

INTRODUCTION

Treatment plans for children diagnosed with autism spectrum disorders frequently recommend participation in a social skills training group. However, there are few published control group studies of social skills training group interventions for the relatively able group of children with High Functioning Autism (HFA), Asperger Syndrome (AS), and Pervasive Developmental Disorder NOS (PDDNOS).

There is ongoing debate about whether HFA, AS, and PDDNOS are distinct and externally valid syndromes or parts of a severity-graded continuum (see Schopler, Mesibov, & Kunce, 1998). It is argued by many, however, that HFA and AS are more similar than different, and that it currently is difficult to reliably distinguish beween the conditions based on the results of empirical studies (Howlin, 2003; Ozonoff & Griffith, 2000; Prior, 2000). Based on diagnostic criteria as well as empirical research, individuals with PDDNOS also appear to exhibit similar social cognitive profiles to children with HFA and AS (see Buitelaar, Van der Wees, Swaab-Barneveld, & Van der Gaag, 1999), including deviant face processing (Serra *et al.,* 2003), and delayed and deviant theory of mind (Serra, Loth, van Geert, Hurkens, & Minderaa, 2002). In sum,

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these three disorders share many characteristics, and, according to the Diagnostic and Statistical Manual of Mental Disorders IV-TR (APA, 2000), include a common feature of qualitative impairment in reciprocal social interaction.

Given the similar social disability profiles in HFA, AS, and PDDNOS, the target children for this study were selected from these three diagnostic categories. Other clinical service providers also have advocated providing very similar basic therapeutic intervention for children with these disorders (see Garcia-Winner, 2000, 2002; Greenspan & Wieder, 1998; Gutstein, 2000; Gutstein & Sheely, 2002; MacAfee, 2001; Ozonoff, Dawson, & McPartland, 2002).

Core Deficits

There have been several lines of inquiry into the primary deficits found in HFA, AS, and PDDNOS. Some have proposed that emotion-based deficits are central, and that persons with autism spectrum disorders have idiosyncratic ways of perceiving and understanding emotions. Autisic symptoms are said to stem from the lack of components of action and reaction necessary for the development of reciprocal, affectively charged interpersonal relationships with others (Hobson, 1990). In support of this view, studies have found that even high functioning persons with autism have more difficulty than controls on tasks involving labeling their own more complex emotions including pride and embarrassment (Capps, Yirmiya, & Sigman, 1992), and on labeling and explaining other children's emotions presented in videoclips (Yirmiya, Sigman, Kasari, & Mundy, 1992). In addition, some studies have found that autistic persons have more difficulty recognizing facial expressions of emotions than matched control subjects (Hobson, 1986a, 1986b; Tantum, Monaghan, Nicholson, & Stirling, 1989), while others have argued that differences disappear when subjects are matched on verbal mental age (Braverman, Fein, Lucci, & Waterhouse, 1989; Ozonoff, Pennington, & Rogers, 1990).

Several more recent studies suggest that even able children with autism exhibit subtle atypicalities in processing emotions from facial expressions. For example, Grossman, Klin, Carter, and Volkmar (2000) found that children with Asperger Syndrome performed significantly worse than control subjects matched by age and Verbal IQ when identifying facial expressions that were paired with incorrect written labels for the emotions. The errors made by children with Asperger Syndrome suggested they overused the incorrent written verbal labels and underused the visual cues. Adolphs, Sears, and Piven (2001) explored recognition of emotional and social information in faces in a sample of high functioning adults with autism compared with subjects with bilateral amygdala damage. All subjects with autism made abnormal judgements of the trustworthiness of faces. The authors suggested that high functioning persons with autism have difficulty linking their visual perceptions of socially relevant stimuli with the retrieval of social knowledge and with the performance of social behaviors.

A second line of inquiry explores the hypothesis that problems related to theory of mind are the main causal agents of social deficits seen in autism. Theory of mind refers to the ability to acknowledge that others' thoughts and beliefs are distinct from ones own, to make inferences about what others are thinking and feeling, and to predict behavior accordingly (Frith, 1989). First-order belief attribution tasks involve distinguishing one's own beliefs from those of other people. Second-order belief attribution tasks assess the ability to think about another person's thoughts about a third person.

A sizeable subgroup of persons with autism spectrum disorders are able to pass second order theory of mind tests (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Bauminger & Kasari, 1999; Ozonoff, Pennington, & Rogers, 1991). However, even able persons with autism spectrum disorders show subtle impairments in this area of social cognition. For example, children and adolescents with autism spectrum disorders have been found to employ context-inappropriate explanations for their answers to questions about mental state inferences (Jolliffe & Baron-Cohen, 1999; Kaland *et al.*, 2002); to have difficulty relative to matched controls in reading other's intentions from information in the eye regions of faces (Baron-Cohen *et al.*, 2001) and voices (Rutherford, Baron-Cohen, & Wheelwright, 2002) and to "overuse" their strengths in verbal information processing when responding to theory of mind test questions (Bauminger & Kasari, 1999). In sum, Frith and Happe (1999) have asserted that high functioning persons with autism often possess a theory of mind which appears to be the result of effortful learning. This can make it difficult to respond appropriately in complex and rapidly evolving social situations.

A third line of inquiry involves deficits in executive functions. Executive functions allow the indi-

vidual to maintain an appropriate problem-solving set for attainment of a future goal. They include planning, impulse control, inhibition of prepotent, but irrelevant responses, set maintenance, organized search, and flexibility of thought and action. Compared to controls, children with autism consistently have shown impaired executive functions as assessed by standard neuropsychological measures (Ozonoff, 1995; Ozonoff, Pennington, & Rogers, 1991; Pennington & Ozonoff, 1996).

Studies of impairments in the broad neuropsychological construct of executive functions in autism have proceeded at two levels. Researchers adopting a "component process aproach" (Friedrich & Rader, 1996) have studied the multiple individual processes involved in executive functions. For example, working memory (Bowler, Matthews, & Gardiner, 1997; Mottron, Morasse, & Belleville, 2001), attention (Nyden, Gillberg, Hjelmquist, & Heiman, 1999), and cognitive flexibility (Rinehart, Bradshaw, Moss, Brereton, & Tonge, 2001) all have been studied in this manner. A second approach, which may be more instructive for understanding everyday social functioning, is to explore how the aggregation of these component executive functions deficits lead to the inability to solve everyday problems. It has been suggested that executive function problems lead to stimulus overselectivity or getting "stuck" on the wrong details of situations (Ozonoff, 1998); to difficulty shifting from ineffective problem solving strategies to more optimal ones; and to distractibility in pursuit of goals (Hughes, 2001; Twachtman-Cullen, 2000). Other issues were illustrated by a study of problem solving that showed children with Asperger Syndrome were impaired in remembering pertinent facts of social problems, and were less able to generate socially appropriate solutions to them (Channon, Charman, Heap, Crawford, & Rios, 2001).

