



# The pragmatics of articles in Dutch children with specific language impairment<sup>☆</sup>

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Received 19 December 2012; received in revised form 19 November 2013; accepted 9 December 2013

Available online 23 January 2014

## Abstract

Previous studies have found that the morpho-syntactic aspects of grammatical morphemes, including articles, pose problems for Dutch-speaking children with Specific Language Impairment (SLI). In the present study it is demonstrated that article errors in Dutch children with SLI appear to be modulated by the pragmatic context to some extent. This study examines the pragmatic aspects of articles in 19 6- to 8-year-old children with SLI, comparing the results with those of 26 monolingual typically developing age-matched (TD-AM) and 17 language-matched (TD-LM) children. An elicitation task was used to test the specific discourse-new context (definite articles) and non-specific context (indefinite articles). In both contexts, the SLI group omitted articles more often than the TD-AM group, thus behaving similarly to the younger TD-LM group. The SLI group substituted articles more often than children in both control groups. Many children in the SLI group displayed variable behaviour and relatively many children with SLI used definite articles in non-specific contexts. We conclude that processing limitations in SLI may lead to less stable lexical knowledge of articles and hinder the successful integration of lexical, syntactic and pragmatic information that is required for target-like use of articles.

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**Keywords:** SLI, definiteness, elicited production, articles, pragmatics, determiners

## 1. Introduction

Children with specific language impairment (SLI) typically have difficulties using grammatical morphology (Leonard, 2009). In Germanic languages specifically, verb inflection is a locus of errors (Dutch: De Jong, 1999; Wexler et al., 2004; English: Leonard et al., 1997; Rice and Wexler, 1996; German: Clahsen, 1989; Swedish: Hansson et al., 2000). Moreover, in the nominal domain of these languages, problems are found in the use of articles: for example in English (Leonard, 1995; Polite et al., 2011), Swedish (Hansson et al., 2003) and Dutch (Orgassa, 2009; Van Ewijk and Avrutin, 2010). These problems manifest themselves as a delay in the production of articles. For Dutch, the wrong selection of gender is also common.

Articles have grammatical functions, but also several pragmatic functions: they encode information related to the speaker, the addressee and other features of the context. More specifically, they indicate specificity, new and given information and the presence of mutual knowledge (Givón, 1995; Lyons, 1999). It is well established that children with SLI

<sup>☆</sup> This research is part of the project 'Cross-linguistic study on the production and processing of grammatical morphemes in L2 children compared to children with Specific Language Impairment' funded by the Netherlands Organisation for Scientific Research (NWO). We would like to thank the Anne Frank school Bunnik, Achtdaan, Polygoon and Pionier schools Almere, Auris Taalfontein Rotterdam, Auris Taalplein Gouda, Auris College Utrecht for their collaboration, and our research assistants Nienke Verhoog, Marleen Dorlandt, Iske Bakker, and Stephanie Leijts.

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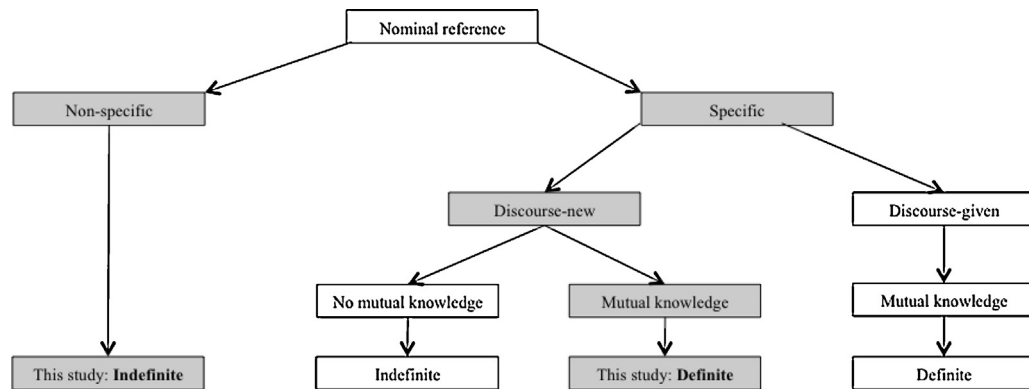


Fig. 1. Pragmatic factors governing article use in Dutch and English.  
Source: Adapted from Rozendaal and Baker (2008:776).

can have difficulties with pragmatic aspects of language (Bishop, 2000). For Dutch, this has been shown at a general level (Geurts and Embrechts, 2010), and for specific narrative abilities (Parigger, 2012), but no specific work has yet been done on articles. This will be the focus of this study. The production of definite and indefinite articles is examined in Dutch children with SLI in relation to specificity, new and given information and presence of mutual knowledge. Data were collected using a controlled elicitation experiment. Analyses looked at incorrect omission of articles and the substitution of definite articles by indefinites and vice versa. Both group and individual data were analyzed.

The pragmatics of definite and indefinite articles are described in Section 1.1. This is followed by an overview of relevant research on article use in Dutch children with TD (Section 1.2) and by the expected patterns of article use in Dutch SLI (Section 1.3). Section 1.4 ends with a brief summary of the goals, research questions and predictions for this study. Sections 2 and 3 report the method and the results, respectively, followed by the conclusions and further discussion in Section 4.

### 1.1. The pragmatics of definite and indefinite articles

Not all languages use articles but, as mentioned above, where they are used, an interaction is found between syntax and pragmatics. Syntactically, articles in combination with the noun phrase (NP) form a Determiner Phrase (DP) where the D head carries features determining definiteness (Ionin, 2003). In Dutch, as in English, an article is compulsory in singular contexts. Sentences (1a and b) are correct but (1c) is not.

1. a. Een schoen ontbreekt.  
'A shoe is missing.'
- b. Schoenen zijn verplicht.  
'Shoes must be worn.'
- c. \*Schoen ontbreekt  
      \*\*Shoe is missing.'

