Grammar and pragmatics in Specific Language Impairment and Autism Spectrum Disorder

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The (non-)modularity of language is a topic of ongoing debate in theoretical linguistics: does language consist of autonomous, domain-specific components (i.e. lexicon, syntax, semantics, phonology, pragmatics), operating independently (Fodor, 1983), or does language occur within a more general cognitive system (Rumelhart & McClelland, 1987)?

The answer to this question has far-reaching implications for a) theories of language acquisition, and b) diagnosis and treatment of individuals with language disorders. If language is modular, the underlying nature of young children's routinely observed language errors (e.g., *Her going to store*) can be sought in the division of labor between language modules as described above and their potential uneven development. In contrast, viewing language as resulting from a more general cognitive system, the explanation of children's language errors will be sought in the immaturity of general cognitive functions and their interaction. Similar reasonings apply to the language errors of individuals with language disorders. Naturally, diagnoses and intervention programmes will also differ strongly, depending on whether the language problems are assumed to be domain-specific, or general cognitive in nature.

Behavioral experimental studies on (Grammatical) Specific Language Impairment (GSLI) (Van der Lely, 1997; 1998; Schaeffer, 2003; Friedmann & Novogrodsky, 2008) provide some evidence for the modularity of language. It is argued that individuals with GSLI display impaired syntactic and morphosyntactic (i.e., grammatical) abilities (i.e. **Daddy cook dinner*), but have intact non-grammatical language areas, including pragmatics, and a normal IQ. This suggests a dissociation between grammar and pragmatics, implying their domain-specificity. However, note that this represents merely a single dissociation. It could still be that grammatical and pragmatic processing are both instances of the same cognitive function, but that pragmatic processing is cognitively "easier" in some sense.

Neuropsychology offers an alternative way to determine domain-specificity, through the use of "double dissociations" (Ellis & Young, 1986). When there are individuals who perform well on cognitive process A, but poorly on cognitive process B, while other individuals perform well on process B but poorly on process A, one can speak of "double dissociations", and therefore of domain-specificity.

The present proposal's main objective is to find a double dissociation between grammar and pragmatics. This would provide important evidence for the domain-specificity/modularity of language (acquisition) and have strong repercussions regarding the diagnoses and treatments of language impairments.

An approach to finding such a double dissociation lies in testing individuals with GSLI as described above, and certain individuals with Autism Spectrum Disorder (ASD), who are claimed to have pragmatic deficits but intact grammatical abilities (Tager-Flusberg, 2000).

Carefully testing pragmatic and grammatical abilities implies addressing language phenomena displaying both pragmatic and grammatical properties. This will allow the design of "minimal pair" experiments, eliminating confounding factors. Two such language phenomena are:

(1) Subjects;
(2) Noun/Determiner Phrases (DPs).

Regarding subjects, the standard assumption is that subject-verb agreement and Nominative Case on subject pronouns are grammatical properties. In contrast, adult Dutch subject drop is argued to be an instantiation of topic-drop, allowed under special pragmatic conditions, as illustrated in (3):

(3) *Wat doet Sofie 's ochtends meestal? _ staat op, __ gaat douchen, …*
'What does Sofie usually do in the morning? __ gets up, __ takes a shower, …'

The grammatical properties of DPs include the distinction between mass and count nouns. For example, Dutch mass nouns do not take plural morphology (**melken/*melks* ('milks')), or numerals (**drie melken/melks* ('three milks')), whereas count nouns do (Chierchia, 1998). However, some nouns can behave either as a mass noun, or as a count noun, such as *string* (*touw* in Dutch) – so-called 'flexible nouns'. The interpretation of flexible nouns as mass or count depends on the linguistic context (Barner & Snedeker, 2005). In (4), *string* is a count noun, because it appears with a plural morpheme, but in (5) it is mass:

(4) Who has more strings?

(5) Who has more string?

Crucially with respect to the proposed project, this analysis views the mass/count distinction as a grammatical phenomenon.

In contrast, the choice between using a definite or an indefinite article in a DP depends on pragmatic concepts such as speaker/hearer beliefs (cf. Stalnaker 1974; 1978; Heim 1982). In Dutch, like in English, if the referent of a noun is familiar to both speaker and hearer, the definite determiner (*de/the*) should be used, as in (6):

(6) This is a story about a girl. **The** girl lived in a big castle.

If the referent of a noun is only familiar to the speaker, as in (7), or unfamiliar to either speaker or hearer, as in (8), the indefinite determiner (*een/a*) should be used.

