John Benjamins Publishing Company

Revisiting pragmatic abilities in autism spectrum disorders

A follow-up study with controls*

Jessica de Villiers, Brooke Myers, and Robert J. Stainton
University of British Columbia / University of Western Ontario

In a 2007 paper, we argued that speakers with Autism Spectrum Disorders
(ASDs) exhibit pragmatic abilities which are surprising given the usual under-
standing of communication in that group. That is, it is commonly reported that
people diagnosed with an ASD have trouble with metaphor, irony, conversa-
tional implicature and other non-literal language. This is not a matter of trouble
with knowledge and application of rules of grammar. The difficulties lie, rather,
in successful communicative interaction. Though we did find pragmatic errors
within literal talk, the transcribed conversations we studied showed many, many
successes. A second paper reinforced our finding of a general level of success
(de Villiers, Myers, and Stainton 2012). It considered differences within the class
of pragmatically-inflected yet literal speech acts. The present paper carries our
project forward. It overcomes some of the methodological limitations of the
second paper, by increasing sample size, and looking at frequency of use rather
than just seeming errors. It also includes a control sample. The emerging results
are two-fold. On the one hand, there was a slight, statistically significant differ-
ence in frequency of use between our participants and the controls in four sub-
categories: indexicals, possessives, polysemy and degree on a scale. In all four,
the participants diagnosed with ASDs had fewer occurrences overall, relative to
controls. On the other hand, there was no significant difference in error rates
between ASDs and controls — not in any of the eight categories of pragmatic de-
terminants of literal content that we coded for. The upshot is that, though there
were less-preferred forms for participants with ASDs, they do very well indeed
with pragmatic determinants of literal content.

Keywords: autism spectrum disorder, pragmatics, pragmatic determinants of
literal content

1.   Introduction

Much important work has been done on language use in high-functioning autism and Asperger syndrome. This paper makes, we hope, a small but important contribution to that growing literature. In particular, it highlights what are, given traditional diagnostic criteria, surprising abilities with respect to the pragmatics of literal speech acts — abilities which lie right at the boundary of semantics and pragmatics.

Our guiding question, here and in two prior papers, is: *Are some pragmatic tasks more difficult than others for people diagnosed with ASDs*? For instance, it has been tentatively suggested by Happé (1995) that understanding irony is more difficult for ASD speakers than understanding metaphor is. Or again, our 2007 paper urged, on the basis of corpus examples, that while speakers with ASDs show difficulties with "figurative language" generally — metaphor, irony, conversational implicature (Dennis et al. 2001; Gold et al. 2010; Happé 1995; MacKay and Shaw 2004) — they are relatively proficient with pragmatic determinants of literal speech act content. The present paper deploys new methodologies and affords new results with regards to our guiding question.

Before we turn to that, some background will be useful. We thus begin with a brief survey of Autism Spectrum Disorders. We then rehearse the contrast between literal and non-literal pragmatics. Only then do we turn to our own work, reviewing the results of our previous research, and then describing our most recent findings.

2.   Background: Autism spectrum disorders and literal pragmatics

It goes without saying that, for reasons of space, our treatment must remain rough and lacking in detail. That noted, ASDs are characterized by, among other things, difficulties in three related areas: reciprocal social interaction; restricted interests and repetitive behaviours; and both verbal and non-verbal communication (APA 1994).

Persons diagnosed with ASDs have shown early problems with joint attention and poor eye contact and gaze (Paul et al. 2009). Similarly, there is a notorious difficulty with reading emotional states of others, reflected in reduced performance on Theory of Mind tasks (Baron-Cohen et al. 1997; Colle et al. 2008; Martin and McDonald 2004). Another difficulty often reported involves making inferences (Dennis et al. 2001). Also noteworthy are problems in executive functioning (Rajendran et al. 2005; Russell 1997) or underconnectivity (Just et al. 2004), and circumscribed interests (de Villiers et al. 2007; Frith 1989; Turner 1999).

Many children with ASDs never acquire functional speech, and in those that do language acquisition may be delayed (Bailey et al. 1996). In high-functioning cases, knowledge and application of grammatical rules is comparatively strong: the difficulties pertain much more to communicative interaction in context (Kelley et al. 2006; Tager-Flusberg 1993; Tager-Flusberg and Anderson 1991). Thus a contrast is often noted between intact grammar or linguistic competence and marked difficulties in pragmatic aspects of language use (Baltaxe 1977; Frith 1989; Tager-Flusberg 1993; Tager-Flusberg and Anderson 1991); patterns that appear early include idiosyncratic lexical meanings (Volden and Lord 1991), and repetitive or echolalic speech, including both immediate and delayed imitation of speech heard (Kanner 1943; Prizant and Duchan 1981; Rydell and Mirenda 1994; Szatmari et al. 1989). Problems with non-literal language include especially difficulties in metaphor comprehension (Dennis et al., 2001; Gold et al., 2010), difficulty understanding irony (Martin and McDonald 2004) and poor interpretation of figurative speech generally (Happé 1995; Rajendran et al., 2005). Initiating and maintaining conversations and topics are particularly challenging (Adams et al. 2002; Capps et al. 1998; de Villiers et al. 2007; Tager-Flusberg and Anderson 1991). Studies have also found speakers with ASD produce fewer pronouns than controls when maintaining a protagonist in a narrative (Colle et al. 2008) and other problems with cohesion, where what an addressee will understand or want to know is not anticipated (Baltaxe 1977; Fine et al. 1994). Some speakers with ASD have unusual prosody (Diehl et al. 2009. Fine et al. 1991; Scharfstein et al. 2011; Shriberg et al. 2001; Tager-Flusberg 2001), including aspects considered to be affective (Shriberg et al. 2001).