In conclusion, it should be noted that the aforementioned lines of inquiry are not orthogonal, and overlap considerably. It has been suggested, e.g., that impairments in emotion recognition underlie theory of mind problems (Capps, Rasco, Losh, & Heerey, 1999) and that executive function deficits may explain elements of theory of mind deficits (e.g., Ozonoff *et al*., 1991; Twachtman-Cullen, 2000)

Depression in Children and Parents

Anecdotal reports and empirical data converge in suggesting that children with autism spectrum disorders experience elevated rates of depression. Several studies have found that depression is the most common psychiatric comorbidity in autism; that the prevalence of depression in higher functioning individuals with autism is 30–40%; that this rate is higher than that for lower functioning persons with autism; and that rates of depression are highest for adolescents and young adults (Ghaziuddin, Ghaziuddin, & Greden, 2002; Green, Gilchrist, Di Burton, & Cox, 2000).

The literature about depression in parents of children with autism is more mixed. Some argue that parents of children with autism show elevated rates of depression compared with parents of typically developing children (Wolf, Noh, Fisman, & Speechley, 1989). This has been attributed to the genetic basis of affective disorders (Piven & Palmer, 1999), and to the fact that parents of children with autism experience chronic stress (Boyd, 2002; Dunn, Burbine, Bowers, & Tantleff-Dunn, 2001). However, others suggest that parents of children with autism and other disabilities are resilient and adopt effective coping strategies for daily problems (Tunali & Power, 2002), and that feelings of self-efficacy mediate levels of stress in mothers (Hastings & Brown, 2002).

Psychotherapeutic Interventions for HFA, AS, and PDDNOS

Over the last 20 years, both individual and group interventions have been used to assist persons with autism spectrum disorders. Most current therapeutic approaches are psychoeducational or cognitive behavioral, and focus on helping persons analyze and organize their thinking; on emphasizing cause and effect relationships between events; on problem solving; and on stress reduction (Mesibov, 1992). Some elements of psychodynamically-oriented therapies including ego support, corrective emotional experience, and encouraging the development of an "observing ego" also have been reported to be helpful (Pope, 1993; Stoddart, 1999).

Group interventions are most frequently included in treatment for persons with higher functioning autism spectrum disorders. The group therapeutic modality allows members to practice skills in a reasonably naturalistic environment. Several authors have outlined suggestions for HFA, AS, and PDDNOS social skills group schedules, activities, and participant composition (Krasny, Williams, Provencal, & Ozonoff, 2003; Mesibov, 1986;

Mesibov & Wooten, 1986) and programs such as Division TEACCH, have a long history of conducting groups for persons with autism. Given the challenges inherent in studying groups, however, there have been relatively few empirical studies of the efficacy of this form of therapeutic intervention.

Several descriptive studies of social skills groups for this population, without control groups for comparison, have been conducted over the last 15 years (Howlin & Yates, 1999; Marriage, Gordon, & Brand, 1995; Mesibov, 1984; Williams, 1989). These studies provide pragmatic ideas about running groups, and report modest improvement and high overall satisfaction by participants and parents. Bauminger (2002) also has reported positive results using a school based socio-emotional and social interaction curriculum for 15 children with diagnoses of high functioning autism aged 8–16 years. Although the children in this program had typically developing peer buddies, it was not a group intervention.

Ozonoff and Miller (1995) completed a small controlled group study with a theoretically derived curriculum focusing on theory of mind skills. They found that subjects improved on laboratory measures tapping this dimension, but that gains did not generalize to more naturalistic contexts or produce changes in teacher-reported social behavior.

To our knowledge, there have been no reports about the potential efficacy of a parent psychosocial intervention to accompany social skills training groups for children with HFA, AS, and PDDNOS. Some of the social skills training programs reviewed above have included a parent component, but these were support groups as opposed to more formal parenting skill development classes. It is surprising there has not been more research in this area. There are, for example, well developed literatures on parent management training for other conditions including oppositional defiant disorder, conduct disorder, eating disorders, and hyperactivity (see Schaefer & Breismeister, 1989).

This study builds on the aforementioned contributions, particularly those of Ozonoff and Miller (1995), which at the time of this study was the only published social skills group research about children to include a control group. The social adjustment enhancement groups that are the focus of the current study employ many of the suggestions about group format that have been developed by others. In addition, we recruited a larger sample to improve statistical power; broadened curriculum objectives beyond theory of mind; fostered within the social skills groups a therapeutic environment where group process could be used as part of the learning experience; and included more structured parent training as part of the intervention with the objective of teaching parents to weave the social skills training into daily activities throughout the week. The goal of these modifications to the basic structure provided by others was to increase the breadth and intensity of the intervention.

We hypothesized that the social skills training group plus teaching implemented by parents during the week would improve subjects' performance on measures of facial expression recognition, theory of mind, and problem solving. Although the children were relatively able to start with, it was thought that additional practice and scaffolding in the deficit areas mentioned above would, none the less, produce gains in test measures. We also hypothesized that reduced isolation and an improved sense of competence (social competence for children and parenting competence for adults) would be related to reduced depressive symptoms in children and parents in the intervention group.

METHODS

The Social Adjustment Enhancement Curriculum

The curriculum used in this study was designed to target three of the hypothesized deficits present in persons with ASDs including emotion recognition in self and others, including facial expression recognition; theory of mind including perspective taking; and executive functions with a special emphasis on individual and group problem solving. Basic conversation skills also were taught.

Subjects and parents came to the M.I.N.D. Institute at the University of California Davis Medical Center for weekly 1.5 hour concurrent sessions for a period of 20 weeks. Children's group sessions were structured using a consistent agenda that included a welcome song that taught participants each other's names as well as personal characteristics; a check-in time for discussion of the previous week's "social experiment" or homework; a snack time where conversation skills were practiced; a lesson time; a motor activity time where emotional understanding and awareness were reinforced using a game; and a joke time.

A high staff to student ratio of 3:5 allowed leaders to use group dynamics as a teaching vehicle,

and to work individually with participants as required. For example, if another child was engaging in inappropriate touching to get the attention of a peer, one leader could work individually with the dyad to have the boy being touched put into words his feelings about this (i.e., "I don't like it when you touch me. I want to be your friend, but I would like it more if you talked about trains instead of tapping me."). This kind of interaction, scaffolded by a staff member, provided in vivo teaching in emotional awareness, conversation skills, and problem solving.

Social skills group leaders consisted of psychologists, a psychiatrist, and a speech and language pathologist assisted by male university students who videotaped activities, and were instructed to serve as role models for the participants. Group leaders met on a weekly basis to review video tapes of the groups, and to consult about speech and language, sensory, and emotional issues arising in the groups.

The 20 group sessions taught skills in the deficit areas reviewed above. The curriculum was divided into two 10 week modules (see Appendix A, Table AI for a listing of lesson topics for each session) with a special event marking the end of each module and a break between modules 1 and 2. Sample activities done to teach various skills are included as Appendix B, Table BI. The first six sessions focused on establishing group rules for treating each other with empathy and respect, and on developing better emotional awareness of one's self and others. Activities stressed understanding gradations of simple emotions including happy, sad, angry, and afraid (see Gray, 1998 for examples of this approach), as well as more complex emotions including pride, guilt, and embarrassment. Receptive and expressive body language (facial expressions, body postures, and tone of voice) accompanying these emotions was taught through modeling and role playing (see Nowicki & Duke, 1992 for examples of activities that can be used to teach these skills). Participants then learned how to use awareness of their own emotions as the basis for making choices about appropriate behavior during sad and/or stressful times (Bloomquist, 1996; Faherty, 2000).