Whether D in a singular DP should be realized as a definite or indefinite article is largely determined by pragmatic factors and this holds equally for both English and Dutch (Lyons, 1999; Rozendaal, 2008). These factors include the knowledge of the speaker and the listener about the referent denoted by the noun (specificity, mutual/world knowledge), and the presence or absence of the referent in the previous discourse (givenness). Fig. 1, adapted from Rozendaal and Baker (2008:776), summarizes these relevant pragmatic factors and the relationships between them. The contexts tested in the current study are marked in grey. In the discussion below, the examples are provided in English but the same distinctions apply to Dutch.

In Fig. 1, a first distinction is made between non-specific and specific reference. The choice between the two depends on whether the speaker (presumably) does or does not have a particular entity in mind when using a DP (Givón, 1995; Lyons, 1999). Non-specific referents are predominantly realized as indefinite DPs.<sup>1</sup> For example, the speaker in (2) does not have a particular car in mind and, therefore, a non-specific referent is realized as an indefinite DP.

<sup>1</sup> Non-specific reference can be expressed through a definite DP, e.g. generic reference predicating over a class of referents such as in 'The dodo is extinct' (Lyons, 1999). In general, these are not very frequent.

- (2) I want to buy a car soon so that I can go on trips.

The specific referents, on the other hand, present a more complex picture in terms of the use of a definite or indefinite article. A specific referent can be discourse-given (previously mentioned) or discourse-new (not previously mentioned). The former will always be realized as a definite article. For example, the car that is referred to in the second sentence in (3) is a specific car the speaker has in mind. It has been introduced in the first sentence and is, therefore, in the second sentence preceded by a definite article.

- (3) My neighbour has two cars for sale. I want to buy the green Porsche.

In the case of a discourse-new referent, both definite or indefinite articles can be used, depending on the presence or absence of mutual knowledge shared by the speaker and the listener. The specific discourse-new referent not known to the listener (no mutual knowledge) is realized as an indefinite DP, such as 'a car' in (4), where the car is known to the speaker but not the listener.

- (4) I have seen a car for sale. It is in the showroom next door.

The specific discourse-new referent known to the listener requires a definite DP as illustrated in (5) and (6).

- (5) The car that you sold last year, well, that was the best car ever.  
 (6) Mary picked up a banana. She first peeled off the skin and then cut it into small pieces.

The referent in (5) is a part of the speaker's and listener's mutual knowledge, as is clear from the discourse, and therefore a definite DP is felicitous. The example in (6) represents a particular type of 'first mention definite expression' also known as the 'bridging constructions' (Clark, 1975; Hawkins, 1991). The definite DP 'the skin', in the second sentence is associated with the DP that has already been introduced ('a banana') through the knowledge the speaker and the listener share about the world, namely that bananas always have a skin. This association is also known as the part-whole entailment, in which the parts entail the whole: the skin is part of a banana (Maratsos, 1976).

In the present study we focus on two pragmatic contexts: one that requires a definite article and one that requires an indefinite article. For the definite article, the specific discourse-new with mutual/world knowledge (bridging) context was used as in (6), whereas for the indefinite article, the non-specific context was used as in (2).

## 1.2. *The development of articles in Dutch children with TD*

For various languages it has been found that young children tend to omit articles (Dutch: Baauw et al., 2002; De Lange, 2008; English: Brown, 1973; Chierchia et al., 2001; Schaeffer, 2000; German: Eisenbeiss, 2000; Swedish: Chierchia et al., 2001). Analyses of spontaneous speech data suggest that by the age of four Dutch children reach an adult-like level use of article use (Rozendaal, 2008; Verbeek et al., 2007), which is later than children acquiring French or English (Rozendaal, 2008). In the context of studies on Dutch and English (Wijnen et al., 1994; Gerken, 1994) it has been suggested that the lack of stress on articles and limited salience could be causing children's article omission. Rozendaal (2008) attributes the observed cross-linguistic variation in the omission of articles amongst other things to the frequency of use in obligatory contexts in the input. She found that Dutch adults produced articles in only 86% of obligatory contexts compared to 90% in English, and almost 100% in French (p. 161).

In Dutch child language indefinite articles are omitted more frequently than definite articles (Schaeffer, 2000; Van Hout et al., 2010); the same holds for English (Brown, 1973; Maratsos, 1976; Zehler and Brewer, 1982). In adult Dutch (and English) bare nouns are typically indefinites, namely plural and mass nouns. Hence the input cues that facilitate article acquisition are less reliable for indefinite articles than for definites (De Lange, 2008), which might explain the observed developmental asymmetry. De Lange argues furthermore that speakers tend to leave the target article unexpressed in those cases where they are relatively uncertain about the correctness of the form. Uncertainty hinders lexical access, resulting in omission. This effect of uncertainty could be greater in speakers with limited processing abilities, such as young children, but also children with SLI. We will return to this issue in the next section.

Detailed analyses of substitution errors in spontaneous speech data show that different pragmatic aspects of articles (specificity, new and given information and presence of mutual knowledge) develop at different rates. Rozendaal and Baker (2008) report that, as soon as Dutch children start using articles, specificity poses no problem. However, up until the age of six, Dutch children persist in erroneously using definite articles in discourse-new contexts, that is where no mutual knowledge about the referent is shared between the speaker and the listener and where therefore an indefinite article

should be used (Roelofs, 1998). The same pattern has been reported for English pre-school children (Brown, 1973; Maratsos, 1976; Schaeffer, 2000; Van Hout et al., 2010; Zehler and Brewer, 1982; but see Schafer and de Villiers, 2000) and emerges in comprehension studies. For instance, Van Hout et al. (2008) found that in Dutch five-year-olds misinterpreted indefinites as definites. Substitution of definite articles for indefinites has been related to children's egocentrism (Maratsos, 1976). This is associated with the development of awareness of mutual knowledge and perspective-taking skills, which are part of the developing Theory of Mind. These skills emerge at four years of age and later (Ruffman and Perner, 2005).

In sum, Dutch children with TD omit articles and they substitute definite articles in indefinite contexts. Omission errors have been related to input factors and processing limitations, while substitution of definite articles in indefinite contexts has been attributed to cognitive immaturity. In the next section, we turn to the implications for article use in SLI.

### 1.3. Implications for article use in SLI

As we saw for children with TD, various factors affect children's use of articles and the same factors are expected to impact the use of articles in children with SLI.