Of relevance to the present study of abilities, two aspects of pragmatic communication where studies have found high-functioning individuals with ASDs perform well are deriving scalar implicatures when presented with under-informative sentences (Pijnacker et al. 2009) and identifying multiple meanings for ambiguous words (Dennis et al. 2001).

Let us turn now to a second crucial bit of background: non-literal versus literal pragmatics. Here again, we move quickly and elide details, directing readers to our prior papers. Grice (1975) drew attention to an intuitive distinction between what a person says — the statement or claim she literally makes — and information that she gets across in other ways. (Though 'says' is dictive, the point also applies, e.g., to what the person strictly speaking asks or orders, versus what questions or commands she merely hints at.) Among the merely conveyed contents are his famous particularized conversational implicatures — e.g., writing in a letter of reference 'Student X has neat handwriting and usually arrives on time for class', thereby intimating that Student X is a poor candidate for a job. Others include metaphor, irony, indirect speech acts and sarcasm.

It became usual to think of "not said but merely conveyed content" as exhausting the pragmatic. These were the cases, after all, in which Grice himself applied his conversational maxims. But this misses the fact, familiar even to Grice, that general-purpose information about the world and about people, and context-specific information about the person speaking, where he is speaking, when he is speaking, etc., is necessary to find the literal speech act. Conversational cooperation is at play here too. To mention obvious examples, famous since Frege, what literal question is asked, what literal command is issued, what literal statement is made, requires resolving lexical or structural ambiguities (e.g., the twin senses of 'bank', or 'visiting relatives can be annoying'), and supplying contextually-specified referents for indexicals and demonstratives (e.g., 'I', 'he', 'this'). In the years since Grice's "Logic and Conversation", many varieties of literal pragmatics have been studied. (See the papers reprinted in Ezcurdia and Stainton 2013, and Carston 2002 for an extremely insightful survey.) We will canvass eight, since these have been our focus. For ease of reference only, and without suggesting deep psycho-linguistic kinds, we divide them into three rough-and-ready classes:

1. *Contextually salient entity being discussed*
    a.   indexical pronouns and other explicitly context-sensitive items
    b.   sub-sentences
    c.   null complements
    d.   possessives
2. *Sense determination*
    a.   accidental homonymy
    b.   polysemy
3. *Unspoken domain or comparison class*
    a.   domain restriction
    b.   degree on a scale[1]

We have already mentioned indexical pronouns (e.g., 'I', 'he', 'they', 'it') and demonstratives (e.g., 'that', 'this', 'those'). In these three cases, a *contextually salient entity* (where this may include a salient property or set) is at issue, and is supplied on the basis of non-linguistic knowledge. Also in this sub-variety fall other kinds of explicitly context-sensitive items: tense markers on verbs, spatio-temporal locatives like 'today', 'here', 'there' and 'now', etc. Another case in which extra-linguistic knowledge plays a crucial role in fixing a salient item are expressions which are, in some very broad sense, "elliptical". A speaker may use what appears to be a mere word or phrase to perform a speech act: for instance, holding up a pen and saying 'From France', or inviting a colleague out by saying 'Lunch?'. A speaker may, in the same vein, use an expression which usually demands a complement, but leave it unexpressed: e.g., 'John arrived __ yesterday' (arrived *where*?), 'I just can't __'

(can't *what*?), 'Maria brought too much __' (too much *of what*?), 'I'll have two more __' (more of *what*?). A fourth sub-variety within this class are possessives such as 'Juan's painting'. Here, it is the contextually-salient relationship between Juan and the painting that is supplied non-linguistically: this very phrase can be used to mean *the painting Juan created*, *the painting Juan owns*, etc. Which is meant will be fixed by things like general facts about the world, general facts about human psychology, particular facts about the context of utterance, particular facts about the conversational participants' mental states, etc.

   Another kind of pragmatic determinant of literal speech act content was also mentioned above, namely *sense determination* in cases of ambiguity. This class, in turn, divides in two. There are cases of accidental homonyms like /băngk/ (of a river or a financial institution), and /lŏk/ (of a door or of hair). We place here as well structurally ambiguous sentences, e.g., 'Susan likes expensive boats and cars'. In addition, though this is not universally acknowledged, there also seem to be single words which have a range of related senses. This is polysemy. (See Pustejovsky 1995). Thus, as Aristotle stressed long ago, 'healthy' applies both to creatures who have health, and to foods that contribute to health. 'The same boat' can mean the very same token, or a token of the same kind. 'Window' applies to both the opening in the wall that one looks out of, and the glass that fills that opening. And so on. We may put the contrast this way. In homophony, there is a single sound-pattern which corresponds to more than one linguistic expression, more than one word/sentence. Thus there is not one word [$_N$ bank] with two meanings. Instead, there are multiple words sharing the pronunciation /băngk/. In polysemy, there is again a single string of sounds, but it corresponds to just one linguistic expression — and that one linguistic expression has a series of related meanings. One clue as to which variety of disambiguation is at work is this: a word which is polysemous in one language will tend to be polysemous in other languages, including ones that are not historically related; in contrast, when two words just happen to be pronounced the same, as with homonyms, this mere accident will not be replicated across unrelated tongues. (Of course, a word can both have a homonym and be polysemous: there are multiple senses of the financial-institution word 'bank', e.g., the physical place one can visit, and the abstract institution.)

