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Conversational Behaviors in Youth with High-functioning ASD and Asperger Syndrome

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Abstract

Twenty-nine youth with autism spectrum disorders and 26 with typical development between 12 and 18 years of age were engaged in structured interviews (ADOS). The interviews were videotaped and rated for atypical conversational behaviors by trained raters, using the Pragmatic Rating Scale (Landa et al. Psychol Med 22:245–254, 1992). The ASD group was divided into AS and HFA/PDD-NOS subgroups. Significant differences were found among groups on approximately one-third of the PRS items. These items involved primarily the management of topics and information, reciprocity, intonation, and gaze management. The only differences to reach significance between the AS and HFA/PDD-NOS group were a greater tendency for overly formal speech on the part of the AS group, and more difficulty with gaze management on the part of the group with HFA/PDD-NOS. The implications of these findings for understanding and treating conversational deficits in ASD are discussed.

Keywords

Autism; Asperger syndrome; Pragmatics; Conversation

Pervasive Developmental Disorders (PDD), often referred to as *autism spectrum disorders* (ASD) are often associated with depressed cognitive and language functioning, but an estimated 20–40% of individuals with these syndromes function within the normal range on IQ testing (American Psychiatric Association 1994; Volkmar et al. 2005). Individuals with ASD at this level of functioning typically receive one of three diagnoses:

1. Autism, in which there is a history of language delay and significant symptoms in all three areas that characterize the syndrome (severe deficits in socialization, communication and stereotyped, repetitive or ritualistic behaviors). Individuals with Autism who function in the normal range of IQ are typically referred to as having high-functioning autism (HFA);
2. Asperger syndrome (AS) in which there is no history of language delay, cognitive development within the normal range, the presence of significant social and communicative disability and the presence of restricted, repetitive, and stereotyped patterns of behavior, interests, and activities;

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3. Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) in which a combination of social, communicative and/or stereotypic behaviors are present, but do not meet all criteria for autism.

Although some variation in the linguistic abilities of this population has been reported (Tager-Flusberg and Joseph 2003), these individuals usually demonstrate large spoken vocabularies and generally intact formal language skills (Tager-Flusberg et al. 2005). The most prominent communication deficits seen in these higher functioning individuals are in the areas of conversational pragmatics and social communication. Difficulties in social uses of language, especially in conversation, have been widely noted for people with both high functioning autism (HFA) and Asperger syndrome (AS) (See Klin and Volkmar 1997; Paul and Landa 2008; Tager-Flusberg et al. 2005).

Unlike most speakers with communication impairments—for whom the more a child talks, the more adaptive language is likely to be—for speakers with ASD, unusual aspects of language have been shown to increase with the amount of speech (Caplan et al. 1994; Volden and Lord 1991). A variety of conversational problems have been reported in this population, including reduced engagement in turn-taking during reciprocal conversations (Capps et al. 1998; Ghaziuddin and Gerstein 1996), less frequent and varied speech acts (Landry and Loveland 1989), difficulty in making appropriate judgments about how much/little to say in conversational responses (Lord and Schopler 1989), problems in taking another's perspective in conversation (Loveland et al. 1989), in providing a relevant, adequate response to what the previous speaker said (Baltaxe and D'Angiola 1992; Capps et al. 1998), and in asking appropriate questions in conversation (Hurtig et al. 1982). Several studies have shown connections between conversational abilities and success on theory of mind tasks (e.g., Losh and Capps 2003; Surian et al. 1996; Tager-Flusberg and Sullivan 1995) in this population.

In general, few differences have been reported between subjects with AS and other ASDs (e.g., Macintosh and Dissanayake 2004, 2006), although Shriberg et al. (2001) found that young adults with AS were significantly more garrulous than those with HFA. Children with HFA have also been shown to use significantly lower proportions of assertions involving explanations or reference to internal state than children with Asperger syndrome (Ziatas et al. 2003). Some research has suggested that speakers with AS are more likely to perseverate on obsessive topics in conversation and to use a 'pedantic' speech style than those with HFA (Ghaziuddin and Gerstein 1996; McPartland and Klin 2006), but these findings have not been consistently replicated (Cuccaro et al. 2007; Shriberg et al. 2001).