The first factor mentioned above was salience. For SLI the role of salience has been addressed in the Surface Account (Leonard, 1989, 2009; Leonard et al., 1997). This account holds that the short duration and lack of stress on grammatical morphemes lead to incomplete processing by language learners, and particularly children with SLI who have often been found to have a reduced processing capacity and slower speed of processing (Archibald and Gathercole, 2006; Ellis Weismer et al., 1999; Leonard et al., 2007).<sup>2</sup> Incomplete processing of articles will lead to weak lexical representations of articles in children's mental lexicon and this could lead to article omission.<sup>3</sup> Previous research has indeed indicated that children with SLI are less likely to use articles in obligatory contexts than their language-matched peers (Dutch: Van Ewijk and Avrutin, 2010; Orgassa, 2009; English: Leonard, 1995; Leonard et al., 1997). This is in line with the idea that a lack of salience affects article use in children with SLI.

Second, the distributional properties of articles may influence acquisition in SLI since these properties affect the reliability of input cues and the certainty with which an article can be used. As in TD, these input factors could lead to variation within subjects also for children with SLI. More specifically, Dutch children with SLI may omit indefinites more frequently than definite articles.

Third, cognitive maturity may also be relevant. Previous research with five-year old children with SLI suggests that these children have problems with perspective taking abilities in the visual domain (Farrant et al., 2006). In language, problems with perspective taking could result in 'egocentrism' with the overuse of definite articles as its consequence. On the basis of their study (to be discussed in more detail later), Polite et al. (2011:292) suggest that an overloaded working memory causes such errors. However, they also indicate that it is difficult to disentangle the cause of such errors. They may also occur because a child has not yet acquired the pragmatic requirements of definite article use. Because of their delayed language development coupled with the functional complexity of (definite) articles it is possible that children with SLI have prolonged difficulties with morphological development and mapping forms to functions. One way to distinguish between the two explanations, i.e., failure to take the listener's perspective into account and delayed morphological development, would be to examine the direction of the errors. Failure to take the listener's knowledge into account is expected to lead to overuse of definite articles, while incomplete acquisition of the pragmatic requirements of definite article use could lead to overuse of both definite and indefinite articles.

The study on SLI briefly mentioned above by Polite et al. (2011) examined article use in English in terms of pragmatics. In an elicitation study with five-year-old children with SLI, they tested production of definite articles in specific discourse-given contexts and indefinite articles in non-specific contexts. The SLI group performed much worse on the specific condition where definite articles were required (20% correct) than age-matched (76% correct) and language-matched (44% correct) TD control groups. In non-specific contexts all three groups were highly accurate (SLI: 87%; TD-age matched: 89%; TD-language matched: 84% correct). The predominant error type in the SLI group was use of indefinite articles in the specific discourse-given context and definite articles in the non-specific context (substitution). In both groups with TD, substitutions were only more frequent than omissions in the specific context.

<sup>2</sup> One reviewer pointed out that in English SLI the third person singular – s is much more affected compared to the noun plural – s, despite similar phonological properties. However, difference in placement – sentence-medial versus sentence-final – could lead to a crucial difference in salience between the two morphemes (Hsieh et al., 1999).

<sup>3</sup> However, also if lexical representations in SLI and TD were equally strong, children with SLI may show higher omission rates because processing limitations is also expected to affect the retrieval of articles (Van Ewijk and Avrutin, 2010).

At this point it is relevant to consider the context used to elicit definite articles in the study conducted by Polite et al. In their study the specific discourse-given context was tested, illustrated in (7).

(7) Mary bought an apple and a banana. She will eat the banana first and leave the apple for her brother.

As the authors suggest, this context for definite articles requires keeping the information about the referents active in working memory until the task is completed. This may well be taxing (see also Brown, 1973; Emslie and Stevenson, 1981; Maratsos, 1974). The demands placed by this particular context could cause additional errors. Schafer and de Villiers' (2000) results showed, for example, that English TD children are more accurate at using definite articles in the specific discourse-new context (70–90% accurate) than in the specific discourse-given context (24–60% accurate).<sup>4</sup> The question that arises, then, is whether children with SLI also perform much worse than TD controls in the specific discourse-new condition, because this condition is less taxing than the specific discourse-given condition in terms of working memory load. As such, the specific discourse-new condition could be more comparable to a condition that elicits indefinite articles.

In addition, Polite et al. analyzed their data at the group level leaving open the question of whether the individual profile data show the same trends, not only for SLI but also for TD. Schafer and de Villiers (2000) report a great deal of individual variation in amounts and types of errors in use of definite and indefinite articles in English children with TD. Analyses of individual profiles are also important because different factors may influence each individual child to a different degree. For instance, one child may show signs of both incomplete morphological development and failure to take into account the listener's perspective, but another child may only struggle with the pragmatics. The differences between children can be made visible in error profiles (e.g., errors in both directions versus errors in one direction). Hence, in order to better understand what distinguishes SLI from TD in terms of article use, comparisons of group data but also of individual error profiles are important.

#### 1.4. Goals and research questions of this study

The goal of this study was to investigate article use in Dutch children with SLI, with a specific focus on the pragmatic aspects of articles in order to examine whether and how such aspects of language are affected by the impairment. In order to achieve this goal we formulated the following general research question that is further split into two sub-questions:

- (8) Do children with SLI differ from TD children in their production of articles, and, if so, does this difference hold for both specific and non-specific contexts?
- a. Do children with SLI omit articles more frequently than children with TD, and is this the same for specific and non-specific contexts?
  - b. Do children with SLI substitute articles – that is, use definite articles in contexts in non-specific contexts and indefinite articles in specific contexts – more frequently than children with TD, and is this the same for specific and non-specific contexts?

Because salience may have more impact on children with SLI compared to TD, we expected more omission of articles by children with SLI for both specific and non-specific contexts. Secondly, we predicted that children with SLI will substitute articles more frequently compared to children with TD. Children with SLI may substitute definite articles in non-specific contexts because of memory limitations and incomplete morphological development, but they may also substitute indefinite articles in specific contexts due to incomplete morphological development. In the present study, as previously mentioned, the specific discourse-new context was chosen to elicit a definite article, in order to reduce working memory load compared to the specific discourse-given context used by Polite et al. (2011). We therefore predicted that children with SLI in our study would be more accurate on definites than the children in Polite et al.'s study.

