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Referential cohesion in Swedish preschool children's narratives

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ABSTRACT

Referential cohesion is an important part of discourse, as speakers use referring expressions to glue utterances together. Choosing an appropriate expression requires the speaker to continuously keep track of the salience of referents in the discourse. Because this is cognitively challenging, children are expected to have problems creating referential cohesion. Yet, research has also shown that young children are sensitive to discourse factors in choosing referring expressions. To shed more light on how and when children learn to use referential expressions to create a cohesive discourse, we analyzed oral narratives by monolingual Swedish-speaking children aged 4;0–6;10, elicited with the Multilingual Assessment Instrument for Narratives (MAIN). We hypothesized that children would base their choice of referring expressions to a large extent on discourse factors for which no detailed mental model of the discourse is required, such as animacy. Our results show that the children indeed relied heavily on animacy as a cue for pronominalization. At the same time, they were sensitive to fine-grained levels of local discourse salience. We propose that, like adults, children use a combination of global and local discourse factors for choosing referring expressions, but that the relative weights of these factors may vary with cognitive capacity.

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1. Introduction

Cohesion is an essential feature of human communication, as it turns a set of seemingly unrelated clauses or utterances into something bigger, i.e. a discourse. Cohesion in discourse may be achieved in different ways (Halliday and Hasan, 1976), but the general principle is that individual clauses or utterances must be linked to each other in some way to become part of a cohesive discourse. In English, for instance, this can be done by gluing sentences together with connective words (e.g. *and*, *because*, *while*). Another important cohesive device is reference. Using different types of referring expressions, speakers can link an element in one utterance to a previous (or a following) utterance. Consider the following example:

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- (1) a. A cat was chasing a butterfly.
b. A cat got stuck in a bush.

The sentences in (1) have no apparent connection to each other. They may describe two unrelated events, involving two different cats in different places. They may also be about the same cat, but since the sentences do not seem to be linked in any way, we cannot be sure. However, if the first indefinite article in (1b) is replaced by a definite article, as in (2b), cohesion suddenly appears. Now it is clear that the cat mentioned in (2b) has to be the same cat that was mentioned in (2a). The same can be achieved by using a pronoun, as in (2c), although without further context the pronoun might also refer to the butterfly.

- (2) a. A cat was chasing a butterfly.
b. The cat got stuck in a bush.
c. It got stuck in a bush.

Even though it is not made explicit here, we also interpret the sentences as temporally connected: the event described in (2b) or (2c) follows the one in (2a).

The question we ask in this paper is how and when children learn to use different referential forms to link individual clauses in order to produce a cohesive discourse. On the one hand, children need to master the appropriate means to introduce a character in the discourse. On the other hand, they need to learn how to refer back to a previously introduced character later in the discourse. As we are concerned with the relation between one clause and the clause(s) that precede(s) it, the focus here is on anaphoric reference.² We make a distinction between two types of anaphoric reference: referent maintenance (repeated reference to the same entity in consecutive clauses) and referent reintroduction (reference to a previously established referent that was not mentioned in the directly preceding clause).³

There are several reasons why producing adequate anaphoric references is not a trivial task: (1) languages often have a range of different referring expressions to choose from. For example, many languages distinguish between indefinite and definite noun phrases (NPs), NPs preceded by demonstrative determiners, demonstrative pronouns, personal pronouns, and null forms (zero anaphora), all with different uses that children need to acquire; (2) to choose a referring expression that links back to the preceding discourse, speakers need to keep the discourse in memory. They also need to continuously update the memory representation when new referents are added to the discourse or when reference to old referents is maintained; (3) to make sure the addressee is following the referential connections, the speaker needs to continuously monitor the interlocutor's mental model of the discourse.⁴ Each of these three factors asks for complex cognitive capacities: the first requires the acquisition of different lexical forms and mapping them to pragmatic functions; the second requires sufficient working memory capacity and self-monitoring; the third requires some level of Theory of Mind skills. Given that longer stretches of discourse are generally already produced at a young age, at which these cognitive skills may still be developing, it is reasonable to expect that creating a referentially cohesive discourse is a challenging task for young speakers.

To get more insight into how and when children learn to produce referentially cohesive discourses, we analyzed the referring expressions used for reintroducing and maintaining referents in oral narratives of 72 monolingual Swedish-speaking children aged 4;0 (years;months) to 6;10. Our results provide evidence that children of this age have to a large extent acquired the Swedish referential forms and their functions. Still, there are a number of cases where they show non-adult-like behavior in their pragmatic use of the different forms, which might indicate problems in maintaining a mental model of the discourse or in monitoring addressee knowledge.