Studies of conversational skills in speakers with autism spectrum disorders, however, have been limited by measurement difficulties. There are no standard instruments for assessing natural conversational behavior. A variety of conversational coding schemes have been proposed, including Prutting and Kirchner's (1983) Pragmatic Protocol, Bedrosian's (1985) Discourse Checklist, Damico et al.'s (1999) Systematic Observation of Communicative Interaction, Rice et al.'s (1990) Assessment of Language Impaired Children's Conversations, Bishop and Adams' (1989) Assessing Language in Conversational Contexts, Brinton and Fujiki's (1992), and Larson and McKinley's (1995) Conversational Analysis. However, these were designed to assess conversation in children with specific language impairments, and do not focus on the categories for observation that are likely to affect the discourse of speakers with ASD. Parent and teacher report measures are often used to assess communication ability in this population (e.g., Bishop 2003; Constantino et al. 2003). Although these are sensitive to differences between children with ASD and those with TD, they fail to illuminate the specific aspects of conversational difficulty that would enable the development of intervention aims and programs. Several recent efforts have attempted to provide analyses of conversational skills that can serve as a guide toward pragmatic language intervention in children whose communication problems are primarily in the conversational domain, including (Adams

2002; Adams et al. 2002; de Villiers et al. 2007). The present study adds to this growing literature, both by focusing on a range of conversational behaviors reported to be present in the speech of those with ASD, and by contrasting these behaviors between speakers with AS and those with other ASDs to provide a more detailed picture of the conversational abilities typical of each diagnostic category.

Landa et al. (1992) developed the Pragmatic Rating Scale (PRS) to be used to evaluate parents of individuals with autism to determine whether weaknesses in pragmatics were common across family members. The scale was devised to examine conversational difficulties that had been reported in the earlier, anecdotal literature, as being prevalent in the conversation of speakers with ASD. Using this scale, the authors were able to show that parents of children with ASD displayed atypical pragmatic behaviors more often than parents of children with typical development (TD). Thus, the PRS would appear to be ideally designed capture the conversational behaviors that characterize the pragmatic difficulties of speakers with ASD, even when they present at a relatively mild level.

The goals of the present report are three-fold:

1. to use the PRS to examine the conversational difficulties most prevalent in high-functioning adolescent speakers with ASD, when compared to age-mates with TD;
2. to use the PRS to explore differences in conversational behavior between speakers with AS as opposed other ASDs;
3. to discuss how the assessment of specific conversational behaviors can contribute to the development of programs aimed at improving conversational skills in speakers with ASD.

Method

Participants and Diagnostic Groups

ASD—Subjects with ASD were selected for the study from a database of children who had participated in either clinical or research activities at the Yale Child Study Center during the five years prior to data collection for the present study. Diagnostic characterization included the Autism Diagnostic Interview-Revised (ADI-R; Lord et al. 1994), and the Autism Diagnostic Observation Schedule-Generic (ADOS-G; Lord et al. 2000). To receive a diagnosis within the autism spectrum, each subject had to meet either DSM-IIIR (APA 1987) or DSM-IV (APA 1994) criteria for one of the three ASD disorders. Clinical diagnoses were confirmed independently by two experienced clinicians. Inter-rater reliability between these clinicians for diagnostic assignment was high, with kappa values ranging from .80 to .95 in related research projects (Klin et al. 2000).

All subjects currently between the ages of 12 and 18 who met diagnostic criteria for ASD, for whom both a videotape of an ADOS-4 interview and a Verbal IQ score were available were considered for the study. Of these, all subjects with VIQs above 70 were selected. This process resulted in a sample consisting of 9 young people with autism, 15 with AS and 5 with PDD-NOS.

These subjects with ASD were subdivided into groups: those with HFA/PDD and those with AS. The HFA/PDD group was formed, first, because there were so few high functioning subjects with the PDD-NOS diagnosis that a group with that diagnosis alone would have been too small for making comparisons. Secondly, as Table 1 shows, there was no significant difference in verbal IQ between subjects with HFA and PDD-NOS. Since the group with PDD-NOS was not significantly different from those with HFA on any of the other characterization

variables, and since combining the groups with HFA and PDD-NOS would yield a group comparable in size to the AS group, the HFA and PDD-NOS groups' data was combined and compared to those from the AS group in subsequent analyses.

TD—A sample of 26 typically developing young people selected to match the ASD sample in terms of age and gender was recruited. Subjects with TD were all reported by parents to have had typical development, never to have received any clinical diagnosis or special educational services, and to be functioning in the appropriate grade for age in school. Age and gender information for the sample appear in Table 1.

Instruments and Procedures

Clinical Characterization—As part of their participation in clinical research at the Child Study Center, participants with ASD had been administered cognitive and language assessments and had been administered an ADOS-Module 4 (Lord et al. 2000). ADOS-4 scores for the two major scoring algorithms on this measure (Communication and Socialization) had been conferred by the diagnosticians who conducted the ADOS interviews. Parents of these young people had also been interviewed using the *Vineland Adaptive Behavior Scale-Expanded Edition* (Sparrow et al. 1984). Average scores on each of these assessments for each of the three ASD groups are displayed in Table 2. There were no significant differences between the HFA/PDD group and the group with AS in terms of age, Verbal or Performance IQ, Vineland, standard language test, or ADOS-4 scores.