## 2. Methods

### 2.1. Participants

Sixty-two monolingual Dutch children and 14 adult controls were tested. The children were assigned to an SLI group, an age-matched typically developing group (TD-AM), or a younger typically developing group matched to the SLI group on language abilities (TD-LM) (Table 1). The three-group design is often used to determine whether children with SLI have a

<sup>4</sup> The accuracy ranges are based on differences between age groups.

Table 1  
Groups in the study.

	<i>N</i>	Age in months	Raw receptive vocabulary score
SLI	19	85 (SD = 8; 73–100)	68 (SD = 9.4; 54–82)
TD-AM	26	83 (SD = 7.4; 72–97)	78 (SD = 7.5; 56–90)
TD-LM	17	65 (SD = 3; 60–70)	67 (SD = 8.7; 48–81)
Adults	14	23 (SD = 8; 19–45) (in years)	Not administered

language delay beyond the general delay (Rice et al., 2006:794).<sup>5</sup> Language level was assessed using the receptive vocabulary subtest of the Taaltoets Alle Kinderen ‘TAK’ (Verhoeven and Vermeer, 2006). A one-way ANOVA indicated an effect of Group ( $F(2, 55) = 8.35, p = .001$ ); the SLI group scored lower than the TD-AM group ( $p = .002$ ) but was not significantly different from the TD-LM group ( $p = 1.00$ ); the TD-AM group scored higher than the TD-LM group ( $p = .012$ ).

Children with SLI were recruited from special schools for children with speech and language problems. They had been referred to these schools by certified clinicians on the basis of a standardized protocol for speech and language disorders in the Netherlands (Cluster 2 protocol). For this study, we selected children who met the criteria for SLI (Stark and Tallal, 1981); this selection was made based on information in the school files. Selected children had no hearing impairment, no neurological damage and no socio-emotional problems. Their scores on the tests measuring expressive language proficiency – TAK (Verhoeven and Vermeer, 2002) or Taaltest voor Kinderen (Van Bon and Hoekstra, 1982) – were at least 1.5 SD below the mean for their age. Moreover, they had to have a non-verbal IQ score of 80 or above. The average non-verbal IQ score of the SLI group was 103 (SD = 15) as measured by SON-R (Snijders et al., 1989). Their low language abilities could therefore not be related to low general learning abilities.<sup>6</sup> For all children a parental consent form was obtained.

## 2.2. Experimental design and materials

An elicitation task was created using specific and non-specific contexts for articles similar to those used in the Diagnostic Evaluation of Language Variation (DELV; Seymour et al., 2005). These materials are available in full at <http://www.iris-database.org>. Unlike the DELV, where the target noun was elicited by asking a question, in this study a sentence completion task was used to elicit the target noun with an appropriate article. Children listened to short stories setting up the context and were asked to complete a sentence, which elicited a definite or indefinite DP in the object position (see examples in (9) and (10)). No pictures or props were used since the use of such objects might lead to the use of an article where the verbal context alone would not require it. Our study was limited to specific discourse-new contexts where a definite article is compulsory and non-specific contexts where an indefinite article is obligatory. There were 8 items per condition (see Appendix for the full list) and 16 filler items, amounting to a total of 32 items.

The specific discourse-new condition is illustrated in (9). This condition involves a part-whole relation.

### (9) Specific discourse-new condition

Experimenter: Anna gaat een banaan eten. Ze moet er eerst iets vanaf halen. Het stukje dat Anna van de banaan afhaalt is ...

“Anna is going to eat a banana. She has to first take something off the banana. The part that Anna takes off the banana is ...”

Child (expected response): de schil ‘the skin’

The definite article in Dutch used in (9) is ‘de’; this form is used with common gender nouns in the singular and with plural nouns regardless of gender. Dutch has a second definite article ‘het’, which precedes neuter nouns in the singular, but such nouns were not included here since errors with neuter gender are frequent for a long time (Polišenská, 2010). Only nouns were included that are typically acquired before the age of 4 years (Schlichting and Lutje Spelberg, 2002; Damhuis et al., 1992). Based on these criteria the following 8 nouns were selected for the specific discourse-new condition (they all form part of a whole given in parentheses): *schil* ‘skin’ (*banaan* ‘banana’), *deur* ‘door’ (*auto* ‘car’), *band* ‘tyre’ (*fiets* ‘bicycle’), *dop* ‘top’ (*fles* ‘bottle’), *glijbaan* ‘slide’ (*speeluin* ‘playground’), *schoorsteen* ‘chimney’ (*open haard* ‘fire place’), *toren* ‘steeple’ (*kerk* ‘church’), *leuning* ‘railing’ (*trap* ‘stairs’).

<sup>5</sup> Mean length of utterance (MLU) is often used for language-matching. Due to limited resources we were unfortunately unable to collect and transcribe speech samples that allowed reliable MLU calculations. Because children with SLI often show delayed vocabulary development (Schwartz, 2009), we matched on the raw vocabulary scores. This resulted in age groups that were similar to those in De Jong (1999) who used MLU for language-matching in his work on SLI in Dutch.

<sup>6</sup> For one child non-verbal IQ (score = 87) was measured with the WISC-III NL (Kort et al., 2002); for six children, all from the same school, the school contact person had verified that their non-verbal IQ is 80 or higher but the exact scores per child could not be obtained.



In the non-specific condition, a lead-in sentence introduced a non-specific DP denoting a profession, such as a photographer in (10). In the following sentence a non-specific DP needs to be expressed using an indefinite article. This DP represented either a tool used by the profession, such as ‘a camera’ in (10), or a place where the profession is exercised. The two DPs are related as a result of the generic property of a photographer having a camera (Haspelmath, 1997).