This paper proceeds as follows. The next section provides a background on the production of referring expressions in children and adults. Section 3 describes the method of the current study. Section 4 presents the results and the paper closes with a discussion of how these results fit into the larger framework of accessibility and reference production (Section 5).

2. Background

2.1. The role of accessibility in the choice of referring expression

It is generally assumed that, in a cohesive discourse, the choice of referring expressions is governed by some notion of discourse salience (e.g. Arnold, 2010). For instance, pronouns are said to be typically used for referents that are currently in the focus of attention, while more elaborate expressions, such as lexical NPs, are required when the referent is less salient (e.g. Ariel, 1990; Grosz et al., 1995; Gundel et al., 1993). According to the theory of accessibility (Ariel, 1990, 2001), different types of referring expressions form a hierarchy, whereby the expressions at one end code a low degree of accessibility, which means that they signal that the referent is relatively difficult to retrieve from memory. At the other end of the hierarchy, expressions code a high degree of accessibility, meaning that the referent is assumed to be highly activated in memory. Since highly

² A study of the acquisition of character introduction on the same data as used in the current study is reported in Lindgren (2018a).

³ Referent maintenance and reintroduction are also called *local coreference* and *no local coreference*, respectively, see e.g. Hendriks (2002).

⁴ This process may or may not coincide with the process in (2), depending on how much audience design takes place, i.e. how much speakers take into account the specific perspective of their addressees (e.g. Brennan and Hanna, 2009).

accessible referents need less informational content to be identified correctly, expressions referring to such referents are generally shorter (pronouns, zeros) than expressions referring to less accessible referents (lexical NPs).

Failure to respect the degree of accessibility of the referent can lead to unrecoverable references. For example, without additional context, the pronoun in the second sentence of (3a) is likely to be unrecoverable, since both possible antecedents, Mary and Susan, are about equally salient in the discourse. At the position of the pronoun in (3b), however, Susan is probably more accessible than Mary, and hence, the pronoun is likely to be resolved to Susan.

- (3) a. Mary and Susan were arguing. She got really angry.
b. Mary and Susan were arguing. Susan had a temper. She got really angry.

Of course, one way to avoid references that are unrecoverable for the addressee would be to always use full definite descriptions or proper names, which are less referentially ambiguous than pronouns. However, speakers also like to be economical: they prefer not to spend more effort in providing information than is strictly necessary (the principle of least effort; Zipf, 1949; see also Grice, 1975). Pronouns, with their short word forms and their low semantic content, are economical expressions par excellence. In addition, being brief can also be beneficial for the addressee: addressees expect speakers to use the full range of possibilities that the language provides to signal how accessible a referent is. For example, a discourse in which the same referent is referred to with a definite description multiple times in a row becomes repetitive and can lead to longer processing time compared to a discourse in which repeated referents are pronominalized (the so-called repeated name penalty; Gordon et al., 1993). By contrast, addressees encountering a pronoun can assume that the referent of that pronoun is already in their focus of attention, and hence that they do not have to look far to find the correct antecedent. This speeds up linguistic processing, and helps making communication more efficient (cf. Ferreira, 2008; Piantadosi et al., 2012; Tily and Piantadosi, 2009).

The degree of accessibility is assumed to be highly influenced by properties of the local discourse context, such as recency, frequency, topicality and grammatical function (e.g. Ariel, 1990; Arnold, 1998; Gundel et al., 1993). In addition, several studies have shown that speakers also base their choice of referring expressions on global discourse factors. These are properties of referents that stay constant throughout the discourse, such as animacy (Fukumura and Van Gompel, 2011; Vogels et al., 2013b), protagonist hood (McGann and Schwartz, 1988; Morrow, 1985), and visual salience (Fukumura et al., 2010; Vogels et al., 2013a). Such factors add to the accessibility of the referent based on local discourse factors.

Given the many different factors influencing referent accessibility, choosing referring expressions that can be easily resolved by the addressee requires the speaker to maintain a detailed model of the discourse that keeps track of the accessibility of the discourse referents. This will be especially demanding for children, whose linguistic as well as general cognitive capacities are still developing (e.g. Whitely and Colozzo, 2013).

