# Towards a convergent account of pragmatic language deficits in children with high-functioning autism: Depicting the phenotype using the Pragmatic Rating Scale

Abstract

Despite its prominence, pragmatic characteristic associated with autism is under-explored and thus was not well defined. The present study attempted to depict a relatively comprehensive profile of language pragmatics in children with high-functioning autism (HFA) using the Pragmatic Rating Scale (PRS). Pragmatic behaviors of 26 HFA children were contrasted with those of their normal counterparts. As predicted, the group with autism demonstrated substantial pragmatic difficulty when compared to their normal counterparts matched stringently on both verbal and non-verbal intelligence. The findings were discussed with relevance to lacking a “theory of mind”, weak central coherence and executive dysfunction.

Keywords: Pragmatic deficits；High-functioning autism；Social inferences

Highlights:

- We depicted the profile of language pragmatics in children with high-functioning autism (HFA) using the Pragmatic Rating Scale (PRS).
- We found that children with autism demonstrated substantial pragmatic difficulty when compared to their normal counterparts matched on both verbal and non-verbal intelligence.
- The findings were discussed in relation to lacking a “theory of mind”, weak central coherence and executive dysfunction.

## 1. Introduction

Pragmatics of language is relatively under-explored and is far from a coherent field of study. Nevertheless, it is no less important than other language fundamentals because it decides how language is to be used.

Thompson (1997) suggested central facets of pragmatic competence that could distinguish it from other major areas of linguistic enquiry. First, pragmatic competence entails knowledge of how language is construed and its permissible range of use. Second, it calls for the knowledge of how we share the world with others. Last but not least, it requires picking up cues from the language and social behavior of others, and an understanding of the rules which govern behaviors in a social context. In other words, pragmatic competence allows an individual to speak intelligibly, behave appropriately, and to understand the perspective of others. The cognitive prerequisites of sophisticated pragmatic development in a child would therefore include: (a) accurate perception and understanding of speech; (b) production of intelligible speech; (c) appreciation of cultural norms and (d) inhibition of inappropriate speech or behavior.

Beside the cardinal features contributing to a diagnosis of autism, pragmatic deficit is another conspicuous feature of the condition. Pragmatic deviance in autism usually does not violate any rules of syntax, phonology, or semantics (Bartak, Rutter, & Cox, 1975; Beisler, Tsai, & Von, 1987; Ramondo & Milech, 1984; Tager-Flusberg, 1981, 1989, 1991; Wetherby & Prutting, 1984). In fact,

it may be the only parameter of language that is deficient with variable severity across the spectrum regardless of the functional level and age of the affected individuals (Young, Diehl, Morris, Hyman, & Bennetto, 2005). Thus, it is all the more important to have a detailed picture of this distinguishing linguistic characteristic of autism.

In this study, we attempted to depict a relatively comprehensive profile of language pragmatics in children with high-functioning autism using the Pragmatic Rating Scale (Landa et al., 1992). The findings would then be discussed abreast with the cognitive impairments pertaining to the disorder.

*1.1 Pragmatic Deficits and Cognitive impairments in Autism*

Pragmatics problems in autism include: preoccupation with restricted topics, incorporation of irrelevant details, abrupt changes of topic (Volden, Mulcahy, & Holdgrafer, 1997), not letting others take their turn (Loveland, Landry, Hughes, Hall, & McEvoy, 1988) and failure to clarify ambiguities (Mesibov, Adams, & Klinger, 1997).

Landa (2000) emphasized the importance of understanding the cognitive roots of pragmatics. The cognitive phenomenon most frequently investigated in association with language pragmatics in autism is the “theory of mind” deficit. A ‘theory of mind” is the cognitive capacity necessary for understanding the mental states of another person (Baron-Cohen, Leslie, & Frith, 1985). Tager-Flusberg (2000) highlighted a close connection between

the capacity to understand other minds and the social use of language. The tendency of individuals with autism to interpret speech literally implies that they do not understand the mind of the speaker (Sperber & Wilson, 1981).

On the other hand, executive functions such as planning, behavioral inhibition, and cognitive flexibility appear essential to pragmatic communication. Thus, it is possible that an executive dysfunction in autism, such as perseveration, could account for pragmatic oddities like repetitive speech and topic preoccupation. However, the relationship between executive dysfunction and pragmatic deficits in autism has received little attention.