Once the meaning of the basic emotions (happy, sad, angry, and afraid) and the receptive and expressive body language corresponding to them were taught, children were provided with instruction about conversation skills (see McConnell & LoGiudice, 1998 for ideas about teaching conversation skills). In this part of the training, there was an emphasis on "sharing the air," "staying on the same page" with respect to context and topic, and "being honest." These rules are parallel to conversation pragmatics maxims reported by Grice (1975). A formula for conversation also was taught. Several lessons about friendship, teasing, and bullying (see Frankel, 1996 for a thoughtful discussion of this difficult subject) followed. The final session of the first 10-week block ended with a friendship party, where members gave each others "gifts" in the form of written things they appreciated or knew about each other.

During the second 10 week module, friendship and conversation skills were elaborated and reinforced, and group and individual problem solving skills were taught (see Johnson, 1998; Marlowe, 2000; Ozonoff, 1998 for a review of issues and strategies in remediation of executive deficits). Some of the skills involved in problem solving are problem identification and prioritization, generation of feasible alternative strategies, and the evaluation of individual strategies. These skills were taught, practiced, and reinforced through the use of a visual template, games, and role-playing activities. The final practice came when members planned and created a group symbol, named their group, and planned a graduation party for the twentieth session.

Parent groups were primarily psychoeducational as opposed to supportive, with the goals of enlisting parents as co-teachers of the curriculum, and teaching them to develop a problem solving approach for managing their children's difficult behaviors. The leaders of this group were a developmental and behavioral pediatrician and a social worker. Parent sessions started with a discussion of the elements of each lesson plan, and an explanation of the rationale behind the lesson. The problem solving approach taught to parents emphasized understanding how child temperament and cognitive endowment interacts with core autism deficit areas discussed earlier to create social problems, and is depicted graphically in Fig. 1. The goal of this approach was to help parents develop a more refined and empathically in-tune understanding of their children's social problems. Such an understanding could improve parents' capacities to generate more effective remediation strategies for their children's social issues.

The second part of each session was a discussion of weekly problem behavior logs completed by the parents. During this part of the group, parents

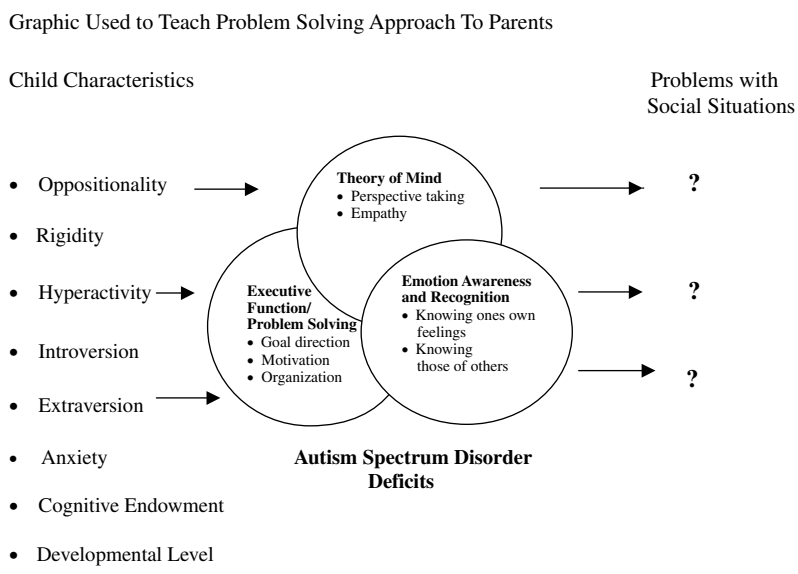

Fig. 1. Graphic used in parent groups to help in the development of child behavior management options.

and group leaders worked together to develop individual solutions to children's problems. The goal of this was to give parents the opportunity to practice effective problem solving using their improved understanding of their children's social issues, and to help them parent in a way that promoted the development of new child skills. This process provided a balance between recognizing the perspective, capabilities, and aversions to criticism (Torisky, 1992) of the children, and being appropriately firm and didactic. Parents also shared weekly readings about the materials covered in the group.

Participants

Eighteen boys aged 8–12 with prior diagnoses of HFA, AS, and PDDNOS were selected to participate in the study. Their diagnoses were confirmed using the Autism Diagnostic Observation Schedule (ADOS-G; Lord *et al.*, 2000), and the Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & Le Couteur, 1994). The boys' scores on these instruments were in at least the PDD range on the ADOS, and in the Autism range on the ADI-R. They also met DSM-IV criteria for HFA, PDDNOS or AS based on a clinical interview.

To be included in the study, all subjects had to obtain Full Scale I.Q. scores (completed within the last two years) of 75 or above as measured by the WISC-III or Wechsler Abbreviated Scale of Intelligence (WASI). They also needed to demonstrate they were able to pass a measure of first order theory of mind—the Smarties false belief task (Perner, Frith, Leslie, & Leekam, 1989). In this task, the child is shown a candy box (with a pen inside), and asked to guess what is inside. All subjects guessed candy, and were then shown the pen. As a test question, subjects were asked what another child, who had never seen the box, would think was inside. A pass was obtained if the child guessed "candy."

Participants were recruited from the M.I.N.D. Institute website, M.I.N.D. Institute clinic, local pediatricians and child psychiatrists, and local Autism and Asperger Syndrome parent support groups. Children with serious conduct problems, as reported by parents, were excluded from the study.

Subjects were matched into pairs based on age and Full Scale I.Q. Nine boys were randomly selected from these pairs to serve as the first intervention group subjects, with the remaining nine assigned to a waiting list control group. It should be noted that during the informed consent process, parents and children were made aware of the possibility they would not receive services right away, but would have to wait approximately six months if not picked to be in the first intervention group. While several local school districts offered a small number of social skills groups, at the time recruitment began, there were very few social skills groups and no free groups like that offered in the intervention, for children with autism spectrum disorders

available in the community. When families were assigned to the waiting list control group, parents were encouraged to contact the project staff if they had questions about their children or required interim consultation during the six month wait. In practice, very few families chose to do so.

Two social skills groups were formed for the first intervention group subjects. Although we did not anticipate that this would be the case, the two groups differed with respect to both age and cognitive profile. The younger group (mean age = 8 years, 7 months, $n = 5$) had a mean FSIQ score of 115. The older group (mean age = 10 years, 10 months, $n = 4$) had a mean FSIQ score of 86. Despite the differences between the groups, the same intervention curriculum was used with each. Although at times it was necessary to modify some of the language and activities used in the less able group, using one curriculum was feasible given that the less able children were older. See Table I for more information about the characteristics of the participants.

Measures

Measures were selected to assess change in the three domains for which remediation was offered. Measures of child and adult depression as well as behavioral ratings related to problem behavior logs also were collected.