2.2. Children's production of anaphoric references

The existing literature on children's production of anaphoric references indeed suggests that children often have difficulty choosing an appropriate referring expression to refer back to a previously introduced referent. At least until age seven, and especially in oral narratives, children are known to often produce pronouns in contexts where adults would prefer a definite NP, leading to incohesive discourses (e.g. Bamberg, 1986; Colozzo and Whitely, 2014; Hendriks et al., 2014; Karmiloff-Smith, 1985; Leclercq and Lenart, 2013). Given that pronouns are more economical forms than full NPs, this suggests that children follow the principle of least effort, but fail to take the addressee's perspective into account. By contrast, again notably in oral narratives, children have also been found to overuse lexical NPs in contexts where the referent is in the focus of attention (e.g. Karmiloff-Smith, 1985; see also the review in Allen et al., 2015). These children seem to try to avoid referential ambiguity at all costs, leading to highly repetitive discourse.

However, a number of other studies, primarily of spontaneous speech or using relatively simple experimental tasks, have shown that by three years of age, children are already sensitive to discourse factors in choosing between a (potentially ambiguous) pronoun and a more elaborate lexical NP. For example, 2- and 3-year olds seem to take into account whether the addressee had mentioned the referent before, which is a cue for the referent being accessible for the addressee (Gundel and Johnson, 2013; Hughes and Allen, 2013; Matthews et al., 2006). Children do this even before they are sensitive to whether the addressee had seen the referent before (joint visual attention), which develops from age three (Matthews et al., 2006). The reason for the good performance of the children in these studies, compared to the older children in the studies cited above, may be that the demands of narrative tasks are higher than those of spontaneous interaction, making it more difficult to use referring expressions appropriately in narrative discourse. However, even in (picture-based) elicited narratives and in more complex experimental settings, 4-year-olds have been found to make use of such detailed discourse cues as recency of mention and grammatical function (Aksu-Koç and Nicolopoulou, 2015; Hickmann, 2003; Hickmann and Hendriks, 1999), as well as the number of possible referents present and animacy (Serratrice, 2013).

If children as young as three or four years old are sensitive both to properties of the linguistic context and to the knowledge state of their addressee, why do they still produce pronouns that are unrecoverable for the listener or overuse lexical NPs at age six? The answer may be that they do not have sufficient cognitive resources to maintain a detailed model of the discourse or the listener's knowledge. For example, maintaining a discourse model may put high demands on pre-school children's capacity to update their working memory (e.g. Whitely and Colozzo, 2013), or children may lack the processing speed necessary to take the listener's perspective into account (e.g. Hendriks et al., 2014; Van Rij et al., 2010).

2.3. Global and local strategies

Pre-school children's limited ability to maintain a detailed discourse model may lead them to use strategies for reintroducing and maintaining referents that differ from those favored by adults, but still allow them to make principled choices for a referring expression. A number of early studies of children's oral narratives (e.g. Bamberg, 1986; Karmiloff-Smith, 1981, 1985; Wigglesworth, 1997) identified several referential strategies. For example, in the adult-like 'anaphoric strategy' pronouns are used to maintain reference to an entity and lexical NPs to reintroduce a previously mentioned referent or shift to a new referent. Children aged 3–7, however, often use what has been termed a 'thematic subject strategy' (Bamberg, 1986; Karmiloff-Smith, 1981, 1985; Shapiro and Hudson, 1991): These children choose one referent to be the protagonist of the narrative, and then mainly use pronouns to refer back to this character, irrespective of its discourse status, i.e. both in referent maintenance and in referent reintroduction. Other referents are almost exclusively referred to with lexical NPs (see also Aksu-Koç and Nicolopoulou, 2015; Wong and Johnston, 2004). Since the thematic subject, or protagonist, pertains to the global organization of the discourse (it mostly stays constant throughout the story; Grosz et al., 1995; Grosz and Sidner, 1986; Kintsch and Van Dijk, 1983; Morrow, 1985), information about protagonist-hood does not require continuous updating of the discourse model. Hence, it can be assumed that using protagonist-hood as a cue for accessibility is not as cognitively costly for the child as using factors determined by local, sentence-by-sentence changes in referential status, such as topicality.

Thus, these earlier studies suggest that children's referential organization of discourse develops from the use of more global to more local strategies: at first, they use pronominalization only for the referent they have established as the protagonist. Later, they start differentiating between pronouns and nouns for non-protagonists based on local discourse factors, and finally they use local discourse factors for all referents.