   Another class of literal pragmatics involves the supplying of an *unspoken domain or comparison class*. Think here of using 'Everyone got drunk' to mean that everyone at the party got drunk, or 'I have had breakfast' to mean that I have had breakfast today. Crucially, as before, the contextually supplied content seems to be part of the literal speech act, not merely part of what a speaker "got across". Intuitively, if Alice is describing last night's party and utters 'Everyone got drunk', she does not state that every human everywhere got drunk; she states merely that everyone in the domain {*x*: *x* was at the party} did so. Similarly, if Ben says 'Most

Canadians are rich', he could easily be stating something true, not just implicating it, if the implicit comparison class is {*x*: *x* is a human being}. On the other hand, if the implicit comparison class is {*x*: *x* is a member of the British Royal family}, then he states something false. (It is not the case that most Canadians are as rich as the Royals.) Similarly with 'tall', 'fat', 'hungry', 'expensive', 'salty', etc.: what one literally claims, asks or orders depends upon an implicit scale or comparison class.

3.   Two previous studies

As noted, it is a frequent research finding that speakers with ASDs have trouble with "figurative" language: e.g., metaphor, irony, conversational implicature (Dennis, Lazenby, and Lockyer 2001; Gold et al. 2010; Happé 1995; MacKay and Shaw 2004). We have described this as trouble with content which is merely conveyed. However, as we been at pains to stress, this does not exhaust the pragmatic. We must contrast two roles for pragmatics, namely, fixing the literal content of the speech act, and fixing additional (or alternative) non-literal contents. To put the lesson another way, the standing meaning of the expression type, what the word/sentence means in the shared language, very frequently cannot get you what is stated, asked, ordered, etc.; when it doesn't, pragmatics is required to bridge this gap.

Our first study, (de Villiers, Myers, and Stainton 2007), addressed abilities of speakers with ASDs with regards to this latter kind of pragmatics. We provided a kind of "existence proof" of their abilities by looking in detail at corpus examples. Many appear in that paper, and from each of the eight sub-varieties sketched above. To give the flavour, we reproduce two here. The first highlights competent usage of indexical pronouns: in an excerpt about playing Tee ball we have multiple uses of indexical pronouns and tense by the participant. (These are marked in bold.) The latter passage, "I want to live way down", highlights competence with degree on a scale and null complements. There are two uses of comparative adjectives: 'quiet' and 'busy'. 'Quiet' corresponds to a scale of volume, but the degree of volume depends on contextual factors. The same goes for 'busy'. Here, the participant actually explores the degree of business: 'well it's not too busy'. We also find a null complement: 'not many cars come down' (my street).

> THEY ALWAYS PUT THE TEE WAY UP[2]
> Participant: **they** always put the tee way up when **I**'m coming up or else **they**'d back up in the field or come in or come in for good if **I** don't do a good big hit.
> Participant: **they I** always wanted the **I** always complained th have the tee the tee lowered always lowered way like right to **my** knees.
> Participant: **they**'re like what's the matter?

> Participant: **you**'re h **you**'re real tall.
> Participant: **you** should have the **you** should have the tee up high.
>
> I want to live way down
> Participant: I want to live way down by maybe um Ash or Edgewood or some quiet streets like that.
> Researcher: mmhm.
> Researcher: so you're street is fairly busy?
> Participant: it's <all> [>].
> Researcher: <or it's> just near a busy street.
> Participant: it's just **well it's not too busy**.
> Participant: not many cars **come down**.
> Participant: some just **come down** to skip the lights.

In that first study, we did not compare levels of difficulty among (1 a-d), (2 a-b) and (3 a-b). And we applied no quantitative tests to the transcripts. Our second study, published in 2012, addressed those limitations, albeit in a preliminary way. In particular, we calculated errors as a proportion of utterances and compared them. Though the question of how this relates to normative use remained, the result was that two sub-varieties stood out as especially error-prone, namely sub-sentences and null complements. Here is an example dialogue for each, chosen this time to illustrate errors rather than successes:

> My Cat
> Researcher: Who's in your family?
> Participant: Hm I don't know
> Researcher: Are there five of you?
> Participant: Yes.
> Participant: **My cat**.
>
> She won!
> Researcher: Do you have a sister?
> Participant: Yes and she **won**!
> Researcher: What did she win?

In "My Cat", the participant uses the sub-sentence 'my cat' in a problematic way. It isn't that the speech act is unintelligible. Presumably, the speaker wishes to say that the cat is a part of the family too. But the message is unclear, and requires significant interpretive work on the part of the hearer. In the dialogue "She Won!", the request for clarification by the researcher suggests that the participant has omitted the complement when context did not make obvious what exactly was being left out.