ADOS Interviews—The Autism Diagnostic Observation Schedule (Lord et al. 2000) is a standardized protocol for the observation of social and communicative behaviors of children for whom autism is suspected. It yields several sets of scores; the two primarily used to establish diagnoses are the Communication and Socialization algorithm scores, both of which indicate the level of autistic symptomotology in the respective area. Thus, higher scores on the ADOS indicate higher levels of impairment. Module 4 is intended to be used with high-functioning adolescents. All subjects in the present study were interviewed with the ADOS Module 4. Subjects with ASD were interviewed by clinicians trained and certified to administer and score the ADOS. Subjects with TD were interviewed by a speech-language pathologist trained to administer Modules 3 and 4. All ADOS interviews were videotaped for later analysis.

Since the ADOS-4 interview, unlike lower-level ADOS modules, is based almost entirely on conversation, and probes included are primarily embedded within a conversational setting, this source of conversation data was deemed an appropriate sample of the pragmatic skills of the participants. In addition, the use of the ADOS-4 interview format across all participants ensured that each had comparable opportunities to demonstrate conversational strengths and weaknesses in similar contexts.

Pragmatic Rating Scale (PRS) Coding—The PRS identifies 30 pragmatic behaviors that reflect abnormalities reported to be typical of autism, based on theoretical and clinical reports of major pragmatic behaviors in the literature (Landa et al. 1992). Although this instrument was originally designed to investigate pragmatic behaviors of parents of children with ASD, its inclusion of the kinds of conversational behaviors reported in early, anecdotal literature to be typical of ASD and the fact that, by providing a three level (inappropriate, mildly inappropriate, appropriate) scoring procedure, the instrument is sensitive to both significantly different and less obvious conversational problems, it would appear to be an measure well-adapted to use with high-functioning individuals in whom conversational problems may be either subtle or more pronounced.

The PRS items are categorized into three major groupings: (1) Pragmatic Behaviors, which focus primarily on topic management and reciprocity and include ratings such as 'overly talkative,' 'unresponsive,' and' vague'; (2) Speech and Prosodic Behaviors, which concern the form of speaker production and include ratings such as 'indistinct speech,' 'intonation is unusual,' and 'unusual rhythm'; and (3) Paralinguistic Behaviors, which include the physical behaviors that accompany speech, such as 'gestures,' 'facial expression,' 'physical distance,' and 'gaze.' See Appendix 1 for a full list of behaviors rated.

The PRS was completed by analyzing the first 30 min of the ADOS videos collected from each subject's interview. Each behavior on the PRS is rated on a three point scale, where 0 = normal; 1 = moderately inappropriate; 2 = absent or highly inappropriate. Landa et al. (1992) made one rating for each category, based on the entire 30 min observed. However, preliminary studies at our Center indicated difficulty in establishing acceptable inter-rater reliability with this method. As a result, ratings for the present study were done by having a trained observer (MO or HM) watch 10 consecutive 3-min segments of each ADOS interview. At the end of each 3-min segment, the observer stopped the video and conferred a rating of 0–2 for each of the 30 categories that were observable in that segment. Then the next 3-min segment was viewed and rated. The scores for each segment for each subject were then summed across the 10 segments, and averaged. Point-to-point inter-rater agreement on a 20% sample of the videotape ratings using this method of coding was .89.

In addition, a score for each of the three major scales on the PRS (Pragmatic, Speech/Prosody, Paralinguistic) was computed for each subject by summing the average scores for the items within the scale. This is referred to as the "raw" score for each scale. Since there were unequal numbers of items within the three scales (Pragmatic Behaviors had 18 items for a possible total score of 36; Speech/Prosody had 8, with 16 possible points; Paralinguistic Behaviors had 4, with 8 possible points), the average percentage of possible points within each of the three categories for subjects was also computed by dividing the "raw" score for each scale by the number of possible points for that scale. In this way, scores across the three scales could be compared. Raw scores were used for statistical analysis; percentage scores for visual comparisons across groups.

Results

Comparisons of PRS Scales

To explore differences in conversational difficulties among speakers within the autism spectrum, in comparison to those with TD, we compared PRS scores of subjects diagnosed with Asperger syndrome to those in the HFA/PDD-NOS group, as well as those with TD.