- (10) Non-specific condition  
 Experimenter: Denk eens aan een fotograaf. Die maakt foto’s met...  
 ‘Think of a photographer. He takes photos with...’  
 Child (expected response): een camera ‘a camera’

As with the specific discourse-new condition, only nouns acquired early were included; the gender criterion did not apply since Dutch indefinite articles are not gender-marked. The following 8 nouns were selected for the non-specific condition: *voetbal* ‘ball’, *schaar* ‘scissors’, *kasteel* ‘castle’, *camera* ‘camera’, *schip* ‘ship’, *paard* ‘horse’, *hoed* ‘hat’, *pistool* ‘pistol’.

To assess whether definite and indefinite articles were indeed compulsory in the selected specific and non-specific contexts in our experiment we analyzed the adult control data. This was particularly relevant for the specific discourse-new condition, because the part-whole relation is not a categorical property and items could vary in this respect. If for an item the part-whole entailment is less necessary, shared/mutual knowledge may not always apply, which, in turn, could lead to use of indefinite articles. This applied to one item in the specific discourse-new condition (*dop* ‘top’): almost one third of the adult controls (30.7%) produced the target noun with an indefinite article. This particular item was consequently removed from the analysis of the three child group data. All other items were produced with the target article by the majority of the adult controls (94–100%).<sup>7</sup>

### 2.3. Coding

In the specific discourse-new condition, responses including a definite article were coded as correct, responses without an article were coded as omissions, and indefinites as substitutions. In the non-specific condition, indefinite articles were coded as correct; omissions could also occur, or, if a definite article was used, substitutions were coded. Any gender errors with definite articles were ignored. Responses with pronouns or demonstratives were excluded. In the specific discourse-new condition, when a child produced a noun (with or without an article), which was not a member of the part-whole relation, this response was excluded from analysis. For example, in (12) the child repeats the noun *fiets* ‘bicycle’ already mentioned and not the target *band* ‘tyre’ and in (13) the child uses a different target noun *raam* ‘window’ instead of *schoorsteen* ‘chimney’

- (12) De fiets van Sander is kapot. Er zit ergens een gaatje in. Er zit een gaatje in de fiets.  
 ‘Sander’s bicycle is broken. There is a hole somewhere. There is a hole in *the bicycle*.’
- (13) Tineke steekt het vuur aan in de open haard. De rook gaat ergens door naar buiten. De rook gaat naar buiten door het raam.  
 ‘Tineke lights the fire in the fireplace. The smoke goes outside through something. The smoke goes outside through *the window*.’

This resulted in an exclusion of 30% responses (SLI), 16% (TD-AM) and 14% (TD-LM).

In the non-specific condition, a noun (with or without an article) that was not semantically related to the target noun was also excluded from analysis, resulting in 21% exclusion for SLI, 9% for TD-AM and 15% for TD-LM. Despite the quite high number of excluded responses, we did obtain at least four responses for each child per condition. The set of excluded responses was larger for SLI compared to TD, but not qualitatively different.

## 3. Results

### 3.1. Descriptive statistics

Table 2 gives an overview of the mean percentages of correct, omitted and substituted articles per condition for each group. Proportions were calculated on the basis of the sum of all three response types (denominator: correct, omissions, substitutions).

<sup>7</sup> The child data also showed a disproportionately high percentage of indefinite articles for the item *dop* ‘top’, almost 50%, whereas substitutions for the other items in the specific discourse-new condition ranged between 0 and 12.5%.

Table 2

Mean percentages (standard deviation – SD) and sum (*N*) of correct article use, omitted articles, substituted articles per condition across groups.

	Specific discourse-new condition			Non-specific condition		
	% correct	% omitted	% substituted	% correct	% omitted	% substituted
SLI	61 (31) <i>N</i> = 498	30 (30) <i>N</i> = 257	8 (10) <i>N</i> = 64	55 (38) <i>N</i> = 592	27 (33) <i>N</i> = 232	20 (21) <i>N</i> = 192
TD-AM	88 (20) <i>N</i> = 1072	10 (20) <i>N</i> = 120	3 (6) <i>N</i> = 32	90 (19) <i>N</i> = 1248	4 (11) <i>N</i> = 56	6 (17) <i>N</i> = 40
TD-LM	68 (35) <i>N</i> = 584	26 (32) <i>N</i> = 208	6 (18) <i>N</i> = 40	78 (30) <i>N</i> = 712	19 (19) <i>N</i> = 184	2 (5) <i>N</i> = 24

None of the groups performs at ceiling in the experimental task. The adults' performance and the item-analysis based on the adult data (Section 2.2) indicate that the task is valid. It is worth noting in this respect that, even in spontaneous speech, eight-year old Dutch children still make errors with articles (Verbeek et al., 2007) and even Dutch adults occasionally omit articles (Rozendaal, 2008:161).

First inspection of the data indicated lower rates of correct production in the SLI group compared to the two other groups in both conditions. The results also indicated more omissions than substitutions in the specific discourse-new condition for all experimental groups. The omission rate appeared to decrease with age in children with TD, TD-AM children omitted fewer articles than TD-LM children. Children with SLI resembled the TD-LM group with regard to omission in the specific discourse-new condition. In the non-specific condition, the error profile of the SLI group was similar to that of the TD-AM group: both groups made a similar amount of omissions and substitutions. Overall, the children with SLI made more errors than TD-AM children, however. The younger TD-LM group had more errors of omission than substitution in comparison to the other two groups in this condition.

### 3.2. Mixed logistic regression analyses

To further statistically analyze the results, mixed logistic regression was used with Group (SLI, TD-AM, TD-LM) and Condition (specific, non-specific) as fixed-effect predictors and Child and Item as random-effect predictors. Mixed logistic regression makes it possible to assess the simultaneous effect of multiple variables on a binary outcome variable and is particularly suited for uneven datasets with many missing data points, as is the case in our study. Furthermore, the inclusion of random-effect predictors allows generalization of the predictions of the statistical model to the wider population of children and items (DPs, in our study) (Chatterjee and Hadi, 2006). We ran three separate analyses with correct article use, omission, and substitution as the binary dependent variables. Only outcomes that reached statistical significance at the .05 alpha level are reported.