These examples illustrate one of the methodological lessons about annotating pragmatic errors in a corpus that emerged from the second paper. It became clear that "errors" could be spotted on two grounds. On the one hand, there were cases

where correction or repair occurs, as in "She Won!". Here, we have direct evidence that the non-ASD *interlocutor* had trouble understanding the content. On the other hand, there were cases where *coders* could not easily glean the meaning, as in "My Cat". That suggests that (likely) the *in situ* interlocutor could not have done so either, or that doing so required unwarranted effort (Sperber and Wilson 1986): either because the signal was too abbreviated, or because information from context was too hard to retrieve.

The second study represented an advance because it provided an initial quantitative glimpse at literal pragmatics in ASDs. Being a pilot, however, it was limited both in terms of the number of participants and the lack of a control group. Continuing with limitations, we also found that identifying errors was very difficult in the case of (2 a-b) homophony/polysemy, and in the case of (3 b) degree on a scale — perhaps accounting for the extremely low number of errors counted. As a result, our results may have shown not stronger abilities in our participants in these cases, but rather limitations in our coding techniques. Finally, though it had become clear that speakers with ASDs performed quite well with regards to literal pragmatics, we found enough errors to know that their performance was imperfect. But was this related to having an ASD, or were their error rates comparable to neurotypical speakers?

4. A follow up study

We designed the present study to overcome the methodological limitations noted above. Our guiding question remained the same, namely whether some pragmatic tasks are more difficult than others for people diagnosed with ASDs. In this case we were especially interested to know, however:

–   Whether frequency of use rates would corroborate our preliminary finding that pragmatic determinants of literal speech act content do not pose significant problems for people with ASDs;
–   Whether statistically significant differences would be found among sub-varieties (1 a-d), (2 a-b) and (3 a-b), once the number of participants was increased;
–   Whether literal pragmatics, which is not perfect in ASD speakers, is nonetheless as good as it is in neurotypical speakers.

We would underscore that these questions all pertain to the description of pragmatic abilities, rather than to explanations of them. Indeed, our guiding question is descriptive in the same sense. We are of course interested in why the behavior of people with ASDs manifests differences in level of pragmatic performance. More

than that, an ongoing sister project to this one traces the neurocognitive correlates of the patterns described here, in an effort to understand the underlying mechanisms at work. In the present paper, however, we will not speculate on these.[3]

The study involved 29 participants diagnosed with either high-functioning autism or Asperger syndrome, 23 male and 6 female. They ranged in age from 11 years, 1 month to 18 years, 8 months. We also recruited as controls 19 typically-developing youths matched for mental age, 9 male and 10 female. All were from Southern Ontario, recruited as part of a broader study of conversational abilities in ASDs. To be included, participants needed to be able to carry on a conversation and read at a grade 4 level. Diagnostic testing took place at the Offord Centre for Child Studies, using the Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview–Revised (ADI-R). (See Lord *et al.* 1999 and Rutter *et al.* 2003.) None of our research participants had co-morbid diagnoses.

Data was collected in loosely structured interviews of approximately 10 minutes duration, which were recorded with audio and video. The recordings were transcribed and analyzed for the eight sub-varieties of pragmatic determinants of literal speech act content sketched above. All occurrences were counted, and frequency of use was calculated as a proportion of total number of utterances by the participant. In addition, all anomalous uses, judged as errors by the coder — according to the criteria noted briefly above, and explained in detail in de Villiers, Myers, and Stainton (2012) — were marked. Error rates, analyzed as a proportion of the number of uses of the sub-variety in question, were then calculated. The same techniques for establishing frequency of use and error rates were applied, blindly, to both control and ASD participants. All coding was checked by a separate coder, also blind to diagnosis.

The results were striking. There were significant differences in frequency of use in four subcategories: indexicals, possessives, polysemy and degree on a scale (Table 1). In all four, the participants diagnosed with an ASD had fewer occurrences relative to their overall number of utterances.

Table 1. Relative frequency of use for 4 categories of PDLC relative to number of utterances[4]

	Indexicality	Possessives	Polysemy	Degree on a scale
ASD	.80	.08	.3	.05
Control	1.01	.12	.43	.08

However, there were no statistically significant differences in error rates between ASD and control participants, in any of the eight sub-categories. There was a trend of higher proportion of errors produced by the ASD group in two sub-varieties, namely (1a) indexicality and (2b) polysemy, but here there were very few errors

Table 2. Proportion of errors for ASD and non-ASD groups (combined)