2.4. The present study

In the current study, we propose that pre-school children, like adults, make referential choices in the production of cohesive narratives based on a combination of global and local accessibility factors. However, since local accessibility continuously changes over the course of the narrative, the discourse model requires constant updating, whereas global accessibility is more or less stable during the narrative, and hence does not need to be continuously monitored by the speaker. Therefore, maintaining a model of the global accessibility of referents is less cognitively effortful, and we expect younger children to base their referential expressions more on this type of accessibility. In our study, we focus on animacy as an indicator of a referent's global accessibility. Animacy has been shown to be an important contributor to the choice of referring expressions (e.g. Fukumura and Van Gompel, 2011; Vogels et al., 2013a), and is relatively easy to code according to objective criteria. Hence, we predict that pre-school children use animacy as a strong cue for the choice of referring expression. More specifically, we predict a preference for high-accessibility expressions (pronouns, zero anaphora) for human referents, and a preference for low-accessibility expressions (lexical NPs) for inanimate referents.

As their cognitive capacities as well as their ability to take the listener's knowledge state into account grow, we expect that children will become better at keeping track of the local discourse and hence will use local accessibility as a cue to their referential choices. In our study, local accessibility is indicated by the degree of topicality: we consider referents that are the topic of both the current and the previous clause as most locally accessible. Non-topical referents that do not have an antecedent in the preceding clause (i.e. reintroductions) are considered least locally accessible. Thus, we predict that as children grow older, they will shift from animacy to topicality as the main cue for choosing referring expressions. The highest proportion of high-accessibility expressions is expected for the most topical referents, whereas the highest proportion of low-accessibility expressions is expected for the least topical referents. In addition, we predict that older children will be less likely to produce unrecoverable expressions than younger children.

The present study investigates anaphoric reference in elicited narratives of monolingual Swedish-speaking children between age four and seven. The acquisition of anaphoric reference in Swedish has not yet been investigated systematically. In Swedish, (in)definiteness and specificity are marked morphologically. The Swedish referential forms are shown in Table 1.

As shown in Table 1, Swedish has an indefinite article marked for grammatical gender (*en* and *ett* for common and neuter gender, respectively). The definiteness marker is a suffix (*-en/-et*). There are four singular pronouns, two marking the biological gender of animate referents (*hon* 'she' and *han* 'he') and two marking the two grammatical genders common and neuter (*den/det* 'it'), and one plural pronoun (*de* 'they'). The pronouns used for the grammatical genders can be used for animate referents (most animate nouns belong to the common gender), although they are rarely used to refer to humans.

The age range from four to seven seems to be central for the development from the use of global to local strategies, based on previous studies (e.g. Bamberg, 1986; Wigglesworth, 1997). Although a number of previous studies have looked at

Table 1
The Swedish referential forms.

Indefinite NP	Definite NP	Pronoun
en pojke 'a boy'	pojken 'the boy'	han 'he'; hon 'she'; den/det 'it'; de 'they'
ett hus 'a house'	huset 'the house'	

reference production in children younger than four, narrative tasks such as the one used in the current study are likely to be too demanding for this age group. Children's general narrative abilities have also been shown to develop extensively from age 4–7 (cf. e.g. Berman and Slobin, 1994; Lindgren, 2018b). In addition, using the same data set as in the present study, Lindgren (2018a) found that there is a clear development between age four and age seven in Swedish-speaking children's ability to appropriately introduce characters in the discourse: 6-year-olds almost exclusively used appropriate indefinite NPs, whereas 4-year-olds did so to a much lower degree.

3. Method

3.1. Participants

Oral narratives were elicited from 72 monolingual Swedish preschool children aged 4;0–6;10, growing up in central Sweden. The data were collected within a larger study of the development of narrative ability in mono- and bilingual Swedish-speaking children (Lindgren, 2018b). All children were recruited with the help of preschool personnel and tested in their preschools. Written parental consent was obtained. A questionnaire about the child's language development and family background was given to all parents. None of the parents reported that their child had impaired hearing, specific language impairment, had been treated by a speech- and language therapist or had any type of diagnosed neurological or psychological disorder (e.g. ADHD or autism-spectrum disorder) that might influence their ability to use referring expressions in narratives.

The children were divided into three age groups, 4-year-olds, 5-year-olds, and 6-year-olds. Table 2 gives an overview of the three groups.

