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Jeannette Schaeffer, Merel van Witteloostuijn, and Doatske de Haan

1. Introduction

The choice between a definite (*the*) and an indefinite (*a*) article has often been investigated in the fields of monolingual L1 (Maratsos 1976; Karmiloff-Smith 1979; Zehler & Brewer 1982; Shafer & de Villiers 2000 ; Schaeffer & Matthewson 2005, van Hout et al. 2010, a.o.) and L2 acquisition (Ionin and Wexler 2003; Ionin et al. 2004; Ionin et al. 2008; Zdorenko & Paradis, 2008, a.o.). However, it has rarely been studied in the language acquisition of impaired populations (but cf. Polite et al.'s 2011 study on English SLI). The present study investigates the choice of a definite versus an indefinite article in various (in)definite (non-)referential contexts in high-functioning children with High Functioning Autism (HFA) as compared to children with Specific Language Impairment (SLI).

The rationale behind the comparison of these two impaired populations is as follows: As argued by Stalnaker (1974; 1978), and Heim (1982) (among many others), the choice between a definite and an indefinite article as in (1) and (2) depends on knowledge of speaker/hearer assumptions, and can thus be assumed to be part of pragmatics.

(1) Dit is een verhaal over **een** (bepaalde) jongen.
De jongen woonde in een groot kasteel.
'This is a story about **a** (certain) boy.
The boy lived in a big castle'

(2) Ik heb zin om **een** boek te lezen (wat voor boek dan ook).
'I feel like reading **a** book (whatever book it may be).

The first sentence in (1) contains the noun *jongen* ('boy'), which is introduced by the speaker while its referent is still unknown to the hearer. Therefore, the indefinite article *een* ('a') is chosen. In the second sentence, the referent of *jongen* is known to both the speaker and the hearer (referred to as 'common ground'), yielding the choice of the definite article *de* ('the'). In (2), the

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referent of the noun *boek* ('book') is unknown to both speaker and hearer, resulting in the choice for an indefinite article as well.

Inspired by Schaeffer & Matthewson (2005) we assume the schema in (3) for the canonical realizations of the three possible assumption states in the Dutch adult article system ('Assumed by X' is shorthand for 'X has grounds for an existential assertion'):

(3)	*The Dutch adult article system*		
A	Assumed by speaker and hearer	Part of common ground	*De*
B	Assumed by speaker only	Not part of common ground	*Een*
C	Assumed by neither speaker nor hearer	Not part of common ground	*Een*

Turning now to pathology, typical characteristics of children with HFA include abnormal communication and deviant pragmatics (see Baron-Cohen 1988; Firth 1989; and Tager-Flusberg 1989 for reviews). In contrast, although all children with SLI show severe grammatical impairments, there are SLI subgroups showing intact pragmatics (Friedmann & Novogrodsky 2008; 2011, van der Lely 1998). If Article Choice (henceforth: AC) is a pragmatic phenomenon, and children with HFA are pragmatically impaired, one would expect that they would make errors regarding AC. In contrast, AC errors are not expected to be a key characteristic of children with grammatical SLI.

To preview our results, we show that, surprisingly, subgroups of both children with HFA and children with SLI overgenerate the indefinite article in indefinite contexts, i.e., we find AC errors in both HFA and SLI.[1] Nevertheless, despite the HFA and SLI resemblance in terms of pragmatic AC, their profiles differ otherwise, suggesting different etiologies (cf. Bishop 2010).

2. Previous L1 studies on Article Choice

Cross-linguistic research on the acquisition of AC shows that young monolingual children acquiring a two-article language system based on definiteness often use definite articles where adults would use an indefinite (Maratsos 1976; Karmiloff-Smith 1979; Zehler & Brewer 1982; Schaeffer & Matthewson 2005, van Hout et al. 2010). Explanations for this definite overgeneration vary from cognitive ('ego-centricity' – Maratsos 1976; 'deictic use of definite' – Karmiloff-Smith 1979) to pragmatic ('lack of 'Concept of Non-Shared Assumptions' – Schaeffer & Matthewson 2005) to Optimality Theory ('no constraint ranking' – van Hout et al. 2010) accounts.