In order to examine the conversational differences among these three groups, a One-way Analysis of variance was used to compare raw scores on the three major scales of the PRS (Pragmatic Behaviors, Speech/Prosodic Behaviors, Paralinguistic Behaviors). ANOVA indicated significant overall differences among the groups on all three of these scales, with very large effect sizes (Borenstein et al. 2001) in each case (Pragmatic Behaviors: $F = 34.2$, $p < .0001$, $f = 5.8$; Speech/Prosody Behaviors: $F = 20.2$, $p < .0001$, $f = 4.5$; Paralinguistic Behaviors: $F = 14.8$, $p < .0001$, $f = 3.9$, very large). Post-hoc pair-wise comparisons for this analysis appear in Table 3.

As stated earlier, the three scales contained differing numbers of behaviors to be rated; therefore, to visually compare the group data, the average percentage of possible points within each of the three PRS scales for subjects within each of the three diagnostic groups were computed. These means are displayed in Fig. 1. There it can be seen that average ratings for the group with HFA/PDD-NOS were in the range of 10% (±5%) for Pragmatic and Speech/

Prosody Behaviors, while those for Paralinguistic Behaviors averaged 18% (±14%). As Table 3 shows, the group with AS did not show raw scores on the three scales that were significantly different from those of participants with HFA/PDD-NOS. As Fig. 1 shows, they received ratings of between 8% and 14% of possible points for aberrant behaviors, with standard deviations ranging from 5% to 13%. The participants with TD received fewer than 1.5% of possible points on all three scales.

Comparison of PRS Items

To look in more detail at differences in individual conversational behaviors among the three groups, One-Way Analysis of Variance with Tukey post-hoc comparisons were run on the 30 PRS items. A Bonferroni correction was employed, such that a p value of .05 was divided among the 30 comparisons, so that a p level less than .002 was required to reach significance. Using this criterion, the following comparisons reached the criterion level of significance of overall differences among the three groups:

- PRS 7: irrelevant detail ($F[2,52] = 7.9$; $p < .001$);
- PRS 8: inappropriate topic shifts ($F[2,52] = 17.1$; $p < .0001$);
- PRS 11: Unresponsive to partner cues ($F[2,52] = 8.3$; $p < .001$);
- PRS 12: little reciprocal exchange ($F[2,52] = 18.4$; $p < .001$);
- PRS 23: unusual intonation ($F[2,52] = 16.2$; $p < .0001$);
- PRS 30: inappropriate use of gaze ($F[2,52] = 14.2$; $p < .0001$).

In addition, the following comparisons approached significance:

- PRS 4: Inappropriately formal ($F[2,52] = 6.0$; $p < .005$);
- PRS 10: topic preoccupation/perseveration ($F[2,52] = 5.5$; $p < .007$).

The individual PRS items on which there were significant differences among the three groups were subjected to Tukey post-hoc comparisons to examine pair-wise differences. These comparisons had already demonstrated significant differences in the omnibus F test, and the Tukey test controls for experiment-wise error; therefore a Bonferroni correction was not employed. Pair-wise differences where $p < .01$ are displayed, with effect sizes, in Table 4. There it can be seen that participants with AS were significantly different from those with TD on all eight of the PRS items on which significant differences were found in the omnibus test. For participants with HFA/PDD-NOS, fewer individual items reached the criterion level of significance when compared to TDs. However, PRS items 8 (out of sync), 23 (unusual intonation) and 30 (gaze) were significantly different from the TD group in the group with HFA/PDD-NOS. The HFA/PDD and AS groups differed significantly on Items 4 (inappropriately formal) and 30 (gaze). Participants with HFA/PDD performed better than those with AS in terms of the ‘overly formal’ item, and worse than those with AS on the use of gaze. On the other items for which a overall difference was found, the HFA/PDD group did not differ significantly from that with AS.

Discussion

These results provide detailed information regarding the deficits seen in the conversational skills of speakers with ASD. When compared with age-mates with TD, difficulties of young people with ASD are not found across all PRS items, but are focus on approximately one-third of the items rated. Differences are largest in the areas of intonational and gaze abnormalities (See Fig. 1). In terms of pragmatic behaviors, the aspects of conversation most significantly impacted are the amount of information provided in conversation to satisfy listener needs, the

degree to which topics are managed and reciprocated, the ability to respond to partner cues and engage in reciprocal exchanges. Other areas affected include the ability to clarify and repair conversational breakdowns, and to initiate appropriate, spontaneous discourse. These pragmatic difficulties can be conceptualized into three broad categories: (1) topic management, specifically, the ability to produce a comment pertinent to the topic introduced by the partner and the ability to introduce topics of shared relevance and interest (PRS 8, 10); (2) information management, specifically, providing the appropriate amount and type of information based on listener needs (PRS 7, 17, 18, 19); and (3) reciprocity (PRS 11, 12), the ability, in both verbal and nonverbal ways, to maintain a balanced, back-and-forth conversational exchange.