3.2. Materials

The picture sequences *Cat* and *Dog* from the Multilingual Assessment Instrument for Narratives (MAIN, Gagarina et al., 2012) were used as stimulus material. These picture sequences, designed for children aged 4–10, consist of six colored pictures and are parallel in terms of narrative structure and number and types of characters. Both contain three animate characters and three inanimate objects. Table 3 shows the characters and objects included in our analysis. In the current study, references to the background environment (e.g. a tree, a bush) were not considered.

3.3. Procedure

Each child told either the story *Cat* or the story *Dog* as part of a larger battery of tasks (see Lindgren, 2018b: Ch. 3). The standard procedure of MAIN was used (see Gagarina et al., 2012 for details). For the present study, it is most important to note that the child told the story to an adult who could not see the pictures and pretended not to know the story, so joint visual attention was not an appropriate cue for the children to use. The adult listener was also only allowed to give minimal prompts (e.g. *aaa, mm, and then?*). The first author acted as listener for all children. Following the standard procedure of MAIN, three envelopes were placed on a table and the child was asked to pick an envelope and look at the story inside. The six pictures were presented as a folded strip. The child first looked at all pictures, without the pictures being visible to the listener, after which they were folded back so that the child could only see the first two pictures. When the child had finished telling about the first two pictures, the experimenter unfolded the next two pictures and finally the last two. At no time were the pictures visible to the adult listener. Video and audio recordings were made of all narratives and they were transcribed by the first author using the CHAT-format (MacWhinney, 2000).

Table 2
Overview of the participants.

Group	4-year-olds	5-year-olds	6-year-olds
N (girls/boys)	24 (12/12)	24 (12/12)	24 (13/11)
Mean age (years;months)	4;5	5;6	6;5
Age range	4;0–4;10	5;0–5;11	6;0–6;10

Table 3
Overview of referents in the stories.

Story	Cat	Dog
Character 1	Cat	Dog
Character 2	Butterfly	Mouse
Character 3	Boy	Boy
Inanimate objects	Ball, bucket with fish, fishing rod	Balloon, sausages, bag

3.4. Coding and analysis

All coding was done by the first author and checked by the second author. Cases of disagreement were solved through discussion. Only referring expressions that could be identified as referring back to one of the characters/inanimate objects (see Table 2) were included.⁵ All referential expressions for which a referent could be identified in the narratives were coded according to type of referential expression (see below), referential function (Reintroduction, Maintenance), animacy (Inanimate, Animate, Human), and topichood (+Topic, –Topic). Additionally, all cases of referent maintenance were coded according to whether or not the referent had been the topic of the previous clause (+TopicPrevious, –TopicPrevious).

Our coding system resulted in two categories of reintroduction (reintroduction as topic and reintroduction as non-topic) and four categories of maintenance (maintenance as topic and maintenance as non-topic, where the referent was either the topic of the previous sentence or not). We used a simple criterion for maintenance and reintroduction: When the referent had been mentioned in the previous clause, it was coded as maintenance, as for the boldface referent in (4a). Otherwise, it was coded as reintroduction, as in (4b). Similarly, our definition of topic was straightforward: When a referent was the first mentioned NP of the clause, it was coded as the topic of that clause. The same criterion held for the topic of the previous clause. In all cases, the topic coincided with the subject. Referents that are the topic of both the current and the previous clause are also called persistent topics (cf. Givón, 1983).

- (4) a. Sen kom pojken. Och **han** hade korv i (.) sin väska. (MoSwe6-19, 6;10)
 ‘Then the boy came. And **he** had sausage in (.) his bag.’
 b. Hunden försökte jaga musen. Och musen sprang in i ett hål. Och **hunden** sprang efter. (MoSwe6-12, 6;0)
 ‘The dog tried to hunt the mouse. And the mouse ran into a hole. And **the dog** ran after.’

As for animacy, references to the boy were coded as Human, and references to the four animals were coded as Animate. The fish in the bucket in the Cat story were coded as Inanimate, since they are conceptualized as food, on a par with the sausages in the Dog story. All other objects (see Table 3) were also coded as Inanimate.

All referential expressions were classified as belonging to one of four types of referring expressions: indefinite NP, definite NP, pronoun, and null (i.e. subject or object drop⁶). Nouns preceded by universal quantifiers (*all(a)* ‘all’) were counted as definite. Bare nouns and mass nouns (without determiner) were counted as indefinite. The few cases of demonstrative pronouns found in the data were included in the pronoun category.