In the accuracy analysis, both omissions and substitutions were counted as incorrect. The SLI group was less accurate than the TD-AM group in both the specific discourse-new and non-specific condition. This was revealed by a main effect of Group ( $\beta = -2.12$ ,  $SE = 0.48$ ,  $Z = -4.39$ ,  $p < .001$ ). The lower performance for TD-LM compared to TD-AM ( $\beta = -1.11$ ,  $SE = 0.51$ ,  $Z = -2.19$ ,  $p = .03$ ) was not maintained when the alpha level was Bonferroni-corrected for multiple comparisons ( $\alpha = .05/3 = .017$ ). Also, the difference between TD-LM and SLI ( $p = .05$ ) was too marginal to remain after this correction. Both the SLI group and the TD-LM group omitted articles more often compared to the TD-AM group (SLI:  $\beta = 2.44$ ,  $SE = 0.72$ ,  $Z = 3.36$ ,  $p < .001$ ; TD-LM:  $\beta = 2.07$ ,  $SE = 0.75$ ,  $Z = 2.76$ ,  $p = .006$ ). In the SLI group substitution was more frequent than in the TD-AM group ( $\beta = -1.89$ ,  $SE = 0.49$ ,  $Z = -3.89$ ,  $p < .001$ ) and in the TD-LM group ( $\beta = -2.33$ ,  $SE = 0.63$ ,  $Z = -3.68$ ,  $p < .001$ ).

The numerical data suggest that the relatively poor performance of the SLI group could be due to the use of definites in non-specific contexts (Table 2): in the non-specific condition the SLI group substituted more (20%) than both the TD-LM (2%) and the TD-AM (6%) groups. This difference did not reach statistical significance, probably due to the large amount of individual variation, an issue to which we will return below. In the specific discourse-new condition all three groups substituted infrequently (SLI: 8%; TD-AM: 3%; TD-LM: 6%).

### 3.3. Individual patterns

Based on examination of the whole data set, we divided the children into types on the basis of their error pattern (see Table 3): '100% correct' were children who did not produce any omission or substitution, 'substituters' were children who – if they made errors – made substitution errors only (to different degrees and in different directions, either unidirectional or bidirectional), 'omitters' were children who – if they made errors – made omission errors only (to different degrees and in



Table 3

Individual patterns; all responses. Percentages (numbers) of children with 100% correct, with at least one omission error, with at least one substitution error, or with at least one omission and one substitution.

Error pattern	SLI	TD-AM	TD-LM
100% correct	5% (1)	31% (8)	17% (3)
Omitters	0	34.5% (9)	59% (10)
Substituters	16% (3)	34.5% (9)	12% (2)
Mixed	79% (15)	0	12% (2)

Table 4

Individual patterns; omissions excluded (based only on responses where an article is used). Percentages (numbers) of children with 100% correct, with difficulties in the non-specific condition, with difficulties in the specific discourse-new condition, or with difficulties in both conditions.

Error pattern	SLI	TD-AM	TD-LM
100% correct	5% (1)	61.5% (16)	65% (11)
Non-specific condition problematic	53% (10)	23% (6)	12% (2)
One article definite	16% (3)	4% (1)	6% (1)
Two articles unidirectional definite	37% (7)	19% (5)	6% (1)
Specific discourse-new condition problematic	21% (4)	11.5% (3)	12% (2)
One article indefinite	0	0	6% (1)
Two articles unidirectional indefinite	21% (4)	11.5% (3)	6% (1)
Bidirectional errors	21% (4)	4% (1)	12% (2)

one of the two or in both conditions), and, finally, ‘mixed’ were children who both substituted (unidirectional or bidirectional) and omitted articles (in one or both conditions) to different degrees. This analysis does not distinguish between children who omit or substitute frequently or infrequently. Information on individual variation in degrees of correct responses, omissions and substitutions is provided in Appendix 2.

The finding that only one child with SLI was 100% accurate confirms the group analyses reported earlier which showed lower accuracies for the SLI group compared to the TD-AM and TD-LM group. As expected, the TD-AM group had the highest percentage of children with a 100% correct score (31%); other children in this group either omitted or substituted. Many children in the SLI group mixed substitution and omission errors, whereas this mixing of errors was infrequent in the TD groups. In the SLI group no child made only omission errors (without substituting), whereas in both TD groups there were relatively many children whose errors were confined to omissions (TD-AM: 34.5%; TD-LM: 59%).

In order to better understand how children use articles when they produce them we examined individual profiles based on the realized responses only, leaving the omission errors aside. The direction of errors was investigated, because certain errors (e.g., definites in non-specific contexts) are typical for younger children and such errors are thus important for identifying a delay profile in SLI. The results are in Table 4. The first main category were children who used both articles and made no errors (‘100% correct’). Since omission errors are not taken into account in the analysis in Table 4, in contrast to Table 3, more children appear here in the 100% correct category. The second main category consisted of children who showed difficulties in the non-specific condition. ‘One article definite’ were children who used only the definite article, regardless of condition. ‘Two articles unidirectional definite’ were children who sometimes used both articles correctly, in combination with errors in the non-specific condition where they overused definite articles. For the third main category the children overused indefinites and thus displayed difficulties in the specific discourse-new condition. The fourth main category included children who in some instances used both definite and indefinite articles correctly, but also made errors in both conditions (‘Bidirectional errors’).

Only one child with SLI used articles correctly, while the majority of TD children did. Most children with SLI used both articles (16/19 = 84%). The SLI group has the largest percentage of children who made errors in both directions, revealing that within-subject variation in the SLI group was not only found for mixing omission and substitution, but also for using definite articles in the non-specific condition and vice versa. The most common error pattern in the SLI group were children who overused definite articles in the non-specific condition, as it was in the TD-AM group.

#### 4. Discussion

The first expectation was that children with SLI would omit articles more frequently than children with TD in both specific and non-specific contexts due to effects of salience. The SLI group omitted more than the TD-AM group, while no robust difference emerged between the SLI group and the younger language-matched TD-LM group. No interaction effects

emerged between Group and Condition, showing that the difficulties for the SLI group held for both the specific and non-specific condition.