*1.2 Formal measures of pragmatic language*

In relevant literature, only a few formal measures were developed to assess pragmatics. One of the reasons could be that the most accurate observation of pragmatic competence should be made during a social conversation in a quasi-experimental environment, but in reality such a set-up is rarely encountered. In addition, the operational definition of pragmatic communication used in previous studies was rather narrow pertaining to comprehension of jokes, inferences, and indirect requests (Ozonoff & Miller, 1996; Rumsey & Hanahan, 1990). Past measures were also opened to question in that they seemed to be heavily dependent on comprehension and cognitive flexibility.

In the present study, the Pragmatic Rating Scale[1] (PRS) was employed to tap

the language characteristics of children with high-functioning autism (HFA). It is one of the few measures that can be used in a semi-social setting (Landa et al, 1992). The PRS categorizes 19 pragmatic anomalies that can be observed during a relatively lengthy interaction. Each behavior is clearly defined to enable consistent ratings by examiners without formal training in speech pathology (see Appendix 1).The internal consistency of the scale was high, yielding a Cronbach's alpha of 0.85. A factor analysis on the 19 items generated 3 factors, with eigenvalues of 5.75, 2.35 and 1.82., leading to a further division of 3 subscales: *Disinhibited social communication, Awkward / Inadequate expression,* and *Odd verbal interaction.* Two items did not load on any of these subscales were classified as *Other items*. Each of these subscales represents tapping a separate, but not independent, domain within the category of language pragmatics.

At this point, it is worth re-emphasizing the importance of matching verbal intelligence, as ensured in the current investigation, when addressing complex language ability. In addition, the age range of the sample was strictly contained from 8.78 to 15.17 years. The HFA group was expected to perform less well than the control group on all 3 subscales.

## 2. Method

### *2.1 Participants*

In the initial screening, 31 children with HFA were recruited from a special school and two Parent Resource Centers serving families with autism children.

Thirty-four normal children in the control group were volunteers recruited from different schools.

Children with HFA included in this study received their diagnoses of autism from either clinical psychologists in child assessment centers or pediatric psychiatrists. Caregivers of prospective participants were interviewed before the actual testing. Children with a history of brain injury, fragile-X syndrome, tuberose sclerosis, epilepsy, or other known medical conditions associated with autism (APA, 1994) were excluded.

During the screening interview, all prospective participants completed the verbal subtests of Wechsler Intelligence Scale for Children-Revised (adapted Hong Kong version) (Wechsler, 1981; The Psychological Corporation) as a measure of verbal intelligence. The Raven's Progressive Matrices (Raven, Court, & Raven, 1976) were administered to measure their non-verbal intelligence and any child with an IQ less than 80 was excluded.

*2.1.1 High-functioning Autism Group*

For the HFA group, Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988) was used as a screening tool to select participants with similar abilities. The primary caregiver of each child with HFA in the final group was then interviewed using a translated Chinese-version of the complete Autistic Diagnostic Interview-Revised (ADI-R) (Lord, Rutter, & Le Couteur, 1994) to confirm their diagnoses.

In the final sample, 26 children with HFA with verbal IQ's from 87 to141, and age ranging from 8.78 to 15.17 years were selected.

*2.1.2 Control Group*

The control group comprised 26 normal children with verbal IQ's from 92 to 137, and age ranging from 6.64 to 14.91 years. The male-to-female ratio of the autism group was 22:4, compared to 23:3 in the control group. Each child in the control group was matched to his/her counterpart in the autism group on several variables in descending priority: verbal IQ, non-verbal IQ, age, gender, and socioeconomic status. All participants completed the same battery of tests including WISC-R for verbal IQ and Raven Progressive Matrices for non-verbal IQ. Characteristics of participants included in the final testing are summarized in Table 1.

*T*-tests for independent samples were performed to compare the group differences on chronological age, verbal competence, and non-verbal intelligence. The only significant difference between groups was in chronological age.

[place Table 1 about here]

All participants were tested individually in a playroom of the Children Psychiatric Unit of Queen Mary Hospital. The children could request a break whenever they wanted. The whole test session of each participant was

videotaped with the informed consent of the participant's parent.

*2.2 Measurement*

A video-camera was set up to record a 30-minute free play session and the whole test session (including executive function, emotion perception and "theory of mind" tasks) of each participant.

*2.2.1 Training for raters administering the PRS*

The rater was trained for 40 hours by the experimenter before she actually started to administer the PRS. During the training, the definition of each PRS item was explained and discussed thoroughly. The rater then assessed 3 videotapes of interviews with normal children and children with autism. Inter-rater reliability was high, with a Spearman's *rho* of .953 ($p$<.001). The internal consistency of the scale was also high; Cronbach's alpha = .976. Throughout the study, a second trained rater who was blind to the group classification of the participants scored from videotaped recording of each entire test session.