Category	Mean proportion incorrect — ASD and Non-ASD cases combined
1a) Indexicality	0.018605
1b) Subsentences	0.153699
1c) Null complements	0.153279
1d) Possessives	0.002195
2a) Accidental homonymy	0.000811
2b) Polysemy	0.015280
3a) Domain restriction	0.039527
3b) Degree on a scale	0
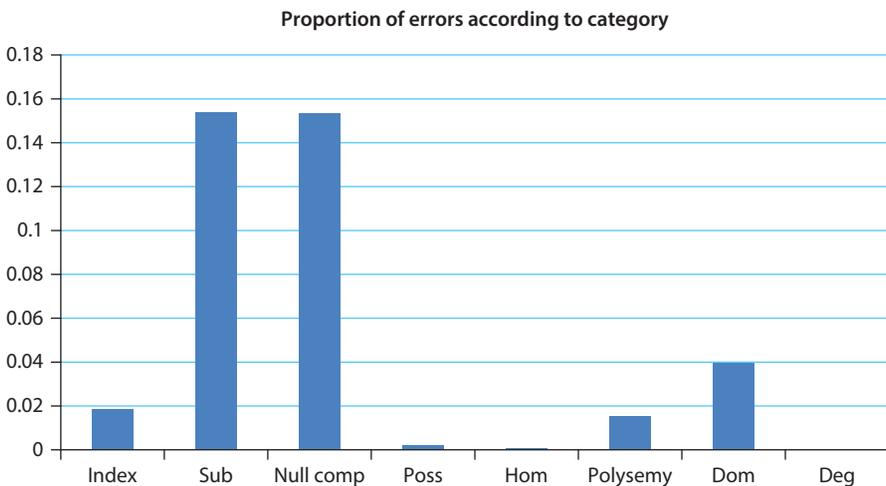
Figure 1. Proportion of errors for ASD and non-ASD groups combined

overall, and the trend was especially weak in the former case. Notably too, these are both high-frequency categories. (Approximately 53% of literal pragmatic uses involved indexicals, while approximately 21% involved polysemy.)

Shifting from contrasts to shared patterns, Table 2 shows the proportion of errors overall. (Figure 1 represents the same proportions in a bar chart.) But for minor variations, the numbers were the same for both groups, and have been combined here. What emerges is a conspicuous difference between subsentences and null complements versus the rest of the PDLC categories.

Breaking down the results by category, (1a), indexicals, had the largest number of uses among our eight (as noted, 53% of the total) and there were few errors in indexicals by either group. And although there was a trend toward more errors

by those with an ASD, the difference in errors was not significant. As noted, indexicals were used less frequently by participants diagnosed with an ASD — possibly in favour of repeated use of lexicalized forms (e.g., repetition rather than pronominal reference), a feature that has sometimes been noted in the speech of people with ASDs (Ghaziuddin and Gerstein 1996).[5] In both (1b) sub-sentences and (1c) null complements, there was a fair number produced (3% and 7% of the total, respectively) and a number of errors by both groups, however there was no notable difference in error rates across controls and the participants with an ASD. (1d), possessives, formed approximately 6% of the total number of literal pragmatic occurrences, and there were very few errors recorded. The same held true for (2a), accidental homophony: these were used fairly frequently (approximately 4%), and used effectively, by both groups. (The proportion would have been higher than 4%, but we excluded "ambiguities" that could be excluded on grammatical grounds alone — such as 'John left the building', where 'left' cannot exhibit the meaning *as opposed to right*.) The second most common sub-variety, (2b), polysemy, paralleled indexicals in terms of frequency, but there were very few errors and the difference in error rates was not significant. There was a trend, and it was a close trend, showing more errors by those with an ASD than those without. But the number of errors overall was relatively small (2.1% vs 0.6% of all polysemy). With respect to (3a), domain restriction, there were a considerable number produced (approximately 3%), and there were a number of errors, but again there was no difference in error rates. Finally, (3b), degree on a scale, patterned most closely with (2a) and (1d): a fairly large number of uses by both groups (approximately 4%), but no significant difference in error rates. Overall then, there was remarkably little difference between groups in the use of (1b–d), (2a) and (3a–b). This time, the categories that stood out as possibly being more difficult for speakers with ASDs were indexicality and polysemy: they were used less frequently as compared to controls, at a significant level; and there was also a slight trend towards more errors.

These results more than confirm the overarching conclusion of our first paper, which was that ASD speakers are conspicuously able when it comes to using pragmatic determinants of literal speech act content. There do not appear to be serious problems for speakers with ASDs in this domain. The findings in our second paper were also supported, even when the sample size was increased and the control participants were compared. In particular, sub-sentences and null complements do stand out for having far more errors coded than the other 6 sub-varieties (15% each), though they do not appear to be more problematic for speakers with ASDs than for controls.[6]

5.   Summary and concluding remarks

To summarize, we take this paper to make a modest contribution to the literature on language use in high-functioning autism and Asperger syndrome. It underscores the pragmatic abilities in such speakers — specifically, abilities with respect to the pragmatics of literal speech acts, which lie right at the boundary between semantics and pragmatics. It comes on the heels of two prior studies. In a 2007 paper, we argued that speakers with ASDs exhibit pragmatic abilities which are surprising given the usual understanding of communication in ASDs. As noted above, it is commonly reported that people diagnosed with an ASD have trouble with metaphor, irony, conversational implicature and other non-literal language. This is not a matter of trouble with knowledge and application of rules of grammar. The difficulties lie, rather, in successful communicative interaction. Though we did find pragmatic errors within literal talk, the transcribed conversations we studied showed many, many successes. A second paper reinforced our finding of a general level of success (de Villiers, Myers, and Stainton 2012). It considered, in addition, differences within the class of pragmatically-inflected yet literal speech acts.