[1] Note that this result is in contrast with our earlier findings in much smaller groups of children with HFA and children with SLI, as described in Schaeffer, van Witteloostuijn, and de Haan (2014).

Interestingly, van Hout et al. (2010) also found non-adultlike interpretation of the indefinite article *a*. Their results indicate that English-acquiring children aged 3;7-5;3 (mean: 4;6) incorrectly interpret *a* as referring to a unique referent 59% of the time.

Van Hout et al. (2010) explain this non-adultlike interpretation of indefinites by the failure of drawing scalar implicatures. These are implicitly communicated propositions linked to relatively weak terms (consider, for example, how *some* pragmatically implies *not all*) (Pouscoulous et al., 2007). The general consensus is that the weaker term (e.g. the quantifier *some*), while logically/semantically compatible with a stronger term from the same scale (e.g. *all*), prompts the inference because the speaker did not use the stronger term (Horn 1989; Levinson, 2000; Carston, 1998; Chierchia, 2004; Wilson and Sperber, 2004). Hawkins (1991) and Horn (2006) propose that adults draw a scalar implicature when they interpret indefinite NPs. They argue that *the* and *a* provide a contrastive set, in which *the* is the logically stronger and most informative member of the pair: <*a*, *the*>. Indefinite interpretations are then analyzed as implicatures that result from not using the definite article in corresponding expressions (Hawkins 1991:417). If children fail to draw a scalar implicature when they interpret indefinite NPs, as in van Hout et al.'s (2010) comprehension study, they arbitrarily choose between a determined referent meaning and a non-determined referent meaning when they hear an indefinite.

3. Hypotheses and predictions

Taking the explanations of a) Schaeffer & Matthewson (2005) for the overgeneration of *the*, and b) van Hout et al. (2010) for the overly liberal interpretation of *a*, we now present two sets of hypotheses and predictions for Dutch-acquiring children with HFA on the one hand (4), and for Dutch-acquiring children with SLI on the other hand (5). Although van Hout et al. consider the scalar implicature for definiteness only in terms of comprehension, we assume that scalar implicatures apply in production as well.

(4) *Predictions for (subgroup of) children with HFA regarding AC*
- (i) Children with HFA overuse *de/het* in referential indefinite contexts because they lack CNSA
- (ii) Children with HFA overuse *een* in definite contexts because they fail to calculate scalar implicature

(5) *Predictions for (a subgroup of) children with SLI regarding AC*
- (iii) Children with SLI (> age 4) do not overuse *de/het* in referential indefinite contexts because they do not lack CNSA
- (iiii) Children with SLI (> age 5) do not overuse *een* in definite contexts because they can calculate scalar implicature

4. Methods

Participants In order to test these predictions we recruited 27 children with HFA, aged 5-14 (mean: 10;0, SD 2.3) through Dutch organizations for autism, autism groups on Facebook and personal contacts. Furthermore, 27 children with SLI aged 6-14 (mean: 9;6, SD 2.2) were selected from special schools for children with speech and language problems in The Netherlands. Children with an IQ < 85 and/or officially diagnosed with any additional disorder (such as autism in the SLI group or language impairment in the HFA group), or AD(H)D) were not included. Nevertheless, we do not exclude the existence of comorbidity with other developmental disorders in both the SLI and the HFA group. 27 typically developing (TD) children aged 6-14 (mean: 10;0; SD 2.1), matched on age and gender, served as a control group. Finally, 16 adult mother tongue speakers of Dutch aged 20-56 (mean: 34;2; SD 14.5) were tested to ensure the psychological reality of the expected target responses.

Materials and procedure Our materials consist of an Elicited Production Task (cf. Crain & Thornton, 2000) in which the participants are asked to describe an event in a picture or short video clip displayed on a computer screen to an experimenter who cannot see the screen while a second experimenter is sitting next to the participant. Following Schaeffer & Matthewson's (2005) schema on definiteness and referentiality as presented in section 1, three conditions are distinguished, namely (i) definite (6 test items), (ii) indefinite-referential (6 test items), and (iii) indefinite-non-referential (6 test items). Furthermore, the experiment contains 18 fillers, eliciting utterances with a scrambled or a non-scrambled object (which were later used for a different study). The conditions are schematized in (6), and sample scenarios of each condition are provided in (7a and b).