*2.2.2 Procedure*

Although pragmatic deficits can be detected within a 15-minute exchange (Prutting & Kirchner, 1987), ratings here were based on conversational behavior observed throughout the entire session which included a 15-minute conversation held midway through testing.

*2.2.3 Scoring*

The PRS has a three-point scale: “0” indicates no sign of abnormality, “1” suggests moderately abnormal behavior not considerably disruptive to the conversation, and “2” indicates that the behavior was severely abnormal, forcing the conversational partner to make remedial measures to keep the conversation going. A rating of “1” or “2” had to be accompanied with at least one example.

*2.2.4 Analyses*

For every participant, the 19 PRS item scores were derived from the mean ratings given by the experimenter and the second “blind” rater. Each participant received a total PRS score that was the sum of all item scores.

A non-directional *t*-test for independent samples was used to compare the group difference (IV) in total scores (DV).

Item scores (DV’s) between the two groups (IV) were compared using the two-tailed Wilcoxon Signed Ranks Test.

A MANOVA was performed to compare the group differences (IV) in the three subscale scores (DV’s) with CA as a covariate.

3. Results

The PRS total score of the autism group was significantly higher (indicating

more pragmatic anomalies) than that of their normal counterparts matched on verbal intelligence [$t$ (50) = 14.94, $p$ <.001]. Thus, children with autism exhibited more pragmatic abnormalities than controls (Table 2).

[place Table 2 about here]

The autism group scored significantly higher than the normal control group on all items except for “Terse” [$Z$=-.936, $p$=.349] (Table 3).

*3.1 Other items*

The autism group also scored significantly higher than the control group on the remaining two items which were not included in the PRS subscales: “Overly direct” and “Indirect” (Table 3).

[place Table 3 about here]

*3.2 PRS subscales*

Results of the MANOVA test were summarized in Table 4. Significant main effect of group was found on all 3 subscale scores. The autism group performed significantly less well (having higher ratings) than the control group on all 3 subscales.

Among the three subscales, *Odd verbal interaction* explained the largest amount of variance of the groups’ performance on the PRS; the $eta^2$ =.719.

The effect of CA was not significant for all three subscale scores [ $F(3,47)=.941$, $p=.429$].

[place Table 4 about here]

The *Disinhibited social communication* subscale includes the following items: “Overly candid”, “Overly talkative”, “Overly detailed”, “Out-of-synchrony communicative behavior”, “Abrupt topic change”, “Topic preoccupation”, and “Confusing account”. The autism group scored significantly higher than control group on this subscale [ $F(2,49)=43.86$, $p<.001$].

The *Awkward / Inadequate expression* subscale includes the following items: “Insufficient background information”, “Vague”, “Awkward expression of ideas”, and “Inadequate clarification”. Children with autism were also significantly worse than their control counterparts on this subscale [ $F(2,49)=51.89$, $p<.001$].

The two groups however, did not differ on the item “Terse”. “Vague” was the item rated most frequently in the control group and more than half (18 out of 26) received a score of 1 or above. “Insufficient background information” was another frequently rated item among the control children; 6 out of 26 received a score of 1 and above.

The Odd verbal interaction subscale includes the items: “Overly formal”, “Little conversational to-and-fro”, “Atypical greeting”, “Odd humor”, and “Inappropriate topics”. Again, children with autism performed more poorly than

the normal participants [ F(2,49)=62.73, p<.001]. In the normal group, 6 out of 26 received a score of 1 or above on the item “Little conversational to-and-fro”.

## 4. Discussion

As predicted, the group with autism demonstrated substantial pragmatic difficulty when compared to their normal counterparts matched stringently on both verbal and non-verbal intelligence.

The significant differences between control and autism groups presented here could not be attributed to task flaws such as ceiling or floor effects, as both groups demonstrated a degree of pragmatic difficulty, varying in frequency and severity. Neither could these findings be due to a difference in language competence nor difference in age, as the two groups were stringently matched one-to-one on verbal intelligence, and chronological age (entered as a covariate) was found to have no effect on any of the PRS subscale scores. Instead, results highlighted that the root of pragmatic problems in autism is probably a secondary consequence of the core cognitive dysfunctions attendant on this condition (Happe & Frith, 1996).

### *4.1 Relevance to executive dysfunction*

Results of the present investigation replicated previous findings, reinforcing notions that children with autism are preoccupied with restricted topics (Volden et al., 1997) and fail to take turn in conversational exchanges

(Loveland et al., 1988). Participants with autism tended to be disinhibited in social communication. They were also excessively detailed in their narration especially on their subjects of interest, and had difficulty disengaging from their preferred topics (topic preoccupation). This repetitive feature has been described as a form of verbal perseveration (Waterhouse & Fein, 1982). When the participants with autism decided to change topic, they did not use any device to signal the change nor maintain a link between the old and new topics. Similar findings have been reported previously (Tager-Flusberg & Anderson, 1991).