The difficulties identified here in topic management and information management can be seen to be related to what linguists refer to as presuppositional skills (Ward and Horn 2004). Presupposition involves the ability to predict what listeners already know and are thinking about, as well as what they wish to know, when choosing what information to convey in conversation. Competent conversationalists use presuppositional skills to adhere to what the linguistic philosopher (Grice 1975) called the “maxim of quantity.” That is, they say just enough to tell the listener what s/he needs to know without expressing information s/he neither wants nor needs. Adhering to this maxim requires a good deal of “mind reading;” i.e., knowing what the listener already knows, has in the forefront of his/her mind where it can easily be related to what is being said, and what the listener’s goals, intentions and desires for this conversation are. Thus, apart from their significant issues in use of intonation and gaze in conversation, speakers with ASD differ from those with TD primarily in their difficulty in determining what topics and information are necessary for a cooperative, mutually engaging conversation to proceed.

Difficulties in reciprocity—including being unresponsive to verbal and nonverbal cues for floor-shifting and turn-exchange, as well as inappropriate timing and latency of turn-taking—may reflect a more basic failure of attention and sensitivity to others. That is, a history of neglecting to attend to the cues of others can be implicated in a failure to form hypotheses about and understand the intentions behind those cues.

The description of pragmatic skills that emerges from this study, then, adds weight to the notion that difficulties in computing others’ states of mind in real-time exchanges play an important role in the conversational deficits of speakers with ASD. Although performance on structured ToM experimental tasks has been shown to be highly related to verbal IQ in previous studies (e.g., de Villiers 2000), the correlation between verbal IQ and total PRS score in this study does not reach significance ($r = .09$). This finding lends support to Klin’s hypothesis (Klin et al. 2000) that in real-world activities, performance is affected not only by general verbal cognition, but also by the ability to “[seek and detect] salient aspects of a social situation to [react] quickly to fast-changing emotional expressions” (p. 382).

These difficulties in orienting to and identifying social cues, according to Klin et al. have deep roots in early failures of joint attention and reference that have been consistently seen in toddlers diagnosed as ASD (Chawarska and Volkmar 2005; Mundy and Burnette 2005; Wetherby et al. 2006), as well as in deficient early orienting preferences for both faces (Klin 1992, 2003) and voices (Klin 1992; Paul et al. 2007).

Gaze management problems, as well, can perhaps be traced to early-emerging differences in prelinguistic interaction. That is, the neural mechanisms that dictate preferences for looking at faces from early in development (Klin 2003; Klin et al. 2002) may differ in individuals with ASD; such differences could develop into aberrant gaze patterns as the information gained through looking at faces is less abundant and less salient for children with ASD, and as gaze

becomes more coordinated and integrated with conversational turn-taking and the monitoring of interpersonal cues in conversation.

Thus, many of the major deficits seen in the conversational skills of speakers with ASD can be construed to relate to core indices of social disability present in the first years of life, including failures of joint attention and attention to face and voice, and to the integration of these abilities, as they develop into linguistic presuppositional skills. One major area of deficit remains to be explained however: the deficit in intonation. Neither presupposition nor early difficulties in joint attention seem obviously related to the difficulty in modulating vocal production and integrating it with underlying intention. Studies underway in our laboratory are attempting to address this puzzle by using neuroimaging to explore the roots of intonational difficulties in brain structure and function.

A *caveat* should be mentioned regarding these results. Even for items on which there were significant differences between participants with ASD and TD, participants with ASD received, on average, only 12–16% of the possible points for aberrant behavior. Subjects who were rated more than one standard deviation above the mean for the ASD group received 30% of the possible points for aberrant behavior in any of the categories rated. The maximum percentage of possible points for aberrant behavior ever assigned to any subject in any category was 42%. Thus, although there were differences between participants with TD and ASD, those with ASD did not produce aberrant conversational behaviors consistently, and were NOT, in fact, rated as aberrant on a majority of the observations. This suggests that a proportionally small amount of atypical conversational behavior characterizes this population. However, it is important to note that these adult–child interactions are those in which speakers with HFA and AS are often seen to be least handicapped. Interactions with peers typically constitute more difficult situations for these individuals. In fact, Communication and Socialization scores on both the *Vineland* and ADOS in Table 2, indicate that others' perceptions of these subjects' interactive skills are highly impacted by this relatively small amount of atypicality.