(6) *Experimental conditions Elicited Production Task on Article Choice*

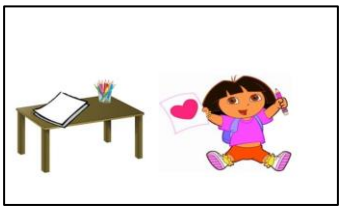
Condition	**Number of items**
1 – Definite	6
2 – Indefinite referential	6
3 – Indefinite non-referential	6
Total experimental items	18
Fillers	18

(7a) *Sample scenario Definite condition*
Situation: Picture of a puppet with a ball (visible to participant, but not to experimenter).


Exp: Hey, who do you see in the picture? (Clip of puppet rolling the ball)
Participant: *Name*!
Exp: What else do you see?
Participant: A ball!
Exp: What did *Name* just do?
Target: She rolled **the** ball.

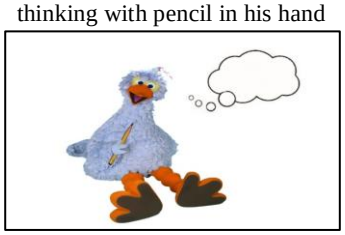
(7b) *Sample scenarios Indefinite Referential and Non-Referential conditions*
Situations (visible to participant, but not experimenter)

Indef. Ref.: Picture of Dora, who has drawn a heart



Exp: Who do you see in the picture?
Participant: Dora!
Exp: And what did Dora just do?
Target: She drew **a** heart.

Indef. non-ref.: Picture of Big Bird thinking with pencil in his hand



Exp: Who do you see in the picture?
Participant: Big Bird!
Big Bird: "Oh, I am so bored, I don't know what to do. Oh, you know what? I'll go to the forest and draw something."
Exp: What do you think Big Bird is going to do?
Target: He is going to draw **a** tree.

5. Results and discussion

Figure 1 presents the results on all conditions for all child groups. The tall bars for the indefinite conditions show that all children overwhelmingly choose to produce the target indefinite article in both indefinite conditions. Kruskal-Wallis tests show that none of the differences between child groups or response types are statistically significant (Indefinite referential indefinites: $H(2) = 2.381$, $p = .304$, definites: $H(2) = 2.000$, $p = .368$ and irrelevant: $H(2) = 2.495$, $p = .287$, Indefinite non-referential indefinites: $H(2) = 4.507$, $p = .105$, definites: $H(2) = 1.067$, $p = .587$ and irrelevant: $H(2) = 4.925$, $p = .085$).

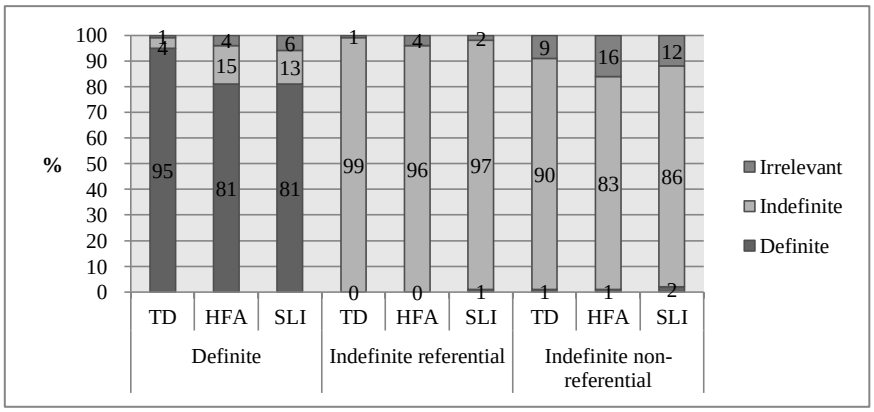


Figure 1 – Definite, Indefinite non-referential and indefinite referential conditions: Proportions of definite, indefinite, and irrelevant responses

As for the choice between a definite and an indefinite article, the results on the indefinite non-referential condition (Figure 1) show that none of the participants have any difficulty producing indefinite *a* in contexts in which neither the speaker nor the hearer has grounds for an existential assertion regarding the referent of the noun. As neither lack of the CNSA nor failure to draw a scalar implicature (both pragmatics) predicts such a result, it is not surprising that even our HFA group performs well on this condition. Importantly, it indicates that AC in SLI or HFA is not random, and that even our impaired participants adhere to some underlying system guiding AC.