Facial Expression Recognition. Facial expression recognition was assessed as a manifestation of emotional understanding. The short forms of the Diagnostic Analysis of Non-Verbal Accuracy-2, Adult Facial Expressions (DANVA-2-AF) and Child Facial Expressions (DANVA 2-CF) were used (Nowicki & Carton, 1993). DANVA-2-AF contains 24 photographs of an equal number of men and women making happy, sad, angry, and fearful facial expressions of both low and high intensity. DANVA 2-CF is similar, but the pictures are of children ages 6–12. Nowicki and Carton (1993) have shown both the DANVA-2-AF and the DANVA 2-CF have acceptable internal consistency for school-aged children, as well as good test–retest reliability. Norms are available for ages 3–99. In both tests, subjects are asked to identify from a photograph booklet whether models are happy, sad, angry or afraid. Subjects receive one point for correctly identifying each facial expression of emotion.

Theory of Mind. As mentioned above, part of the inclusion criteria for the study was being able to pass a first-order false belief test. Two higher order measures were used to assess theory of mind, since all subjects had been able to pass a test at the more basic levels. These were the Strange Stories Task (Happe, 1994) and the Faux Pas Stories Task (Baron-Cohen, O'Riordan, Stone, Jones & Plaisted,

Table I. Descriptive Characteristics of Participants in Intervention and Control Groups[a]

	Intervention (n = 5)		Control (n = 5)	
	Mean	Range	Mean	Range
Group1				
Age (mo.)	103	93–117	100	88–117
VIQ	126	117–136	121	92–142
PIQ	103	89–112	114	85–136
FSIQ	115	99–124	119	88–143
ADOS	9	7–14	9	7–13
	Intervention (n = 4)		Control (n = 4)	
Group 2				
Age (mo.)	130	111–146	122	108–140
VIQ	86	75–94	82	59–91
PIQ	88	63–115	108	90–122
FSIQ	86	75–100	95	83–104
ADOS	15	12–18	14	11–17

[a] In Group 1, the intervention group had three children with AS diagnoses, one child with an HFA diagnosis, and one child with a PDDNOS diagnosis. In the control group, all five children had diagnoses of AS. In Group 2, both the Intervention and the Control Groups consisted of two children with HFA diagnoses and two with AS diagnoses.

1999). Five Strange Stories (pretend, joke, lie, white lie, and double bluff) were read to the subjects. Subjects were instructed to listen carefully as several questions would follow each story. There were two questions following four of the stories, with three following double bluff. The first question assessed whether the child understood that a figurative or non-literal statement had been uttered, and the second question probed for understanding of the first response. One point was awarded for each correct response. If unclear or ambiguous responses were given, the examiner probed more deeply to ensure that the subjects understood their own responses. Subjects could earn from 0 to 11 points on this task.

A total of six Faux Pas stories, interspersed with control stories, were administered next. Faux Pas and control stories were recorded on a cassette tape with various children and adults reading different roles. Subjects were instructed to listen carefully to the stories as several questions would follow each, and that in some, but not all of the stories, someone would say something that they should not say. Four questions followed each story. The first two questions involved detecting the Faux Pas; the third was a control question designed to see if the child understood a critical element of the story; and the fourth was a probe to see if the child understood why the faux pas had been committed. Subjects were permitted to listen to the story a maximum of three times. Stories were scored on a pass/no pass basis, with a pass indicating that the child understood that a faux pas had been committed, could identify what it was, and could explain why it was a faux pas. Each correct answer was worth one point for a total of six points. Possible scores on this task ranged from 0 to 6.

Executive Functions. To assess executive functions as operationalized as real life type problem solving, the Test of Problem Solving or TOPS-Elementary Revised (Zachman, Huisingh, Barrett, Orman, & LoGiudice, 1994) was used. The TOPS consists of 14 stimulus pictures and accompanying questions that are designed to provide information about a subject's critical thinking abilities. The test items include probes about what is going on in the pictures, definition questions, as well as reasoning and problem solving queries. For example, one picture shows two boys working together in a class. One of the boys is new to the school. The subject is asked to interpret what might be going on; what the new student could do to make friends; what the other students could do to help the new boy; and what the new boy could do if he doesn't know which bus to take home. Thus, the TOPS assesses executive functions in that it requires respondents to identify the overall gist of a social situation (planning); to generate feasible solutions to social problems (set maintenance, organized search and cognitive flexibility); and to select between them (impulse control, and inhibition of prepotent but irrelevant responses). Specifically, the TOPS penalizes subjects for misinterpreting questions; for providing vague, inadequate, perseverative, irrelevant, concrete or tangential responses; for failing to provide context for responses; and for the inability to generate responses. Subjects are awarded one point for each correct answer.

The TOPS-Elementary was designed for children from ages 6 to 11, and was normed on a large sample of non-language disordered subjects. The TOPS has shown high levels of test–retest and internal consistency reliability for all age levels. Age norms and percentile ranks are available for this measure.

CDI. The Children's Depression Inventory (Kovacs, 1992) was used to assess depression in the child participants. The CDI is a self-report inventory with 27 groups of three items describing different aspects of child mood, interpersonal problems, feelings of effectiveness, physical symptoms, and self-esteem. It is suitable for children ages 7–17. The child is instructed to select the statement from each group that best describes them for the last two weeks. The CDI has exhibited acceptable levels of internal consistency, test–retest reliability, and discriminant validity. On the CDI, scores over 18 are considered to be in the above average range for boys aged 7–12.

Beck Depression Inventory. The Beck Depression Inventory (BDI) was used to assess parent depression (Beck, 1987). The BDI is a self-report instrument used to screen respondents for depression. It consists of 21 groups of four statements about a person's affect, as well as cognitive and vegetative symptoms. Respondents are asked to circle the number beside the statement that best describes the way they have been feeling over the past week

including the day of testing. Responses are totaled and compared to norms for normal, mild, moderate, and severe depression.

The BDI has shown good test–retest reliability (Beck, 1970); and concurrent validity for test items (Reynolds & Gould, 1981). Scores of 10–18 are considered to indicate mild to moderate depression and scores of 19–20 are considered indicative of moderate to severe depression.

Problem Behavior Logs. As mentioned in the section on the curriculum, parents were asked to complete weekly problem behavior logs for their children. They were provided blank log sheets that asked them to record social problems their children experienced during the week. They were asked to rate on a 10-point likert scale, anchored by "Not Pleased" and "Very Pleased," their own satisfaction with how they handled the problem situation; to write about how they might handle the situation differently next time; and to rate on a 10-point likert scale how confident they were they could handle the situation in this new and better way next time. This scale was anchored by "Not at all confident," and "Confident."

Procedure

Participants were tested at baseline and after the intervention using measures to assess emotion recognition in others; theory of mind; and problem solving. Testing was done by the first author in one session when possible. The order of the testing was the same for each subject. At the time of the clinic visit, mothers were given the CDI and the BDI. They were asked to supervise their children in the completion of the CDI by giving explanations of questions when necessary, and by breaking the task into manageable intervals. They also were asked to let the children answer the actual questions on their own.