The present paper carries our project forward. It overcomes some of the methodological limitations of the second paper, by increasing sample size, and looking at frequency of use rather than just seeming errors. It also includes a control sample. The emerging results are two-fold. On the one hand, there was a slight, statistically significant difference in frequency of use between our participants and the controls in four sub-categories: indexicals, possessives, polysemy and degree on a scale. In all four, the participants diagnosed with ASDs had fewer occurrences overall, relative to controls. On the other hand, there was no significant difference in error rates between ASDs and controls. Not in any of the eight categories of pragmatic determinants of literal content that we coded for. The upshot is that, though there may exist less-preferred forms for participants with ASDs, they do very well indeed with pragmatic determinants of literal content.

We end with a word about future research. Though this follow up study improves methodologically on the prior ones, there remain some important limitations. Most obviously, ours being a corpus-based approach we only have data about literal pragmatic production. Whether there are differential abilities in comprehension tasks — between literal and non-literal, and within the non-literal subvarieties — remains an open question. And too, it would be useful to increase the number of utterances coded and the number of study participants. Finally, as we have said, it remains to be seen what explains the differences/similarities that we have uncovered.

Notes

1. We have, in the past, coded for "extended sense" — that is, the use of a word in a broader, or looser way. However, very few examples were found, and it was difficult to distinguish between literal use in an extended sense and metaphorical use. We have thus dropped that category for the present study.

2. The following transcription symbol is used for overlapping speech:

    [>] overlaps with following text
    [<] overlaps with preceding text

3. The interested reader may, however, consult the 2007 paper. There, making use of ideas from François Récanati (2004), we conjectured that one important difference in performance may lie in this: that in ASDs one finds impaired secondary pragmatic processing, but comparatively good primary pragmatic processing. To explain, secondary pragmatic processing is reflective, discursive, fully inferential, at the personal level, available to consciousness, holistic, slower and more effortful. Primary pragmatic processing, in sharp contrast, is sub-personal, not available to consciousness, intuitive, more like perception, local, and bottom up. Our conjecture was, in short, that there may be a difference in kind, not just a difference in degree of difficulty, between the two sorts of pragmatics. (See Pulvemüller et al. 2009 and Asp 2013/in press for a useful review.)

4. Utterances, of course, typically contain numerous words; in particular, they may contain numerous examples of (1 a-d), (2 a-b) and/or (3 a-b). Thus in the table, there can be a frequency of higher than one usage per utterance. In fact, this occurs in the use of indexicals by controls. For the definition of utterance used in this study see Asp and de Villiers 2010.

5. A similar association was suggested in Colle et al. 2008, where participants with Asperger syndrome used full NPs rather than pronouns to maintain a participant line, which sometimes made the narrative sound "pedantic".

6. It is not clear why the speakers with ASDs used polysemous expressions less frequently than neurotypical control participants. One hypothesis would be avoidance of ambiguity, but the frequency of usage of homophones did not differ between groups. Another possibility might be that for some speakers who had an ASD, polysemous words were used regularly, but only for a single (default) meaning, which would affect the overall numbers. Equally, one might wonder why null complements and subsentences are especially difficult to produce (or code). One possibility is that these constructions may be less automatic for speakers, requiring more contextualization than other varieties — a feature that might also make them difficult to code. Consonant with our overall aim in this paper of merely describing rather than explaining usage, however, we will not pursue these matters here.

References

Adams C., Green, J., Gilchrist A and Cox, A. 2002. "Conversational behaviour of children with Asperger syndrome and conduct disorder". *Journal of Child Psychology and Psychiatry*, 43(5): 679–690. DOI: 10.1111/1469-7610.00056

American Psychiatric Association. 1994. *Diagnostic and statistical manual of mental disorders DSM-IV*. American Psychiatric Publishing Inc.

Asp, E. and de Villiers, J. 2010. *When language breaks down: Analysing discourse in clinical contexts*. Cambridge: Cambridge University Press. DOI: 10.1017/CBO9780511845352

Asp, E. 2013/in press. "The twin paradoxes of unconscious choices and unintentional agents: what neurosciences say about choice and agency in action and language".

Bailey, A., Phillips, W., and Rutter, M. 1996. "Autism: towards an integration of clinical, genetic, neuropsychological, and neurobiological perspectives". *Journal of Child Psychology and Psychiatry* 37(1): 89–126. DOI: 10.1111/j.1469-7610.1996.tb01381.x

Baron-Cohen, S., Jolliffe, T., Mortimore, C., and Robertson, M. 1997. "Another advanced test of theory of mind: evidence from very high functioning adults with autism or Asperger Syndrome". *Journal of Child Psychology and Psychiatry* 38: 813–822. DOI: 10.1111/j.1469-7610.1997.tb01599.x

Baltaxe, C.1977. "Pragmatic deficits in the language of autistic adolescents". *Journal of Pediatric Psychology* 2: 176–180. DOI: 10.1093/jpepsy/2.4.176

Capps, L., Kehres, J., and Sigman, M. 1998. "Conversational abilities among children with autism and children with developmental delays". *Autism* 2(4): 325–344. DOI: 10.1177/1362361398024002

Carston, R. 2002. *Thoughts and Utterances*. Oxford: Blackwell. DOI: 10.1002/9780470754603