Secondly, recall our prediction that children with HFA overuse *de/het* in indefinite referential contexts because they lack the CNSA. As the results on the indefinite referential condition in Figure 2 above demonstrate, this prediction is not borne out: none of the participants, including the children with HFA overgenerate the definite article *de/het* in this condition. Nevertheless, the results in Figure 2 do confirm our prediction that children with SLI (who are hypothesized to have the CNSA) do not overgenerate *de/het* in indefinite referential contexts. These results suggest that neither the children with SLI nor the children with HFA lack the CNSA. In other words, although the children with HFA tested in our experiment may be pragmatically impaired, the part of pragmatics that is responsible for their knowledge that speaker and hearer assumptions are always independent (CNSA) seems to be intact.

Our SLI results on the indefinite conditions are corroborated by Schaeffer et al. (2003) who conducted a spontaneous speech study on article omission and AC in a group of 14 English-speaking children with SLI aged 3;11- 4;10 and their age- and MLU-matched TD controls. None of the children with SLI (or

their TD controls, for that matter) overgenerated the definite article *the* in indefinite contexts.

Thus, overall, all groups perform target-like on both indefinite conditions, disconfirming our prediction for the HFA group that they would overgenerate the definite article *the* in the definite referential condition, but confirming our prediction that children with SLI older than four would NOT overgenerate *the* in this condition. We therefore conclude that all participants, including the children with HFA have the pragmatic Concept of Non-Shared Assumptions.

In contrast, definite articles are not always chosen in the definite condition, as illustrated in Figure 1. A Kruskal-Wallis test reveals a significant difference between the number of correct definite responses of the TD, HFA and SLI groups ($H(2) = 8.676$, $p < 0.05$). Mann-Whitney U tests between the different pairs of groups show that the difference between the HFA and the TD group is significant ($U = 245$, $p < .05$), the same holds for the SLI and the TD group ($U = 224.5$, $p \leq .005$). The HFA and SLI groups do not differ significantly from one another ($U = 356$, $p = .875$).

Both the HFA group and the SLI group produce correct definite articles significantly less often than the TD group. This lower use of correct definite articles in the definite condition is largely due to the substitution of indefinite articles in both groups: 15% in the HFA group and 13% in the SLI group. Both these numbers are significantly higher than that of the TD children (4%) (HFA: $U = 272$, $p < .05$, SLI: $U = 265.5$, $p < .05$).[2]

The indefinite article responses in the definite condition suggest that both the children with HFA and the children with SLI sometimes fail to draw the scalar implicature that underlies the choice between the weaker *een* and the stronger *de/het* in a definite context. The expression *een* may be interpreted in two different ways: either with an inference-driven, pragmatic reading, excluding *de/het* or with just its literal, semantic meaning (existence of a referent), which is also compatible with *de/het*. The inference-driven pragmatic reading requires the calculation of a scalar implicature. In an indefinite referential context this renders the choice for the weaker *een* because this choice implies that the use of the stronger *de/het* is too strong: this would have implied knowledge of the existence of the referent by both speaker and hearer, whereas speaker-only knowledge of the referent is appropriate in an indefinite referential context.

Although the substitution of indefinite articles in the definite condition was predicted for the HFA group, this is a surprising result for the children with SLI, who are hypothesized not to have impaired pragmatics. To investigate this

[2] A smaller part of the definite condition errors consists of irrelevant responses, including demonstratives (*Hij zit te knuffelen met **die** hond.* 'He is cuddling with that dog') and some article omissions (*Hij knuffelde __ knuffelbeer*. 'He cuddled __ teddybear). However, neither the HFA nor the SLI group produces more irrelevant answers than the TD group (HFA: $U = 309.5$, $p = .123$, SLI: $U = 307.5$, $p = .11$).