Secondly, we predicted that children with SLI would substitute articles more frequently compared to children with TD since substitution might be caused by memory limitations and/or incomplete morphological development. The SLI group did make more substitutions than both TD-AM and TD-LM groups. Again, no interaction between Group and Condition emerged, showing that the higher rate of substitution errors in the SLI group included both substitutions of indefinite articles as well as definite articles. That the delay in article use in the SLI group goes beyond a general delay was particularly clear in the substitution errors, as the SLI group made more substitution errors than both the TD-AM and TD-LM group.

Problems with articles in Dutch children with SLI do not only exist at the group level, but also at the level of many individual children. Two analyses of individual patterns demonstrated a high degree of optionality and variability in the SLI group: The children with SLI tended to make both omission and substitution errors and relatively many children with SLI made substitution errors in both directions. Closer scrutiny of article use revealed that most children with SLI showed a delay profile characterized by use of definite articles in the non-specific condition. In sum, we conclude that, in Dutch children with SLI, article use is compromised in both specific and non-specific contexts and that they children with SLI do not only omit articles more than their TD peers, but also make substitution errors.

Our final prediction was that in our study accuracy in using definite articles would be higher than in Polite et al.'s (2011) study on SLI in English, because the specific discourse-new context in our study is less demanding than the specific discourse-given context tested by Polite et al. In our study the SLI group had an accuracy of 61% correct in the specific condition, whereas this was only 20% in the study conducted by Polite et al., confirming our prediction. It must be kept in mind though that the children in our study were on average two years older. In addition, unlike Polite et al. we did not find any asymmetries between definite and indefinite articles, at least not at the level of group data. We hypothesized that this could be due to rather similar working memory demands in the specific and non-specific contexts in our study, whereas in the Polite et al. study the specific context tested may have been more taxing.

Other differences between our study and Polite et al.'s study were (i) that in the SLI group performance with indefinite articles was not highly accurate in our study, and (ii) our study children with SLI have a high number of omissions. Possibly, differences between English and Dutch have contributed to these different findings. As mentioned earlier, Dutch articles are acquired later than English articles (Rozendaal and Baker, 2008). The difference between the two languages is expected to be maintained in SLI and this could have contributed to the higher accuracies for indefinites in the Polite et al. study. The observation that the English children with SLI substituted rather than omitted (as the Dutch children did) may support this interpretation, because omission is more characteristic of earlier developmental stages, whereas in later stages children substitute more often.

The results of our study raise the question as to what causes children with SLI to have difficulties with articles. It is possible that their morphological knowledge is incomplete, but they may also fail to use morphological knowledge due to problems with lexical access or taking into account pragmatic information. Below we explore these ideas discussing two observations that emerged from our study.

First, optionality of article use, and variability in the directionality of errors with articles, was a clearer characteristic of the behaviour of individual children in the SLI group than of the behaviour of individual children in both TD groups. According to Leonard (2007) optionality and variability in use of grammatical morphology in children with SLI could indicate that children with SLI have weak associations between the forms and (pragmatic) functions of definite and indefinite articles in long-term memory, but these errors could also stem from failures to retain relevant information about the context in short-term memory. Retaining contextual information and then channelling it to connect it to lexical items stored in long-term memory is crucial for selecting an article, and in children with SLI this ability seems compromised (Van Ewijk and Avrutin, 2010). Hence, both a lack of morphological knowledge and limited processing abilities could underlie the observed variation in our study.

Second, relatively many children with SLI overused definite articles in the non-specific context, an error type reported for young TD children (see Section 1.2). In young TD children overuse of definites has been attributed to a lack of Theory of Mind and limitations in perspective taking skills (Maratsos, 1976; and others). In our study, in the non-specific condition children with SLI may have had a specific referent in mind and, failing to take the listener's perspective into account, used a definite article. This was possibly because they were unable to apply their perspective taking skills in online performance due to an overloaded working memory. In this respect it would be interesting to compare children with SLI to children with autism. Studies looking at adults with autism have found difficulties with pragmatic aspects of language, including Theory of Mind and use of referential expressions such as pronouns (Colle et al., 2008). A question that could be pursued in future research is whether similarities between the two groups extend to article use, pointing to aetiological similarities between SLI and autism.

In the present study it was demonstrated that Dutch children with SLI have problems using articles and that article errors in Dutch children with SLI appear to be modulated by pragmatic context to some extent. Future research should aim

at disentangling effects of impaired knowledge and performance factors in SLI by applying methodologies that measure children's responses to definite and indefinite articles when used incorrectly, such as in self-paced listening tasks (Marinis, 2010). In this way insights could be obtained into children's article representations. It would furthermore be important to contrast obligatory contexts for articles systematically manipulating the variables specificity, givenness and mutual knowledge, because this would provide more insight into which pragmatic aspects pose problems to children with SLI. In addition, individual differences should be further explored. In particular, it would be interesting to determine if, using far larger samples, certain error profiles are correlated with age and severity of the disorder. Also, relationships between short-term and working memory on the one hand and article use on the other could be investigated, and future studies could examine the availability of a Theory of Mind in children with SLI and how this relates to their overuse of definite articles, and compare this to other populations, such as children with autism.

## Appendix A

### Specific discourse-new condition

1. Anna gaat een banaan eten. Ze moet er eerst iets vanaf halen. Het stukje dat Anna van de banaan afhaalt is... *de schil*. (Anna is going to eat a banana. She has to first take something off the banana. The part that Anna takes off the banana is ... the skin.)
2. Bas wil uit de auto. Hij moet iets open doen om naar buiten te gaan. Bas gaat naar buiten door... *de deur*. (Bas wants to get out off the car. He must open something to get out. Bas is leaving through... the door.)
3. De fiets van Sander is kapot. Er zit ergens een gaatje in. Er zit een gaatje in... *de band*. (Sander's bicycle is broken. There is a hole somewhere. There is a hole in... the tyre.)
4. Louise doet de fles cola dicht. Ze draait iets op de fles om hem dicht te doen. Louise doet de fles dicht met... *de dop*. (Louise is closing the coca cola bottle. She screws something on the bottle to close it. Louise is closing the bottle with... the top.)
5. Mark is in de speeltuin. Hij wil ergens afglijden. Mark glijdt van... *de glijbaan*. (Mark is at the play ground. He wants to slide down something. Mark slides down... the slide.)
6. Tineke steekt het vuur aan in de open haard. De rook gaat ergens door naar buiten. De rook gaat naar buiten door... *de schoorsteen*. (Tineke lights the fire in the fireplace. The smoke goes outside through something. The smoke goes outside through... the chimney.)
7. Rik staat op het hoogste puntje van de kerk. Hij staat op het puntje van... *de (kerk)toren*. (Rik is standing on the highest point of the church. He is standing on the top of... the (church)tower.)
8. Jan loopt de trap op. Hij houdt zich ergens aan vast. Jan houdt zich vast aan... *de leuning*. (Jan goes up the stairs. He is holding onto something. Jan holds onto... the railing.)