Colle, L., Baron-Cohen, S., Wheelwright, H.K., and van der Lely. 2008. "Narrative discourse in adults with high-functioning autism or Asperger syndrome". *Journal of Autism and Developmental Disorders* 38(1): 28–40. DOI: 10.1007/s10803-007-0357-5

Dennis, M., Lazenby, A.L., and Lockyer, L. 2001. "Inferential language in high-function children with autism". *Journal of Autism and Developmental Disorders* 31(1): 47–54. DOI: 10.1023/A:1005661613288

Diehl, J., Watson, D., Bennetto, L., McDonough, J., and Gunlogson, C. 2009. "An acoustic analysis of prosody in high-functioning autism". *Applied Psycholinguistics* 30: 385–404. DOI: 10.1017/S0142716409090201

Ezcurdia, M. and Stainton, R.J. 2013. *The Semantics-Pragmatics Boundary in Philosophy*. Peterborough, ON: Broadview Press.

Fine, J., Bartolucci, G., Szatmari, P., and Ginsberg G. 1994. "Cohesive Discourse in Pervasive Developmental Disorders". *Journal of Autism and Developmental Disorders* 24(3): 315–29. DOI: 10.1007/BF02172230

Fine, J., Bartolucci, G., Ginsberg, G., and Szatmari, P. 1991. "The use of intonation to communicate in pervasive developmental disorders". *Journal of Child Psychology and Psychiatry* 32(5): 771–782. DOI: 10.1111/j.1469-7610.1991.tb01901.x

Frith, U. 1989. "Language and communication in autism". *British Journal of Disorders of Communication* 24: 123–150. DOI: 10.3109/13682828909011952

Ghaziuddin, M. and Gerstein, L. 1996. "Pedantic speaking style differentiates asperger syndrome from high-functioning autism". *Journal of Autism and Developmental Disorders* 26(6): 585–595. DOI: 10.1007/BF02172348

Gold, R., Faust, M., and Goldstein, A. 2010. "Semantic integration during metaphor comprehension in Asperger syndrome". *Brain and Language* 113: 124–134. DOI: 10.1016/j.bandl.2010.03.002

Grice, H.P. 1975. "Logic and Conversation". In R. Cole and J. Morgan (eds.), *Syntax and Semantics: Speech Acts*. New York: Academic Press, pp. 41–58.

Happé, F. 1995. "Understanding minds and metaphors: Insights from the study of figurative language in Autism". *Metaphor and Symbolic Activity* 10(4): 275–295. DOI: 10.1207/s15327868ms1004_3

Just, M., Cherkassky, V.A., Keller, T.A., and Minshew, N.J. 2004. "Cortical activation and synchronization during sentence comprehension in high-functioning autism: evidence of underconnectivity". *Brain* 127: 1811–1821. DOI: 10.1093/brain/awh199

Kanner, L. 1943/1968. "Autistic disturbances of affective contact". *Acta Paedopsychiatrica: International Journal of Child and Adolescent Psychiatry* 35(4-8): 98–136. (Original work published in 1943; Nervous Child 2: 217-250.)

Kelley, E., Paul, J., Fein, D., and Naigles, L.R. 2006. "Residual language deficits in optimal outcome children with a history of autism". *Journal of Autism and Developmental Disorder* 36(6): 807–28. DOI: 10.1007/s10803-006-0111-4

Lord, C., Rutter, M., DiLavore, P., and Risi, S. 1999. *Autism Diagnostic Observation Schedule Manual*. Los Angeles: Western Psychological Services.

MacKay, G. and Shaw A. 2004. "A comparative study of figurative language in children with autistic spectrum disorders". *Child Language Teaching and Therapy* 20(1): 13–32. DOI: 10.1191/0265659004ct261oa

Martin, I. and McDonald, S. 2004. "An exploration of causes of non-literal language problems in individuals with Asperger Syndrome". *Journal of Autism and Developmental Disorders* 34(3): 311–328. DOI: 10.1023/B:JADD.0000029553.52889.15

Paul R., Orlovski, S.M., Marcinko, H.C., and Volkmar, F. 2009. "Conversational behaviors in youth with high-functioning ASD and Asperger syndrome". *Journal of Autism and Developmental Disorders* 39(1):115–25. DOI: 10.1007/s10803-008-0607-1

Pijnacker, J., Hagoort, J., Buitelaar, J., Teunisse, J.P., and Geurts, B. 2009. "Pragmatic inferences in high-functioning adults with autism and Asperger syndrome". *Journal of Autism and Developmental Disorders* 39: 607–618. DOI: 10.1007/s10803-008-0661-8

Prizant, B.M. and Duchan, J.F. 1981. "The functions of immediate echolalia in autistic children". *Journal of Speech and Hearing Disorders* 46: 241–249.

Pulvermüller, F., Shtyrov, Y., and Hauk, O. 2009. "Understanding in an instant: Neurophysiological evidence for mechanistic language circuits in the brain". *Brain and Language* 110: 81–94. DOI: 10.1016/j.bandl.2008.12.001

Pustejovsky, J. 1995. *The Generative Lexicon*. Cambridge, MA: The MIT Press.