issue further, and taking into account the well-known heterogeneity of impaired populations, we divided up all groups into 'passers' and 'failers'. Participants received a 'pass' if they produced 0 or 1 (out of 6) indefinite articles in the definite condition, and a 'fail' if they produced 2 or more (out of 6) indefinite articles in the definite condition. Subsequently, we compared the different subgroups on their scores on some other grammatical and non-verbal WM tests that we carried out with the same children, as part of a larger study. Besides AC, we also administered the core components of the CELF-IV-NL (testing mainly grammar), a mass-count experiment, a subject-verb agreement experiment and a non-verbal Working Memory test with all participants. The mass-count experiment was a Quantity Judgment Task based on Barner & Snedeker (2005) in which the participants were asked to point at the picture that has 'more X'. 'X' represents either a (flexible) mass noun, such as *rope*, or a plural (flexible) count noun, such as *ropes*. One picture has one thick, long piece of rope, whereas the other picture shows 3 thin, short pieces of rope. As the crucial distinguishing factor is the plural morpheme, this experiment tests knowledge of grammar. Similarly, the subject-verb agreement experiment, in which 1st, 2nd, and 3rd person singular and plural subject pronouns are elicited together with inflected verbs, tests grammatical knowledge. In addition, non-verbal Working Memory (WM) was tested with the so-called 'Odd-one-out' task (Henry, 2001), in which the participant has to point at the odd-one-out figure (out of 3), and subsequently indicate the (blank) positions where the odd-one-out figures were before (maximum of 6). The results of this analysis are presented in Table 1:

Table 1 – *Grammatical (accuracy) and WM scores of HFA and SLI failers on AC as compared to TD*

	N	AC (def cond)	CELF	Mass-Count	Subj-V Agr	WM
HFA failers	6	39%*	79%	85%	95%	4.0
HFA passers	21	92%	49%	82%	95%	4.3
SLI failers	4	42%*	9%*	65%*	91%*	3.0*
SLI passers	23	88%	8%*	70%*	85%*	3.6*
TD passers	26[3]	95%	73%	94%	96%	4.9

* = significantly worse than TD

[3] The original size of each group was 27. This was diminished by 1, because one child with HFA did not do the CELF and the WM test, resulting in the removal of his TD and SLI matches.

The division into passers and failers shows comparable numbers of failers in both impaired groups: 6 out of the 27 HFA participants (22%) and 4 out of 27 SLI participants (15%) make substantial amounts of errors in the definite condition, mainly due to the substitution of the indefinite article *een*.

Nonetheless, in terms of grammar and non-verbal WM, the HFA AC failers and the SLI AC failers show very different profiles: the HFA AC failers (but also the HFA AC passers, for that matter) are TD-like on all grammatical tests and on the non-verbal WM test (CELF: $U = 59.5$, $p = .767$, Mass-Count: $U = 68.5$, $p = .541$, Subject-Verb Agreement: $U = 53.5$, $p = .421$, WM: $U = 50$, $p = .398$). The HFA AC failers and the HFA AC passers do not differ from each other on the grammatical and WM tasks either, except for on the CELF, on which, perhaps surprisingly, the HFA AC failers do actually better (79%) than the HFA AC passers (49%). Note, however, that 49% is still within the norm (50%). In contrast, the SLI AC failers (as well as the SLI AC passers, for that matter) are outperformed by the TD children on all these tests (CELF: $U = 3$ $p \leq .001$, Mass-Count: $U = 13$, $p < .05$, Subject-Verb Agreement: $U = 23$, $p < .05$, WM: $U = 14$, $p < .05$).

Considering the TD-like performance of the 6 AC HFA failers on grammar and WM, and the fact that the HFA AC failers do not differ from the HFA AC passers on the grammatical and WM tasks, their weaker scores on AC in the definite condition cannot be attributed to either a grammatical or a WM weakness. Even if we language-match children with HFA individually to TD children based on the CELF scores, the children with HFA still perform worse than their TD controls on AC in the definite condition. As Table 2 shows, 4 of the 6 HFA AC failers are in this language-matched HFA group, resulting in 74% correct AC for the HFA group (N=14), vs. 94% correct AC in the TD group (N=14) in the definite condition (marginally significant: $U = 60$, $p = .052$). The 2 remaining HFA failers (ages 6 and 11) on AC in the definite condition could not be included since for the 6-year-old (CELF score: 55,3%) we did not have a language match in our TD group, and the 11-year-old unfortunately did not do the CELF, nor the WM test (see also footnote 3).