In considering the comparisons between conversational behaviors in speakers with AS and those with HFA/PDD-NOS, we see, first, a similar picture of generally low levels of aberrant conversational behavior in both ASD groups (See Fig. 1). Significant differences between the two groups with ASD on individual PRS items are relatively rare, primarily in the use of overly formal language style in the group with AS, and in significantly more difficulties with gaze management in the group with HFA/PDD-NOS. Both the group with AS and with HFA/PDD-NOS were significantly more impaired on PRS item 8 (out of sync) than the group with TD; however, they were not significantly different from each other on this item. The same pattern was seen on PRS item 23 (unusual intonation). This finding supports those of Shriberg et al. (2001), who reported that AS and HFA groups showed similar impairments in prosody. Our findings also support observations of a more formal, pedantic speech style in speakers with AS than in those with HFA/PDD-NOS (Ghaziuddin and Gerstein 1996).

For the other items on which significant differences were seen in the three-way comparison (PRS 7 [inappropriate detail], 10 [topic preoccupation], 11 [unresponsive], and 12 [little reciprocal exchange]), only the group with AS was significantly different from that with TD. The large standard deviations within the AS and HFA/PDD-NOS groups are factors likely to contribute to a reduced power to find pair-wise differences, despite significant findings in the three-way comparison. Still, these results support the suggestion of Tager-Flusberg et al. (2005) that, unlike other speakers with other communication problems, speakers with ASD show more marked impairment the more they talk. That is, the speakers with AS who, as Shriberg et al. (2001) reported, tend to be more verbose than those with HFA/PDD-NOS, show larger differences from typical speakers.

Clincal Implications

The finding that speakers with ASD show aberrations on a minority of their conversational turns suggests that they do have some conversational skills that can be built on in intervention. Carefully analyzing conversational behaviors with a tool like the PRS may help clinicians to identify not only the deficits, but also the adaptive conversational behaviors within an interaction, and help the speaker extend their use to a greater number of contexts. Thus, in some sense, these speakers may not need to learn "how" to converse, but may need additional cues to "when" their successful conversational behaviors should be applied. Our discussion of the possible roots of these pragmatic difficulties in early-emerging failures to "tune in" to appropriate social cues suggest that one way to help speakers with ASD respond more appropriately in conversation may involve prompts to attend to cues present in the interaction (presented in instructional contexts in exaggerated form, at first) and recognize them. Once cues are recognized more consistently, strategies for responding may be addressed.

The study also suggests the broad areas in which conversational strengths and weaknesses are most likely to be seen in speakers with ASD. On the PRS Speech/Prosody and Paralinguistic scales, only intonation and gaze items showed between-group differences. Other areas of difficulty seen in younger and more severely impaired individuals, included scripted speech, poor use of gesture, and problems with volume, rate or timing are infrequent in these high-functioning adolescents. In the Pragmatic domain, usages easily misinterpreted as rude, such as excessive bluntness and informality, are also rare. Areas of significant deficit center on management of topics and information, related to difficulties in presuppositional skills, and achievement of reciprocity related to attention and sensitivity to partner verbal and nonverbal cues. Although individual assessment will be necessary to establish the conversational difficulties in a particular student, these data suggest promising areas in which treatment programs that will have broad applicability for high-functioning speakers can be developed.

Such programs would focus, as suggested earlier, on increasing the awareness of interlocutor cues to turns and topics in conversation and learning adaptive ways to respond to these cues, helping students identify topics likely to be of interest to peers, finding ways to comment reciprocally on topics introduced by others, adding new, relevant ideas to a given topic, avoiding irrelevant and tangential contributions, monitoring the success of contributions and learning strategies for conversational repair. Several methods reported in recent literature on social skills training could be adapted to address these foci, including video modelling (Charlop-Christy and Milstein 1999; Charlop-Christy et al. 2000; Corbett and Larsson 2001), social thinking (Paul 2007; Wiig and Wilson 2002; Winner 2005), think-aloud protocols (Brinton et al. 2004; Camp and Bash 1981), and cognitive-behavioral approaches (Bock 2001; Timler et al. 2005; Timler et al. 2007).

The data also suggest that, although students with AS are more likely than others with ASD to use an overly formal speech style, other areas of conversational deficit are likely to be shared among all speakers on the spectrum who function at this level. Since scores on PRS items that were significantly different from speakers with TD were not significantly different between the AS and HFA/PDD groups, it is likely that most goals and strategies discussed above will be relevant for high functioning speakers with all diagnoses within the autism spectrum. These findings can guide clinicians as they attempt to address the persistent conversational difficulties faced by these otherwise able individuals.