Rajendran G., Mitchell, P., and Rickards, H. 2005. "How do individuals with Asperger syndrome respond to nonliteral language and inappropriate requests in computer-mediated communication?". *Journal of Autism and Developmental Disorders* 35(4): 429–43. DOI: 10.1007/s10803-005-5033-z

Récanati, F. 2004. *Literal Meaning*. Cambridge: Cambridge University Press.

Russell, J. 1997. "How executive disorders can bring about adequate theory of Mind". In J. Russell (ed.), *Autism as an Executive Disorder*. Oxford: Oxford University Press, 256–304.

Rutter, M., Le Couteur, A., and Lord, C. 2003. *Autism Diagnostic Interview-Revised*. Los Angeles: Western Psychological Services.

Rydell, P. and Mirenda, P. 1994. "Effects of high and low constraint utterances on the production of immediate and delayed echolalia in young children with autism". *Journal of Autism and Developmental Disorders* 24(6): 719–735. DOI: 10.1007/BF02172282

Scharfstein, L.A., Beidel, D.C., Sims, V.K., and Finnell, L.R. 2011. "Social skills deficits and vocal characteristics of children with social phobia or Asperger's disorder: a comparative study". *Journal of Abnormal Child Psychology* 39(6): 865–875. DOI: 10.1007/s10802-011-9498-2

Shriberg, L.D., Paul, R., McSweeny, J.L., Klin, A.M., Cohen, D.J. and Volkmar, F.R. 2001. "Speech and prosody characteristics of adolescents and adults with high-functioning autism and Asperger syndrome". *Journal of Speech, Language, and Hearing Research* 44(5): 1097–1115. DOI: 10.1044/1092-4388(2001/087)

Sperber, D. and Wilson, D. 1986. *Relevance*. Cambridge, MA: Harvard University Press.

Szatmari, P., Bartolucci, G., Bremner, R., Bond, S., and Rich, S. 1989. "A follow-up study of high-functioning autistic children". *Journal of Autism and Developmental Disorders* 19(2): 213–225. DOI: 10.1007/BF02211842

Tager-Flusberg, H. 2001. "Understanding the language and communicative impairments in autism". *International Review of Research in Mental Retardation* 23: 185–205. DOI: 10.1016/S0074-7750(00)80011-7

Tager-Flusberg, H. 1993. "What language reveals about the understanding of minds in children with autism". In S. Baron-Cohen, H. Tager-Flusberg, and D. J. Cohen (eds.), *Understanding Other Minds: Perspectives from autism*. New York: Oxford University Press, 138–157.

Tager-Flusberg, H. and Anderson, M. 1991. "The development of contingent discourse ability in autistic children". *Journal of Child Psychology and Psychiatry* 32(7): 1123–1134. DOI: 10.1111/j.1469-7610.1991.tb00353.x

Turner, M. 1999. "Annotation: repetitive behaviour in autism: a review". *Journal of Child Psychology and Psychiatry* 40(6): 839–849. DOI: 10.1111/1469-7610.00502

De Villiers, J., Fine, J., Ginsberg, G., Vaccarella, L., and Szatmari, P. 2007. "Brief report: a scale for rating conversational impairment in autism spectrum disorder". *Journal of Autism and Developmental Disorders* 37(7): 1375–1380. DOI: 10.1007/s10803-006-0264-1

De Villiers, J. Myers, B., Stainton, R.J. and Szatmari, P. 2007. "Pragmatic Abilities in Autism Spectrum Disorder: A Case Study in Philosophy and the Empirical". *Midwest Studies in Philosophy*31(1): 292–317. DOI: 10.1111/j.1475-4975.2007.00151.x

De Villiers, J, Myers, B., and R. J. Stainton. 2012. "Differential pragmatic abilities and autism spectrum disorders: The case of pragmatic determinants of literal content". In M. Macaulay and P. Garces-Blitvich (eds.), *Pragmatics and Context*. Toronto: Antares.

Volden, J. and Lord, C. 1991. "Neologisms and idiosyncratic language in autistic speakers". *Journal of Autism and Developmental Disorders* 21(2): 109–130. DOI: 10.1007/BF02284755

Authors' addresses

Jessica de Villiers
Department of English
University of British Columbia
397-1873 East Mall
Vancouver, BC V6T 1Z1

Jessicadevilliers@mail.ubc.ca

Roberst Stainton
Department of Philosophy
The University of Western Ontario
1151 Richmond St.
London, ON Canada N6A 5B8

rstainto@uwo.ca

Brooke Myers
Department of Educational and Counselling
Psychology
Special Education University of British
Columbia
2125 Main Mall
Vancouver, BC Canada V6T 1Z4

brookemyers@gmail.com

About the authors

Jessica de Villiers is an Associate Professor of English Language at the University of British Columbia. She is the co-author, with Elissa Asp, of *When Language Breaks Down: Analysing Discourse in Clinical Contexts* (2010, CUP).

Brooke Myers is a Board Certified Behaviour Analyst who works with children and adults with autism spectrum disorder (ASD). She collaborates with these individuals and their families/ caregivers to teach new skills and/or reduce challenging behaviour.

Robert Stainton is Distinguished University Professor at the University of Western Ontario in Canada, and Director of Western's Linguistics MA Program. His most recent book is *The Semantics-Pragmatics Boundary in Philosophy* with Maite Ezcurdia (2013, Broadview).