(7) I found **a** puppy last night.

(8) My mother is going to build **a** house.

Hypothesizing that individuals with GSLI are grammatically, but not pragmatically impaired, and that (a subset of) individuals with ASD are pragmatically, but not grammatically impaired, we make the following predictions:

(i) Dutch-speaking children and adults with GSLI will perform worse than their age-mates on the mass/count distinction of flexible nouns such as *string*: even after the age of 7, they will not use syntactic cues to distinguish between mass and count nouns;
(ii) The performance of Dutch-speaking children and adults with GSLI will be similar to that of their age-mates regarding the felicity of definite vs. indefinite articles;
(iii) The performance of high-functioning Dutch-speaking children and adults with ASD will be similar to that of their age-mates regarding the mass/count distinction of flexible nouns such as *string*.
(iv) High-functioning Dutch-speaking children and adults with ASD will perform worse than their age-mates regarding the felicity of definite vs. indefinite articles;
(v) Dutch-speaking children and adults with GSLI will perform worse than their age-mates on subject-verb agreement and Nominative Case on subject pronouns;
(vi) The performance of Dutch-speaking children and adults with GSLI will be similar to that of their age-mates regarding the felicity of subject-drop;
(vii) The performance of high-functioning Dutch-speaking children and

adults with ASD will be similar to that of their age-mates regarding subject-verb agreement and Nominative Case on subject pronouns;

(viii) High-functioning Dutch-speaking children and adults with ASD will perform worse than their age-mates regarding the felicity of subject-drop.

Methods

For participant selection, a special language assessment test will be developed, in which grammar and pragmatics are explicitly distinguished, building on the experience of the applicant, who designed such a test for Hebrew. Obviously, in order to avoid circular reasoning, this assessment will not include tests on subjects and/or DPs.

Grammaticality and appropriateness judgment tasks will be conducted with the six target groups in (9) on each of the five topics in (10).

(9) Adults with GSLI, Adults with ASD, Typical adults, Children with GSLI, Children with ASD, Typically Developing Children

(10) Grammar: Subject-verb agreement, Nominative Case on subjects, Mass/Count
Pragmatics: Subject-drop, Article choice

Research impact

If the predictions are borne out, the study will provide the first robust and systematic piece of evidence in favor of a dissociation between grammar and pragmatics, i.e. modularity within language. For language acquisition theories this means that the explanation for language errors made by young, typically developing (TD) children should be sought in the potential uneven development of the different language components, rather than in immature (or non-existent) general connections between elementary units in neural networks à la Rumelhart & McClelland.

Similarly, it will provide important insights in the underlying nature of (G)SLI and ASD language impairments (SLI estimated prevalence 7%; ASD estimated prevalence 0.7% - Bishop, 2010). Without a thorough understanding of the underlying nature of different language impairments, correct diagnosis and adequate intervention are virtually impossible. In the current state of affairs, misdiagnoses are often made, resulting in large expenditures on inadequate, and therefore ineffective intervention programs. A confirmation of the predictions will provide evidence for the existence of subgroups of SLI, in this case, G(rammatical) SLI, and support the hypothesis that GSLI involves a deficit in grammar/grammatical processing, rather than in general temporal processing. It will also support the hypothesis that pragmatics can be impaired without deficiencies in grammatical processing, as in individuals with ASD. This has far-reaching implications for the diagnosis and treatment of such language disorders. For example, on the one hand, impaired Nominative Case assignment to subjects, subject-verb agreement and mass/count syntax should be adopted as inclusionary criteria for Dutch GSLI. By contrast, age-level-like performance on subject-drop and article choice (pragmatic), should be an exclusionary criterion. On the other hand, the diagnosis of pragmatic impairments (such as in some individuals with ASD) should include the latter as an inclusionary criterion, and grammatical difficulties (with, e.g., Nominative Case on subjects, subject-verb agreement and mass/count syntax) as exclusionary criteria. This would drastically change the currently available (and often inadequate) diagnostic tools into much more adequate test batteries for different language impairments. Naturally, such fine-tuned diagnosis requires the development of different intervention programmes. If (part of) grammar or pragmatics is impaired, then this should become a primary therapy goal. Non-normative language behaviors which can be seen as resulting from the impaired grammar or pragmatics should be remediated by addressing the underlying grammatical or pragmatic (processing) system. On the other hand, if, for

example, grammar is intact, treatment could focus on using it compensatorily to circumvent pragmatic impairments, and vice versa.

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