It is, however, noteworthy that inhibitory control may be partially preserved in children with autism (Ozonoff and Jensen, 1999; Christ, Holt, White & green, 2007). For example, Ozonoff and Jensen (1999) found that their participants with autism were impaired on tests of planning and cognitive flexibility, but had normal inhibitory control. Therefore, unusual perseverative behavior such as topic preoccupation in autism may have resulted from a desperate failure to discover alternative topics instead of a conscious act to persist in one's preferred topic.

*4.2 Relevance to lacking a "theory of mind"*

Despite an adequate quantity of verbal output, the autism group expressed relatively little in content, and usually failed to clarify a message that was originally confusing. Finding that HFA children failed to clarify ambiguities was not unprecedented (Mesibov et al., 1997; Dennis, Lazenby & Lockyer, 2001).

Moreover, comments made by participants with autism were usually overly candid, expressing intimate information or making highly critical comments about people or situations. In this case, failure to take into accounts the listener's feelings and emotion may be one of the more straightforward reasons for making tactless remarks.

Tager-Flusberg and Anderson (1991) particularly attributed these awkward or inadequate expressions to the lack of a "theory of mind". "Theory of mind" alludes to the idea that individuals are able to predict or speculate upon the wishes and intentions of others. As a "theory of mind" deficit entails an impoverished understanding of human relationships and behavior in everyday situations, it provides a convincing account for many pragmatic oddities in autism.

It is, however, noteworthy that almost 70% of the children in the normal group received moderate to high score on "Vague", indicating that a degree of ambiguity may be normal in this age group.

*4.3 Relevance to a weak central coherence*

Consistent with an earlier study (Tager-Flusberg & Anderson, 1991), the verbal responses of children with autism were frequently tangential; seldom did they address a question directly. When a child with autism attempted to initiate a conversation, the presentation of information was generally

disorganized or fragmented. A recent study found that HFA children were not aware of how they have derived correct answers from the context (Loukusa et al., 2007).This lent support to the account of weak central coherence, hypothesizing that individuals with autism were absorbed by the least salient details instead of the whole picture.

*4.4 Inaccessible thoughts*

Finally, the autism group demonstrated ‘odd’ verbal interaction. An obvious oddity was the way they greeted the experimenter; some of them bowed and spoke rather formally. Another common observation was unusual humor which could emerge anytime during the interaction, associated with thoughts not accessible to outsiders.

*4.4 Study limitations and future endeavours*

The present study attempted to add in details for a more thorough understanding regarding the nature of pragmatic difficulty related to autism. However, it is important to compare these deficits against those found in other clinical groups to demarcate pragmatic deficits specific to autism. Also, if language skills accelerate with age, then it is especially true for pragmatics as social experiences enhance the ability to make social inferences. Thus, longitudinal study is necessary to examine whether the same pragmatic deficits manifested in childhood persist into adulthood.

Finally, the relationship between pragmatic and cognitive deficits in autism

demands more rigorous examination. For example, if the same cognitive substrate governs both pragmatics and executive functions, then as executive malfunctioning alleviates with age, we should expect the same for the pragmatic problems. Furthermore, efforts should be directed to explore how different cognitive skills (e.g. planning, inhibition, making inferences etc.) are related to pragmatic difficulty in autism.

## Footnote

[1]A copy of the test can be provided upon request via email.

References

American Psychiatric Association (1994). Diagnostic and Statistical Manual of Mental Disorders (4th ed.). Washington, D.C.: Author.

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21*(1), 37-46.

Bartak, L., Rutter, M., & Cox, A. A. (1975). A comparative study of infantile autism and specific developmental receptive language disorder. *British Journal of Psychiatry, 126*, 127-145.

Beisler, J.M., Tsai, C.Y., & Von, K.D. (1987). Comparisons between autistic and nonautistic children on the test for auditory comprehension of language. *Journal of Autism and Developmental Disorders, 17*(1), 95-102.

Dennis, M., Lazenby, A. L., & Lockyer, L. (2001). Inferential language in high-function children with autism. *Journal of Autism and Developmental Disorders, 31*, 47-54.

Happe, F., & Frith, U. (1996). The neuropsychology of autism. *Brain, 119* (4), 1377-1400.

Landa, R., Piven, J., Wzorek, M. M., Gayle, J. O., Chase, G. A., & Folstein, S. E. (1992). Social language use in parents of autistic individuals. *Psychological Medicine, 22*(1), 245-254.