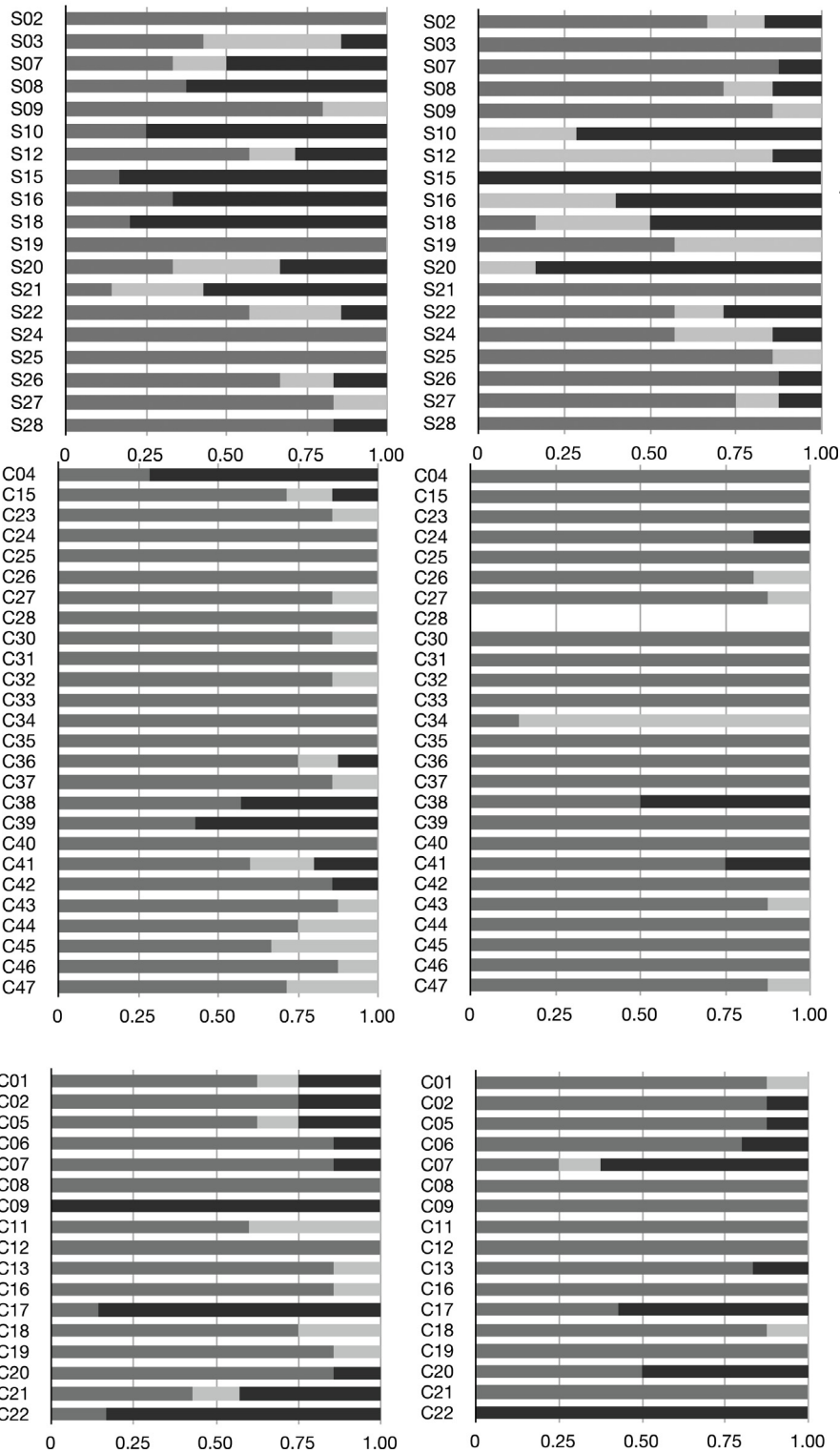
### Non-specific condition

1. Denk eens aan een voetballer. Die voetbalt met... *een voetbal*. (Think about a soccer player. He plays soccer with... a soccer ball.)
2. Denk eens aan een kapper. Die knipt met... *een schaar*. (Think about a hair dresser. He cuts hair with... a scissor.)
3. Denk eens aan een prinses. Die woont in... *een kasteel*. (Think about a princess. She lives in... a castle.)
4. Denk eens aan een fotograaf. Die maakt foto's met... *een fotoestel/een camera*. (Think about a photographer. He takes photos with... a camera.)
5. Denk eens aan een kapitein. Die vaart op... *een schip/een boot*. (Think about a captain. He sails on... a ship/a boat.)
6. Denk eens aan een ridder. Die rijdt op... *een paard*. (Think about a knight. He rides on... a horse.)
7. Denk eens aan een goochelaar. Die tovert een konijn uit... *een hoed*. (Think about a magician. He conjures a rabbit out of... a hat.)
8. Denk eens aan een soldaat. Die schiet met... *een geweer/een pistool*. (Think about a soldier. He shoots with... a gun/pistol.)

## Appendix B

The figures below indicate individual variation in proportions of accuracy (Pcorrect), substitution (Psubstitution) and omission (Pcomission) in the SLI group (two top graphs), the TD-AM (two middle graphs) and the TD-LM group (two bottom graphs) with definite (left) and indefinite articles (right).

■ Pcorrect    ■ Psubstitution    ■ Pomission



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