RESULTS

Psychotherapeutic intervention research with children is methodologically complex, and highly labor intensive. The current study, for e.g., involved challenges including recruiting an appropriate sample with respect to subject diagnosis, age and cognitive match, and compatibility; training staff to provide consistent services for a 20 week period; and maintaining an ethical professional relationship with participants in the waiting-list control group. Although this study included a larger sample than those previously published, it remains small, and thus lacks a high level of statistical power. With small samples, it has been suggested that traditional significance tests of mean differences may lead to an inappropriate acceptance of the null hypothesis (Cohen, Cohen, West, & Aiken, 2003). Because this may be the case in this study, information about qualitative patterns of changes also is included.

Variables from the DANVA, theory of mind tests, and TOPS were subjected to a 2×2 analysis of variance (ANOVA) with intervention vs. control group being the between-subjects factor, and time (pre-and post-intervention) being the within-subjects factor. Means and standard deviations for variables in these three domains can be found in Tables II–IV, respectively. In cases where VIQ was statistically significantly correlated with these measures, it was used as a covariate.

To ensure that results were not affected by the one child with a diagnosis of PDDNOS, analyses for major variables were completed with and without this child. To ensure that possible differences between children with HFA and AS were not responsible for results, analyses using these diagnoses as the between-subjects factor also were completed for the target variables, and are reported below.

For variables assessing depression in children and parents, and for variables related to problem behavior logs, only data from the nine members of the intervention group were available. The *t*-tests for repeated measures were completed for these variables.

Facial Expression Recognition

On the DANVA (see Table II), mean scores for subjects on total adult and child faces started in the low end of the average range. Correlations between VIQ, PIQ, and FSIQ and all DANVA scores were not significant. Thus IQ was not used as a covariate in any of these analyses. There was no main effect of time or group. The interaction of group and time, however was significant $F(1, 16) = 12.51$, $p = .003$, meaning that boys who participated in the intervention group scored higher at follow up, whereas waiting list control subjects' scores declined. The one child with PDDNOS was

Table II. Pretest and Posttest Means (and Standard Deviations) for Raw Scores on the DANVA for Members of the Intervention and Control Groups

Measure	Age	Pretest	Range	Post-test	Range	Gain
Intervention						
Adult faces[a]	8–10	12.2 (1.1)	11–14	13.4 (1.1)	12–15	1.2
Child faces	8–10	11.6 (1.5)	10–14	13.2 (1.8)	11–16	1.6
Total faces	8–10	23.8 (1.3)	23–26	26.6 (1.5)	25–29	2.8
Adult faces[b]	10–12	10.5 (1.3)	9–12	12.8 (2.9)	9–15	2.3
Child faces	10–12	12.0 (2.4)	10–15	12.0 (1.8)	10–14	0.0
Total faces	10–12	22.5 (2.9)	19–26	24.8 (3.4)	20–28	2.3
Control						
Adult faces	8–10	11.8 (2.2)	10–15	11.2 (1.3)	10–13	(.6)
Child faces	8–10	13.0 (1.2)	12–15	12.8 (1.5)	11–15	(.2)
Total faces	8–10	24.8 (3.1)	22–30	24.0 (2.3)	22–28	(.8)
Adult faces	10–12	12.4 (1.3)	11–14	11.8 (2.4)	10–15	(.6)
Child faces	10–12	12.8 (.9)	12–14	11.8 (2.1)	9–14	(1.0)
Total faces	10–12	25.2 (2.2)	23–28	23.6 (3.3)	19–27	(1.6)

[a] $n = 5$ for the younger groups.
[b] $n = 4$ for the older groups.

removed from the analysis and this did not affect the results. Also, a 2×2 ANOVA with AS diagnosis vs. HFA diagnosis as the between subjects factor was conducted and the results were not significant. Further examination of data for individual subjects indicated that overall scores for all of the children in the intervention group increased by one point or more, whereas only one child in the control group's score increased, with scores for four declining and four staying the same.

Results were similar for both the adult and child faces DANVA subscales, with a statistically significant interaction of group and time for adult faces, $F(1,16) = 6.55$, $p < .05$, and child faces $F(1,16) = 5.76$, $p < .05$. Post hoc analyses revealed an additional significant interaction effect for the child faces subscale score and membership in group 1 vs. group 2, with members of the younger and more cognitively able group improving significantly more than their older and less able counterparts, $F(1,16) = 4.78$, $p = .05$.

Theory of Mind

Scores on theory of mind measures (see Table III) were significantly correlated with VIQ,

Table III. Pretest and Post-test Means (and Standard Deviations) for Raw Scores on the Theory of Mind Measures for Members of the Intervention and Control Groups

Measure	Age	Pretest	Range	Post-test	Range	Gain
Intervention						
Strange stories[a]	8–10	10 (1)	9–11	10.4 (.9)	9–11	.4
Faux pas	8–10	2.6 (2.1)	0–5	5.4 (.9)	4–6	2.8
Strange stories[b]	10–12	6.5 (1.7)	7–11	7.3 (.5)	7–11	.8
Faux pas	10–12	.75 (.5)	1–4	3.0 (2.2)	1–6	2.25
Control						
Strange stories	8–10	9.2 (1.6)	4–8	9.4 (1.8)	7–8	.2
Faux pas	8–10	2.8 (1.3)	0–1	3.6 (2.5)	0–5	.8
Strange stories	10–12	7.41 (1.3)	6–9	7.5 (1.3)	6–9	.1
Faux pas	10–12	1.2 (.5)	1–2	3.0 (1.2)	2–4	1.8

[a] $n = 5$ for the younger groups.
[b] $n = 4$ for the older groups.

Table IV. Pretest and Post-test Means (and Standard Deviations) for Percentile Ranks on the Test of Problem Solving (TOPS) for Members of the Intervention and Control Groups

Measure	Age	Pretest	Range	Post-test	Range	Gain
Intervention						
TOPS[a]	8–10	32.2 (13.9)	13–44	43.2 (22)	10–65	11
TOPS[b]	10–12	2.25 (1.5)	1–4	1.5 (1)	1–3	(.75)
Control						
TOPS	8–10	41.6 (30)	2–73	23.8 (13)	6–42	(17.8)
TOPS	10–12	2.75 (.5)	2–3	2.0 (1.2)	1–3	(.75)

[a] $n = 5$ for the younger groups.
[b] $n = 4$ for the older groups.

$r = .74$, $p < .001$ and FSIQ, $r = .63$, $p < .05$, thus VIQ was used as a covariate in theory of mind analyses. On the Strange Stories Test, both the intervention and control groups' scores increased over time, but neither this increase, the effect of group or the interaction of group and time was statistically significant.

On the Faux Pas Stories Task, there was a main effect of time, with scores at post testing significantly higher for both intervention and control group subjects, $F\ (1,\ 16) = 19.26$, $p < .001$. The interaction between group and time, however, did not achieve statistical significance, $F(1,\ 16) = 2.34$, $p < .15$. Again, removing the child with PDDNOS did not affect the results of these analyses. Similarly, the interaction between intervention vs. control group, diagnosis (HFA vs. AS), and time was not significant. Scores for all children in the intervention group either increased or stayed the same. Scores for control group children also improved, however the average size of the improvement was about half that of intervention group children (2.6 points vs. 1.2 points).