Landa, R. (2000). Social language use in Asperger's syndrome and high-functioning autism. In A. Klin, F. R. Volkmar, & S. S. Sparrow (Eds.), *Asperger Syndrome*, (pp.159-171). New York: Guilford Press.

Lord, C., Rutter, M., & Le Couteur, C. A. (1994). Autism Diagnostic Interview-Revised: a revised version of a diagnostic interview for caregivers of individuals with possible developmental disorders. *Journal of Autism and Developmental Disorders, 24*, 659-685.

Loukusa, S., Leinonen, E., Kuusikko, S., Jussila, K., Mattila, M. L., Ryder, N., Ebeling, H., & Moilanen, I. (2007). Use of context in pragmatic language comprehension by children with Asperger syndrome or high-functioning autism. *Journal of Autism and Developmental Disorders, 37*, 1049-1059.

Loveland, K., Landry, S., Hughes, S., Hall, S., & McEvoy, R. (1988). Speech acts and the pragmatic deficits in autism. *Journal of Speech and Hearing Research, 31*, 593-604.

Mesibov, G. B., Adams, L. W., & Klinger, L. G. (1997). *Understanding the Disorder*. New York: Plenum Press.

Ozonoff, S., & Jensen, J. (1999). Specific executive function profiles in three neurodevelopmental disorders. *Journal of Autism and Developmental Disorders, 29*, 171-177.

Ozonoff, S., & Miller, J. N. (1996). An exploration of right-hemisphere contributions to the pragmatic impairments of autism. *Brain and Language, 52*(3), 411-434.

Ramondo, N., & Milech, D. (1984). The nature and specificity of the language coding deficit in autistic children. *British Journal of Psychology, 75*, 95-103.

Raven, J. C., Court, J. H., & Raven, R. (1976). *Manual for Raven's Progressive Matrices and Vocabulary Scales. Section III: Standard Progressive Matrices*. London: H.K. Lewis & Co. Ltd.

Rumsey, J. M., & Hanahan, A. P. (1990). Getting it "right": performance of high-functioning autistic adults on a right hemisphere battery. *Journal of Clinical and Experimental Neuropsychology, 12*, 81.

Schopler, E., Reicher, R. J., & Renner, B. R. (1988). *The Childhood Autism Rating Scale (CARS)*. Los Angeles: Western Psychological Services.

Sperber, D., & Wilson, D. (1981). Pragmatics. *Cognition, 10*, 281-286.

Tager-Flusberg, H. (1981). On the nature of linguistic functioning in early infantile autism. *Journal of Autism and Developmental Disorders, 11*, 45-56.

Tager-Flusberg, H. (1989). A psycholinguistic perspective on language development in the autistic child. In G. Dawson (Ed.), *Autism: Nature, diagnosis, and treatment*, (pp.92-115). New York: Guilford.

Tager-Flusberg, H. (1991). Semantic processing in the free recall of autistic children: Further evidence for a cognitive deficit. *British Journal of Developmental Psychology, 9*(3), 417-430.

Tager-Flusberg, H. (2000). Language and understanding minds: connections in autism. In S. Baron-Cohen, H. Tager-Flusberg, & D. J. Cohen (Eds.), *Understanding Other Minds: Perspectives from Developmental Cognitive Neuroscience*, (pp.124-149). Oxford: Oxford University Press.

Tager-Flusberg, H., & Anderson, M. (1991). The development of contingent discourse ability in autistic children. *Journal of Child Psychology and Psychiatry, 32*(7), 1123-1134.

Temple, C.M. (1993). *The Brain: An introduction to human brain and behavior*. London: Penguin.

Thompson, L. (1997). *Children talking: The development of pragmatic competence*. Clevedon: Multilingual Matters Ltd.

Volden, J., Mulcahy, R. F., & Holdgrafer, G. (1997). Pragmatic language disorder and perspective taking in autistic speakers. *Applied Psycholinguistics, 18(2*), 181-198.

Waterhouse, L., & Fein, D. (1982). Langauge skills in developmentally disabled children. *Brain and Language, 15*, 307-333.

Wechsler, D. (1981). *Hong Kong Wechsler Intelligence Scale for Children (HK-WISC)*. New York: The Psychological Corporation.

Wetherby, A. M., & Prutting, C. A. (1984). Profiles of communicative and cognitive-social abilities in autistic children. *Journal of Speech and Hearing Research, 27*, 364-377.

Young, E. C., Diehl, J. J., Morris, D., Hyman, S. L., & Bennetto, L. (2005). The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. *Language, Speech, and Hearing Services In Schools, 36*, 62-72.