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Appendix 1

Items included in Pragmatic Rating Scale (Landa 2000; Landa et al. 1992)

PRS Items	
Pragmatic behaviors	
1	Inappropriate/absent greeting
2	Strikingly candid
3	Overly direct or blunt
4	Inappropriately formal
5	Inappropriately informal
6	Overly talkative
7	Irrelevant/inappropriate detail
8	Out of sync content/unannounced topic shifts
9	Confusing accounts
10	Topic preoccupation/perseveration
11	Unresponsive to examiner's cues
12	Little reciprocal to-and-fro exchange
13	Terse
14	Odd humor
15	Insufficient background information
16	Failure to reference pronouns, terminology
17	Inadequate clarification
18	Vague
Speech/Prosody behaviors	
19.	Scripted, stereotyped sentences or discourse
20.	Awkward expression of ideas
21.	Indistinct speech/mispronunciations
22.	Rate of speech is too rapid/slow
23.	Intonation is unusual
24.	Volume is inappropriate (note too loud/soft)
25.	Unusual timing of responses, reformulations
26.	Unusual rhythm of speech such as stuttering

PRS Items
Paralinguistic behaviors
27. Physical distance
28. Gestures
29. Facial expressions
30. Gaze

Rating scale: 0 = occurs almost never, 1 = occurs sometimes, 2 = occurs almost always, cnr = could not rate, n/o = no opportunity to rate

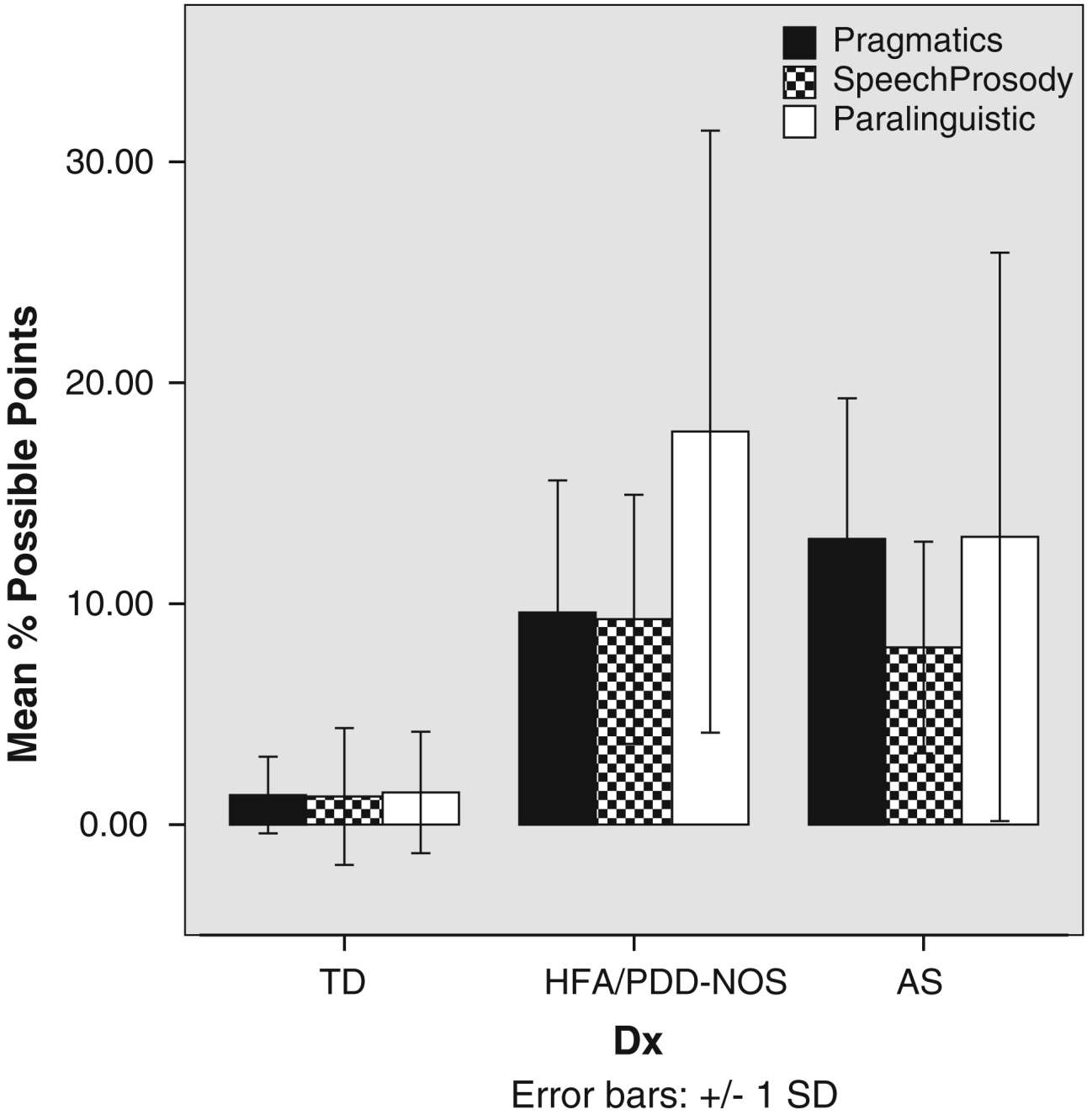

Fig. 1.
Mean % of possible points on three PRS categories for participants with HFA/PDD-NOS, AS, and TD