Executive Functions/Problem Solving

On the Test of Problem Solving, standard scores were only published for two standard deviations from the mean. Some of the subjects scored lower than this, thus standard scores attenuated the range of scores. To mitigate this problem we used age graded percentile ranks in the data analysis. (see Table IV). Scores on the TOPS were statistically significantly correlated with VIQ, $r = .73$, $p < .001$ and FSIQ, $r = .66$, $p < .05$ so VIQ was used as a covariate in all analyses. Overall, intervention group percentile rank scores increased, whereas control group percentile rank scores declined. The interaction between group and time was significant, $F\ (1,\ 16) = 4.44$, $p < .05$.

The child with a PDDNOS diagnosis did very well on the TOPS at post-testing. After removing this child from the analysis, results were no longer significant, $F(1,16) = 3.13$, $p < .10$.

Depression

Data on depression were collected for children and parents in both the intervention and control groups, however, the response rate for control group subjects and parents was poor. Thus, we only included child and mother depression data for intervention group subjects in the analysis. Data pre- and post-intervention were subjected to repeated measures *t*-tests, (see Table V).

Depression inventory scores for all of the children at the beginning of the intervention were in the average range, and did not decrease significantly over the course of the intervention. The interaction between cognitive ability and time was significant, with boys in the older and less cognitively able

Table V. Pretest and Post-test Means (and Standard Deviations) for CDI and BDI Scores for Members of the Intervention Group

Age group	Pre-test	Range	Post-test	Range
Children(CDI)				
8–10	6.0(1.6)	4–8	8.4(5.0)	4–17
10–12	6.25(4.3)	2–12	3.8(3.2)	1–7
Mothers(BDI)				
Both	5.9(7.2)	0–20	3.89(3.3)	0–9

group improving significantly more than those in the more able younger group, $F(1,7) = 5.77$, $p < .05$. The mean total depression score for both groups placed the boys in the non-clinical range.

Depression scores were related to IQ, although due to the small sample size in this analysis, the magnitude of the correlation did not achieve traditional levels of statistical significance. In our small sample of nine boys, the correlation between CDI score at 20 weeks and FSIQ was $r = .50$, $p = .17$, which although not statistically significant in this small sample, is in the moderate and "clinically meaningful" range according to Cohen (1988), and represents a substantial magnitude effect size.

One mother in the group reported depression in the moderate to severe range at baseline (and the family consulted with the team about intervention), and two reported scores in the mild to moderate range. Mother's BDI scores declined from pre- to post-testing, although declines were not statistically significant, possibly due to the small sample size and high variance of the scores. Mother's scores declined by an average of 38% with none falling in the clinical range at post-testing. Post hoc analyses showed that mother and child depression scores were highly intercorrelated. At post-testing, e.g., the correlation between mother and child BDI score was $r = .78$, $p < .01$.

A final measure of parent well-being was provided by the results of the problem behavior logs. Despite weekly reminders and encouragement, parent participation in this exercise dropped substantially during the last weeks of the intervention. To compensate for this, we computed incidents included per time reporting (as opposed to total incidents reported) and average satisfaction with how problem behaviors were handled, for the first and second eight weeks of the intervention (the time period when most reports were completed). We then computed repeated measures *t*-tests for the first and second eight week period. The number of total problem behavior reports per time reporting dropped significantly over this interval from an average of 9.6 to 5.9, $t\,(9) = 2.4$, $p < .05$. Parent satisfaction with how they handled their children's problem behaviors increased from 6.2 to 6.9 (on a 10-point scale) indicating that they felt neutral to very pleased with how they handled behaviors. This increase in satisfaction was not statistically significant, $t\,(9) = 1.8$, $p = .11$. This average score of satisfaction handling problem behaviors was correlated $r = .65$, $p < .10$, with the decrease in a mother's depression score between pre- and post-testing. While not statistically significant, this correlation represents a substantial magnitude effect size. Parent confidence in their ability to handle problem behaviors increased from 8.1 to 8.7, but this was not a statistically significant increase.

DISCUSSION

Participation in the social adjustment enhancement groups detailed in this paper was associated with improvements in target measures of emotional awareness as measured by facial expression recognition for simple emotions and executive functions as measured by problem solving skills for children in the intervention vs. the control group. These results were relatively independent of child diagnosis. In the small sample of children for whom depression data were available there was a significant interaction between age group membership and time with the older and less cognitively able group's depression inventory scores declining significantly more over the course of the intervention. Mother's depression inventory scores declined by an average of 38%, although the results did not achieve statistical significance. Mothers also reported statistically significantly fewer problem behaviors in their children over time, and their increased satisfaction with how they handled these behaviors approached statistical significance.

The ability to read both adult and child facial expressions for simple emotions improved significantly more for children in the intervention group vs. the control group. In this sample, unlike in some others (e.g., Ozonoff *et al.*, 1990) ability to correctly identify facial expression measures was not related to VIQ. This was consistent with clinical observations that children from both the more and less able groups were capable of making gains in this area. It did appear, however, that children learned in different ways with children with relative strengths in visuo-spatial skills relying more on this type of information, while children with relatively stronger verbal skills used more strategies requiring verbal mediation. For example, we are reminded of one child with a PIQ significantly higher than his VIQ who was exceptionally good at interpreting faces in videos when the sound was off, while his peers with relatively higher VIQs needed more verbal cues. This observation is consistent with that made by Grossman *et al.* (2000) that children with Asperger

Syndrome use (and perhaps overuse) verbal skills in emotion recognition tasks.

The interaction between age group (i.e., younger and more able vs. older and less able) and scores on child facial expressions was significant with the younger and more able group showing more improvement on this task. This finding is at odds with folk wisdom that children with autism spectrum disorders are more interested in interacting with adults, and may be related to the findings of intervention literature that children with autism spectrum disorders are motivated in social interactions by peers (see McConnell, 2002). It was our observation that children in the groups were interested in both their peers and the adult leaders. Some group members (generally the highest functioning) acquired "high social status," and were sought out by other group members for conversations. Adults, including the young male leader, were attractive partners in the absense of high status peers. It remains unclear, however, why the younger more able group improved more in their ability to interpret the child faces.

The finding that recognition of facial expressions of simple emotions from photographs can be taught to children with ASDs is consistent with other studies showing that it is possible to teach this discrete skill to children with autism (see Hadwin, Baron-Cohen, Howlin, & Hill, 1996). The current study adds to what is known in this area by showing that it is possible to teach these skills in the context of a social skills intervention group format.