Table 2 - *AC performance in the definite condition of children with HFA as compared to their TD language matches*

	N	CELF % range Mean (SD)	AC	% correct definite condition
HFA	14	5.5 – 99.3 71.7 (26.4)	4 failers and rest passers	74%
TD	14	5.5 – 98.1 71.7 (26.5)	All passers	94%

We therefore propose that the children with HFA have a true pragmatic impairment: the children with HFA lack (or: do not adhere to) the Maxim of Quantity, and therefore sometimes fail to draw a scalar implicature. When they fail to draw the scalar implicature for definiteness, they rely on the literal,

semantic meaning of (referential) *een* ('a'), namely the existence of a referent, which is also true for *de/het*. Corroborating evidence for this account comes from a study by Surian, Baron-Cohen & van der Lely (1996). With a 'Prop selection' task Surian et al.'s study investigates the ability to adhere to Gricean Maxims (although not the Maxim of Manner) in 8 children with HFA (mean age 12;11), 8 children with SLI (mean age 11;10) and 8 TD children matched on mental age (mean age 6;7). Results show that 5 out of 8 children with autism perform significantly worse than their TD (and SLI, for that matter) controls on these Gricean Maxims.

Other studies on scalar implicatures in children with autism are extremely scarce, and report mixed results. Chevallier et al. (2010) find that their ASD group (N = 22, mean age = 13;4) did not differ from TD on inferring the 'exclusive' and 'inclusive' interpretation of "or" (as in "John or Mary will come"). Conversely, an earlier study did find differences between HFA and TD child groups (N = 8, mean age = 9.9) in a truth value judgment task where children were asked to judge sentences containing implicative verbs such as 'manage' (Dennis, Lazenby & Lockyer, 2001).

Turning now to the SLI results, we argue that the low AC scores of the 4 SLI failers are not caused by their weak grammatical abilities. Despite the fact that the CELF percentiles of the 4 SLI failers are far below the norm, they are virtually the same as those of the 23 SLI AC passers (9% vs. 8%, respectively). Moreover, the SLI failers and passers do not differ on the other grammatical tasks either (mass-count: $U = 45$, $p = .945$, subject-verb agreement: $U = 39$, $p = .630$). This is further confirmed by the fact that no significant correlations were found between CELF scores and AC scores (Spearman's Rank-Order Correlations: CELF and AC of 4 SLI failers: correlation coefficient $r_s = .816$, $p = .184$; CELF and AC of 22[4] passers: correlation coefficient r_s (22) = .174, $p = .439$).

The SLI group's weak performance on the definite condition in the AC test cannot be attributed to an unstable Working Memory either. Although the SLI failers' WM scores (3.0) significantly differ from those of the TD children (4.9, $t(46) = -2.956$, $p \leq .005$), they are no different from the SLI passers' WM scores (3.6, $t(24) = .773$, $p = .447$). This is further confirmed by the absence of significant correlations between WM scores and CELF scores (Spearman's Rank-Order Correlations: WM and AC of 4 SLI failers: correlation coefficient r_s (4) = .816, $p = .184$; WM and AC of 22 SLI passers: correlation coefficient r_s (22) = .088, $p = .696$). Also, as illustrated in Table 3, if we divide up the SLI group into a 'low WM' group (memory level of 1 or 2 out of 6, mean WM level: 1.9) and a 'high WM' group (memory level of 3 or above, mean WM level: 4.3, comparable to our TD children), we see that 'high WM' SLI group actually contains more AC failers (3) than the 'low WM' SLI group (1), a completely unexpected result if WM were predictive of AC performance:

[4] See footnote 3.

Table 3 - *AC performance of children with SLI with a low vs. a high non-verbal WM score*

	N	Mean Memory Level	AC	% correct definite condition
Low WM (SLI)	8	1.9	1 failers and rest passers	75%
High WM (SLI)	19	4.3	3 failers and rest passers	83%

The final column does show that overall the 'high WM' SLI group performs slightly better on AC in the definite condition than the 'low WM' SLI group, but the difference is far from significant ($U = 76$, $p = 1.0$).