Table 1

Age and gender of participants by diagnosis

	Mean (and SD) age	% Males
Autism (*n* = 9)	14.6 (3.6)	77.8
Asperger syndrome (*n* = 15)	14.7 (3.0)	100
PDD-NOS (*n* = 5)	14.4 (2.1)	75.0
TD (*n* = 26)	14.9 (3.2)	84.6

Table 2

Characterization data on participants with ASD

Measure	Autism/PDD (*n* = 14) Mean (and SD)	AS (*n* = 15) Mean (and SD)
Age	14.5 (2.3)	14.8 (2.7)
Performance IQ[a]	88.1 (16.7)	93.3 (25.8)
Vineland communication[b]	66.8 (20.8)	69.3 (14.0)
Vineland socialization[b]	44.4 (12.6)	47.1 (17.9)
Standard expressive language score[c]	84.3 (16.3)	90.0 (18.6)
ADOS-4[d] communication algorithm score	3.8 (1.2)	3.3 (1.8)
ADOS-4[d] social algorithm score	9.1 (2.2)	8.3 (2.6)

[a] Wechsler Intelligence Scale of Children-III (Wechsler 1992) or Wechsler Adult Intelligence Scale-R (Wechsler 1997), depending on subject's age

[b] *Vineland Adaptive Behavior Scales-Expanded* (Sparrow et al. 1984)

[c] Standard score the *Test of Language Competence* (Wiig and Secord 1989)

[d] Autism Diagnostic Observation Schedule-Module 4 (Lord et al. 2002)

Table 3

PRS scales with pair-wise between-group comparisons; and effect sizes[a]

PRS scale	TD (*n* = 26) < HFA/PDD[b] (*n* = 14)	TD (*n* = 26) < AS[b] (*n* = 15)[b]	HFA/PDD (*n* = 14) vs. AS (*n* = 15)
Pragmatic behaviors	T^2 = 2.8; *p* < .0001; d = 1.9; v. large	T^2 = 3.9; *p* < .0001 d = 2.2; v. large	NS[c]
Speech/Prosody behaviors	T^2 = 1.3; *p* < .0001; d = 1.8; v. large	T^2 = 1.1; *p* < .0001; d = 1.7; v. large	NS[c]
Paralinguistic behaviors	T^2 = 1.3; *p* < .0001; d = 1.4; v. large	T^2 = 0.9; *p* < .002; d = .73; medium	NS[c]

[a] Cohen's (1988) effect size metric: .20–.49 = small effect; .50–.79 = medium effect; >.80 = large effect; >1.0 = very (v.) large effect

[b] Ss with TD received fewer points for *inappropriate* behaviors (i.e., performed better)

[c] Between-group difference fails to reach significance

Table 4

PRS items with significant pair-wise between-group differences; and effect sizes[a]

PRS item	HFA/PDD[b] (*n* = 14) vs. AS (*n* = 15)	TD[b] (*n* = 26) < HFA/PDD[c] (*n* = 14); *p* < .01	TD[b] (*n* = 26) < AS[c] (*n* = 15); *p* < .01
4. Inappropriately formal	HFA/PDD < AS[d] d = .78; medium		d = .78; medium
7. Irrelevant/inappropriate detail			d = 1.2; v. large
8. Out of sync content/unannounced topic shifts		d = 1.5; v. large	d = 1.7; v. large
10. Topic preoccupation/perseveration			d = 1.1; v. large
11. Unresponsive to examiner's cues			d = 1.1; v. large
12. Little reciprocal to-and-fro exchange			d = 1.3; v. large
23. Intonation is unusual		1.3; v. large	d = 1.9; v, large
30. Gaze	AS < HFA/PDD[e] d = .67; medium	d = 1.6, v. large	d = .92; large

[a] Cohen's (1988) effect size metric: .20–.49 = small effect; .50–.79 = medium effect; >.80 = large effect; >1.0 = very (v.) large effect

[b] Tukey post-hoc comparisons where $p < .01$

[c] Ss with TD received fewer points for *inappropriate* behaviors (i.e., performed better); $p < .0$

[d] Ss with HFA/PDD-NOS received fewer points for *inappropriate* behaviors (i.e., performed better); $p < .0$

[e] Ss with AS received fewer points for *inappropriate* behaviors (i.e., performed better); $p < .01$