The social adjustment enhancement intervention did not produce changes in theory of mind as measured by performance on the Strange Stories or Faux Pas tasks in intervention vs. control group subjects. On the other hand, others have shown that, like for facial expression recognition, it is possible to teach children with autism to pass mental state tasks (see Bowler & Strom, 1998; Hadwin *et al.*, 1996; Ozonoff & Miller, 1995; Swettenham, Baron-Cohen, Gomez, & Walsh, 1996). The curriculum used to teach theory of mind in the current study was far less structured than those used in these studies. Social adjustment enhancement actively encouraged perspective taking; becoming more aware of attributes of self and others; development of conversation skills that involved true sharing of information between participants; and understanding the meaning of reciprocal friendships. This strategy of building internal awareness and perspective taking, and teaching their use in the contexts of conversations and friendships, is very different than that adopted by the authors mentioned above who taught specific algorithms or problem-solving strategies that could be used to solve theory of mind tasks (e.g., "perception causes knowledge" or "thoughts are like pictures in the head"). The approach used in the current study is more similar to some recently advocated group and individual approaches (see Bauminger, 2002; Faherty, 2000; Krasny *et al.*, 2003). While these newer methods may not produce significant gains in scores on traditional theory of mind tasks, they may provide other benefits not assessed by these tasks. Perhaps, for example, some of the perspective taking skills acquired by the boys may have contributed to their improving on the test of problem solving. In failing to anticipate this, the current study is limited in that it does not have measures sensitive to awareness of attributes of others or reciprocal conversations. The growing use of and acknowledgement of the validity of the ADOS-G (which includes opportunities to observe conversational and social reciprocity) as a measure of intervention outcome will be useful in future intervention studies (Lord, personal communication, September 2003).

It was our observation that the boys were very willing and able to learn facts about each other (i.e., he likes Thomas the Tank Engine and subways), and mentioned these facts without prompting during the group and in phone conversations. In fact, many demonstrated notable "patience" with each other around these interests during role plays where each boy got to be the leader in a scenario developed to involve their special interest. Parents also observed teaching the boys to ask even scripted questions to them about themselves (i.e., "What did you do today dad?") was pleasing and made the boys seem less self-focused. Participants also were able to learn conversation skills as taught by the formulas used in the group. What remained unclear, however, was whether "knowing" what friends do for each other, recognizing the interests of others, and remaining engaged with other's interests in the context of conversations, became flexibly integrated into the social repetoires of the boys so that the skills were used in the "heat of the moment."

We are not the first to mention that more research is necessary to ascertain whether skills taught in the group generalize into other contexts. One of the limitations of the current study is that it relies solely on laboratory test results and parent

report data, as opposed to those of outside observers like teachers or peers, which may have helped answer questions about whether target behaviors actually improve in day-to-day contexts. We concur with Ozonoff and Miller (1995), who suggest that the autism field is in need of measures that detect in a more fine-grained way the elements of reciprocal interaction in daily life. Future studies may benefit from social psychology paradigms assessing empathic accuracy (Ickes, 1997) and empathy (Levenson & Ruef, 1992). Functional magnetic resonance imaging is another tool that may in the future enable researchers to better understand whether interventions are having long-term meaningful effects that even alter the neurobiology of social cognition. For example, fMRI is being used in this way to assess the effectiveness of interventions for dyslexia (see Berninger & Richards, 2002).

Problem solving test scores involving drawing inferences from stimulus pictures about social situations also increased more in participants than in controls. To our knowledge, this is the first evidence that real life type problem solving skills can be taught to higher functioning children with autism spectrum disorders. On this task, however, members of the younger and more able group improved their scores, whereas older less cognitively able children did not. Given the strong correlation between performance on the Test of Problem Solving and Verbal IQ, and on the heavy emphasis on using verbal mediation of strategies for problem solving, this was not surprising.

Results from this very small sample indicate that issues related to depression in children with ASDs is complex. First, it should be noted that, at baseline, no children's self-report depression inventory scores were in the clinical range. In this study, there was a statistically significant interaction between the younger, more cognitively able and older group's depression inventory scores, with the older and less cognitively able children showing a relatively larger decrease in depression inventory scores. These results were driven largely by one child in the younger and more able group who became depressed (above average range on CDI) during the course of the intervention and was referred for further evaluation and treatment. These results that a younger child became depressed while all preteenagers were in the non-clinical range is contrary to clinical lore about depression and children with autism spectrum disorders that asserts that middle school children and teenagers are most vulnerable to depression, and suggests that cognitive ability may be a more important risk factor. We observed that while the vast majority of children greatly enjoyed coming to group, some showed a growing awareness of their own social challenges as a result of participating. The groups also may have been experienced as unusually emotionally intense given that interpersonal conflicts did arise and were dealt with during the course of meetings. Given that social skills groups are so frequently recommended for children from this population, and that the potential growing self awareness and emotional intensity engendered by these groups can produce depressive symptoms, more research clearly is needed to better understand the risk factors for depression in children participating in these groups, the role of increased self-awareness in the development of social competence, and the most effective interventions for treating depression in children with ASDs.

At the beginning of the study, 33% of mothers reported depression in the mild to moderate/severe range. Mother's depression scores in the intervention group declined on average and no scores were in the clinical range at the end of the intervention, although this decline was not statistically significant. Mother's also reported fewer problem behaviors in children over time, but this must be interpreted with some caution since this may have reflected fatigue with the reporting process. Satisfaction and confidence levels in dealing with problem behaviors levels remained relatively low. However, decline in mothers' depression was highly correlated with feelings of satisfaction in dealing with problem behaviors. Results in this sample were similar for parents of children with HFA, AS, and PDDNOS, although the sample in the current study was extremely small, and further research into the relationships clearly is warranted.

The current study raises the large and important issue of how individual differences in cognitive ability and profile, diagnostic classification, symptom severity, and affect influence response to social skills interventions. The group recruited into the current study all met our criteria for "high functioning" forms of ASDs which was set at FSIQ of 75. It is common clinical and research practice to label such children as high functioning and consider them to be a homogeneous group. As is evident from this study, however, not all high functioning children with autism are equally high functioning and/or possess equal relative strengths and challenges.

Some studies have shown that Verbal IQ correlates highly with the abilities tested here (see Liss *et al*., 2001 for executive functions and Happe, 1994 for theory of mind). For example, results of the test of problem solving illustrate that not all high functioning children with ASDs benefit from training in problem solving that relies on verbal instruction. Thus, in the current study, it also appears that VIQ influences not only who is better at these types of tasks, but who benefits from instruction. Writing about lower functioning children with autism, some have surmised that a certain level of cognitive ability is required before certain capabilities are possible (see Liss *et al*., 2001). Although this usually is thought to be the case for only classically autistic children, it also may be the case for the lower range of children considered to be high functioning. Another problem with the term "high functioning" is that it relates most closely to IQ, but frequently is losely used to describe autistic symptom level and diagnosis. These three variables—cognitive level, autistic symptom severity, and diagnostic classification are not perfectly related to each other.