We therefore conclude that in SLI, like grammar, a weak Working Memory is not predictive either of overgeneration of *een* in definite contexts. Having thus ruled out a grammatical and a working memory cause for AC failure in the SLI group, we propose that the 4 children with SLI who fail the AC test have a pragmatic impairment, in addition to, but not related to their grammatical and WM impairments. Despite their resemblance to HFA in their performance on AC in definite contexts, we cannot say that SLI and HFA are part of the same continuum (cf. Bishop 2010), since the SLI and HFA profiles differ strongly in terms of grammar and non-verbal Working Memory.

5. Conclusion

In this study we compared a group of children with SLI with a group of children with HFA between the ages of 6 and 14 on pragmatic AC. First of all, none of the tested children overgenerated the definite article in indefinite contexts. This suggests that children with SLI as well as children with HFA older than 6 have the Concept of Non-Shared Assumptions (Schaeffer & Matthewson 2005). Yet, we did find that 4 children with SLI and 6 children with HFA overgenerate indefinite articles in definite contexts. Despite this resemblance on AC performance, the children with SLI perform much worse on grammatical and non-verbal Working Memory tasks than their TD controls, but the children with HFA and the TD children perform equally well on grammar and WM. Nevertheless, we did not find any correlations between a) the SLI grammar scores and the SLI AC scores, or b) the SLI Working Memory scores and the SLI AC scores. We therefore conclude that the 6 HFA as well as the 4 SLI AC failers have a pragmatic impairment in that they fail to derive the scalar implicature following from the Maxim of Quantity. Despite this resemblance in terms of pragmatic AC, the HFA and SLI (sub-)groups strongly differ in their grammatical and non-verbal Working Memory profiles. This suggests that they are not part of the same continuum, as argued by Bishop (2010).

References

Barner, David & Jesse Snedeker 2005. Quantity judgments and individuation: Evidence that mass nouns count. Cognition 97. 41-66.

Baron-Cohen, Simon 1988. Social and pragmatic deficits in autism: Cognitive or affective? *Journal of Autism and Developmental Disorders* 18(3). 379-402.

Bishop, Dorothy V. M. 1997. *Uncommon understanding: Development and disorders of language comprehension in children*. Hove, UK: Psychology Press.

Carston, Robyn 1998. Informativeness, relevance and scalar implicature. In R. Carston & S. Uschida (eds.), Relevance Theory: Applications and Implications, 79-236. Amsterdam: John Benjamins.

Chevallier, C., Wilson, D., Happé, F. & Noveck, I. 2010. Scalar inferences in autism spectrum disorders. *Journal of autism and developmental disorders* 40(9), 1104-1117.

Chierchia, Gennaro 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. *Structures and Beyond* 3. 39-103.

Dennis, Maureen, Anne L. Lazenby, & Linda Lockyer. 2001. Inferential language in high-function children with autism. *Journal of autism and developmental disorders* 31(1), 47-54.

Friedmann, Naama & Rama Novogrodsky 2008. Subtypes of SLI: SySLI, PhoSLI, LeSLI, and PraSLI. In Anna Gavarró & Maria João Freitas (eds), *Language Acquisition and Development*, 205-217. Newcastle, UK: Cambridge Scholars Press/CSP.

Friedmann, Naama & Rama Novogrodsky 2011. Which questions are most difficult to understand? The comprehension of Wh questions in three subtypes of SLI. *Lingua* 121(3). 367-382.

Frith, Uta 1989. Autism: Explaining the enigma. *British Journal of Developmental Psychology* 3. 465–468.

Hawkins, John A. 1991. On (in)definite articles: Implicatures and (un)grammaticality prediction. *Journal of Linguistics* 27. 405–442.

Heim, Irene 1982. *The semantics of definite and indefinite NPs*. Ph.D. Dissertation, University of Massachusetts, Amherst: GLSA.

Henry, Lucy A. 2001. How does the severity of a learning disability affect working memory performance? Memory 9, 233-247.