In the current study, the younger children exhibited highly skewed verbal vs. performance IQs. On average, their VIQs were 23 points higher than their performance IQs. This pattern of relative cognitive strengths and weaknesses has been referred to as the Nonverbal Learning Disability (NLD) profile (Rourke, 1995). Not surprisingly, it was our observation that the older group had more difficulty with lessons with a high verbal content. The younger group was more able to develop verbal strategies to solve problems. Volkmar, Klin, Schultz, Rubin, and Brown, (2000) have suggested that children with this distinct NLD cognitive profile have different educational needs than other children with autism spectrum disorders. Pennington (1991, 2002) has pointed out that differential response to treatment is one of the variables arguing for the discriminant validity of a subtype. If, in fact, certain persons on the autism spectrum (like those with the NLD Profile) respond differently to treatment, this raises the thorny issue of whether this is a different subtype of ASD.

A second large issue raised by the study is why several of the children in the control group's scores declined from pre to post test on the DANVA and the TOPS. In each case, different children's scores were responsible for the overall decline. Uncertain about why this occurred, we investigated post-hoc for the intervention group for whom data were available, the hypothesis that increases in depression were related to the performance decline. This hypothesis was not confirmed. Research has shown, however, that children with HFA, AS, and PDD-NOS may experience more anxiety than typically developing children (Gillot, Furniss, & Walter 2001; Kim, Szatmari, Bryson, Streiner, & Wilon, 2000). We reasoned that, since they were familiar with the U.C. Davis Medical Center, intervention group children may have been more relaxed when returning for post-testing. Their lower anxiety level, coupled with skills training, enabled them to remain motivated and to do their best during post-testing, while waiting list control children may have been anxious and performed unevenly. Research with typically developing school children is providing interesting clues to individual differences in emotional reactivity, social behavior, and psychopathology (Boyce *et al*., 2001). Future research into the emotional reactivity of children with autism spectrum disorders could illuminate characteristics of anxiety responses in this population, and provide explanations for the variability in their social responses, motivation, and performance on these tasks.

Another possible explanation for performance declines in waiting list control subjects is that being on the waiting list for six months was somehow detrimental. This does not explain why the pattern of declines was not uniform across measures or children. While few studies of the effect of being on a therapy group waiting list have been conducted, Elliott and Brown (2002) showed that a three month wait to participate in a stress management program did not result in any significant deterioration in those adults waiting to receive treatment. Several studies also have shown that the impact of waiting upon treatment responses to therapy groups is small and not significant (Avia, Ruiz, Olivares, Crespo, & Guisado, 1996; O'Hara, Stuart, & Gorman, 2000).

Conclusion

With current estimates of the incidence of all autism spectrum disorders estimated at 1 in 166 (Chakrabarti & Fombonne, 2001), there is a great need to study issues related to interventions for children on the higher functioning end of the autism spectrum. The current study makes some small, but important contributions to these efforts. Building on the work of Ozonoff and Miller (1995), and employing approaches that have been developed by

others over the last several years, this study showed that it is possible to teach facial expression recognition and problem solving skills to high functioning children with autism in a group format. We also were able to assess in a preliminary way the possible contributions of more structured parent training as part of the therapeutic modality.

In our view, the current study raises multiple issues worthy of future research. The field needs to continue to refine its understanding of how individual differences in cognitive level and profile, autism symptom severity, and affect-related variables affect learning in children with ASDs. Areas to study include risk and protective factors for depression in children with ASDs undergoing periods of growing self awareness as well as participation in therapeutic intervention; mechanisms through which parent intervention influences parent-related variables and child outcome in an attempt to strengthen the effectiveness of parent training; and the role of child anxiety in motivation and performance in social and other interactions.

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APPENDIX A

Table AI. Outline of Class Topics for a Social Adjustment Enhancement Intervention for ASDs

Session	Topics covered
Module one	
1	Introduction of leaders and members; group format and procedures; the golden rule; knowing your feelings; basic emotions, emotion thermometers
2	Continuation of knowing your feelings; gradations of feelings; focus on "happy" and "sad;" beginning stress management
3	Continuation of knowing your feelings (more subtle emotions like guilt, pride embarrassment, anger, excitement); gradations of feelings. Continue work on stress management
4	Continuation of knowing your feelings; emphasis on uncomfortable feelings; stress management techniques
5	Continuation of knowing your feelings; beginning integration with non-verbal communication (facial expressions, eye contact); continuing discussion of stress management
6	Continuing work on non-verbal communication (gestures, posture, tone of voice)
7	Beginning conversation skills (appropriate topics, rules for conversations)
8	Beginning conversation skills (maintaining topics, repairing conversations, appropriate topics, rules for conversations, recipe for a conversation)
9	Continuing conversations skills (recipe for a conversation): introduction to friendship skills (the meaning of true friendship, matching emotions, trust)
10	Friendship party
11	Break
Module two	
1	Continuation of friendship skills including skills especially important for groups
2	Introduction to individual problem solving template, identifying relevant information; prioritizing problems
3	Continuation of individual problem solving; focus on flexibility in generating alternative solutions to problems
4	Solving real life problems: focus on handling losing, getting teased or bullied, being insulted, reacting to other people's problems, sharing friends
5	Transition to group problem solving; the roles of leaders and followers
6	Useful skills for problem solving teams: getting input from everyone and listening, taking turns, group decision-making, repair phrases
7	Group Problem #1: Group Name and Coat of Arms
8	Group Problem #2: Preparing a video for the graduation
9	Group Problem #3: Finalizing the group video and planning for the graduation
10	Final Session: Problem solving presentations and graduation ceremony

APPENDIX B

Table BI. Sample Activities for Teaching Various Social Skills

Skill	Sample activities
Awareness of emotions	Emotion thermometers drawn on individual white boards with color coding for different emotions in response to different scenarios; feeling intensities expressed through drawing, number lines, musical instruments; "Simon Says" using emotions; TV viewing with parents to observe emotions in others
Face processing and nonverbal communication	Practice facial expressions and corresponding body postures and gestures using mirrors, and video and digital cameras; facial expression and body language "charades" in response to different scenarios; TV viewing to observe facial expressions and body postures; practicing making eye contact
Theory of mind and perspective taking	Teach and reinforce "golden rule" through point system for showing concern about others, "thumbs up and thumbs down" games for scenarios that do and do not illustrate the golden rule; introductory song gradually modified to incorporate characteristics of others as well as their names; use of funny confederates who clearly model poor perspective taking in social situations and allowing children to give him/her feedback; having children make each other "gifts" in the form of written statements about what they appreciate in each other; teach rules for good friends and role play how good friends act towards each other in different sceanarios
Conversations	Teach general rules of "sharing the air," "staying on the same page," and "being honest," as well as a "recipe" for having a conversation that begins with a "starter," involves adding some personal information on the starter topic, and passing to the next person by asking them a related question; use these when children build "conversation towers" with blocks added for reciprocal contributions and towers toppled for rule violations; start with conversation topics related to objects selected from a box at random to build flexibility
Problem solving	Teach using a visual template outlining a pros and cons analysis to problem solving; use "thumbs up and thumbs down" games to practice identifying important vs. unimportant problems; play individual and group games to generate creative strategies to problems selected from a hat and real social problems generated by the group; teach the meaning of group roles of leaders and followers and give members a chance to role play both; ask members to work with their parents to assign roles to each group member in the event that they were shipwrecked on a desert island; have group use problem solving skills to select a group name and make a group symbol, and plan a "graduation"

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