Horn, Laurence R. 1989. *A Natural History of Negation*. Chicago: University of Chicago Press.

Horn, Laurence R. 2006. Toward a Fregean pragmatics: Voraussetzung, Nebengedanke, Andeutung. In Laurence R. Horn & Istvan Kecskes (eds.), *Explorations in Pragmatics: Linguistic, Cognitive, and Intercultural Aspects*, 39-69. Berlin: Mouton.

Van Hout, Angeliek, Kaitlyn Harrigan, & Jill de Villiers 2010. Asymmetries in the acquisition of definite and indefinite NPs. *Lingua* 120(8). 1973-1990.

Ionin, Tania R. & Kenneth N. Wexler 2003. The certain uses of *the* in L2-English". In Juana.M. Liceras et al. (eds.), *Proceedings of the 6th Generative Approaches to Second Language Acquisition Conference*, 150–160. Somerville: Cascadilla Press.

Ionin, Tania, Heejeong Ko & Kenneth Wexler 2004. Article semantics in L2 acquisition: The role of specificity. *Language Acquisition* 12(1). 3-69.

Ionin, Tania, Maria L. Zubizarreta & Salvador B. Maldonado 2008. Sources of linguistic knowledge in the second language acquisition of English articles. *Lingua* 118(4). 554-576.

Karmiloff-Smith, Annette 1979. *A Functional Approach to Child Language.* Cambridge: Cambridge University Press.

van der Lely, Heather K.J. 1998. SLI in children: Movement, economy and deficits in the computational-syntactic system." *Language Acquisition* 7. 161-192.

Levinson, Stephen 2000. *Presumptive Meanings: The theory of generalized conversational implicature.* Cambridge, MA: MIT Press.

Maratsos, Michael P. 1976. *The use of definite and indefinite reference in young children: An experimental study of semantic acquisition*. Cambridge: Cambridge University Press.

Polite, E. J., Leonard, Laurence. B., & Roberts, F. D. 2011. The use of definite and indefinite articles by children with specific language impairment. International Journal of Speech-Language Pathology, 13, 291-300.

Pouscoulous, Nausicaa, Ira A. Noveck, Guy Politzer & Anne Bastide 2007. A developmental investigation of processing costs in implicature production. *Language Acquisition* 14(4), 347-375.

Schaeffer, Jeannette & Lisa Matthewson 2005. Grammar and pragmatics in the acquisition of article systems. *Natural Language & Linguistic Theory* 23(1), 53-101.

Schaeffer, Jeannette, Merel van Witteloostuijn & Doatske de Haan 2014. Article choice in children with High Functioning Autism (HFA) and in children with Specific Language Impairment (SLI). In Anita Auer & Björn Köhnlein (eds.) *Linguistics in The Netherlands 2014*. Amsterdam/Philadelphia: John Benjamins, 107-128.

Schafer, Robin J. & Jill de Villiers 2000. Imagining articles: What *a* and *the* can tell us about the emergence of DP. In S. Catherine Howell, Sarah A. Fish, Thea Keith-Lucas (eds.), *Proceedings of the 24th annual Boston University Conference on Language Development* 2, 609-620. Somerville, MA: Cascadilla Press.

Stalnaker, Robert 1974. Pragmatic presuppositions. In Milton K. Munitz & Peter Unger (eds.), *Semantics and Philosophy*, 197-214. New York*:* New York University Press.

Stalnaker, Robert 1978. Assertion. In Peter Cole (eds.), *Syntax and Semantics 9: Pragmatics*, 313–332. New York: Academic Press.

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

Wilson, Dan & Deirdre Sperber 2004. Experimental pragmatics. In Frank Jackson & Michael Smith (eds.), Handbook of Contemporary Analytical Philosophy, 607-632. Oxford: Blackwell.

Zdorenko, Tatiana & Johanne Paradis 2008. The acquisition of articles in child second language English: fluctuation, transfer or both? Second Language Research 24(2). 227-250.

Zehler, Annette M. & William F. Brewer 1982. Sequence and Principles in Article System Use: An Examination of *A*, *The*, and *Null* Acquisition". *Child Development* 53. 1268-1274.