Furthermore, all referential expressions were coded according to whether or not they could be recovered by an adult listener with no prior knowledge of the story. The unrecoverable expressions were defined as one of three types: (a) cases where the previous clause contained two possible antecedents; (b) cases where the previous clause contained only possible referents that were not the correct antecedent, as in (5); and (c) cases where the pronoun gender did not match the gender of the antecedent noun or where a different pronoun had previously been used in reference to the character/object. This last type is illustrated in (6), where reference to the boy is maintained in the second clause, but using a different pronoun. Because of the small size of each of these categories, they will be treated as one throughout the remainder of the paper.

- (5) Och så tar katten fiskarna. Och så fick **han** sin badboll. Och så äter **han**. (MoSwe5-17, 5;7).
 ‘And then the cat takes the fish-PL. And then **he** [boy] got his ball. And then **he** [cat] eats.’
 (6) Och sen gick **han** hem. Och sen så tappade **den** en liten boll. (MoSwe4-06, 4;6).
 ‘And then he [boy] went home. And then it [boy] dropped a small ball’

We first descriptively explored the distribution of the different types of referring expressions, as well as the proportion of unrecoverable expressions, across the levels of each of our coded factors (Age group, Animacy, Topichood, and Topic of Previous Clause). Next, we performed four logistic regression analyses to test the effects of all factors combined on the proportion of pronouns and zero anaphora versus other expressions and on the proportion of unrecoverable expressions. Separate analyses were run for reintroduction and maintenance.⁷

For each analysis, we first fitted a full model to the data, including all factors as predictors. The predictors Topic and TopicPrevious were centered to reduce collinearity. Reversed Helmert coding was used for Age group in order to get one predictor comparing the 6-year-olds to the other two age groups together and one predictor comparing the 5-year-olds to the 4-year-olds. Animacy was coded in the same way, such that one predictor compared human referents to animate and inanimate referents together, and one predictor compared animate to inanimate referents.

⁵ Expressions used to introduce new referents were not included. Character introductions in these narratives, as well as from another narrative task, are analyzed in Lindgren (2018a).

⁶ In Swedish, null subjects in coordinated clauses are strictly speaking the only grammatically allowed null forms. However, in some genres, clause-initial subjects can also be dropped, so-called topic drop or ‘diary drop’ (cf. Mörnstj, 2002; Teleman et al., 1999, p. 692f). Object drops are not grammatical in Swedish, and were not found in our data.

⁷ The predictor TopicPrevious only applied to analyses of referent maintenance.

We applied model selection to find the best-fitting model. We did this by step-by-step removal of predictors with the highest p-values, and checking whether this significantly affected model fit by performing model comparison using a likelihood ratio test. Only final models will be reported.

4. Results

4.1. Reintroduction vs maintenance

A total of 962 expressions referring back to previously introduced characters and objects were produced by the children. There were 424 cases of reintroduction and 538 cases of maintenance. We first tested if there was a general difference in the choice of referring expression between reintroduction and maintenance across all age groups using a chi-square test. The result is shown in Table 4.

As Table 4 shows, the distribution of referring expression types was significantly different between reintroduction and maintenance. Bonferroni-corrected paired comparisons showed that this was the case for all four expression types. This indicates that, overall, the children were sensitive to the difference between reintroduction and maintenance, mainly using definite NPs for the former and pronouns for the latter. Still, there are also sizeable proportions of pronouns used to reintroduce characters (23.1%) and of definite NPs used to maintain reference (29.6%). Null forms were only used for maintenance. Most of these were adult-like uses of null subjects in coordinated clauses, as in (7a), but a few cases of topic drop that could be considered less adult-like in this type of discourse were also found in the data, as in (7b).

- (7) a. Och mannen tog sitt fiskespö och Ø tog upp bollen. (MoSwe6-11, 6;4)
 'And the man took his fishing rod and Ø took up the ball.'
 b. Han kastade ut det. Ø fiskade upp bollen. (MoSwe6-18, 6;0)
 'He threw it out. Ø fished up the ball.'

Next, we examined the distribution of unrecoverable expressions (i.e. expressions for which the referent could not be identified by a naïve listener) out of all referring expressions between reintroduction and maintenance (Table 5). Of all references, 11.6% were considered unrecoverable, but the percentage was significantly higher for reintroduction than for maintenance. All unrecoverable expressions were pronouns, since producing a lexical NP always disambiguated between possible referents in these narratives.

Having established that reintroduction and maintenance of referents differ in the use of pronouns vs. lexical NPs as well as in the occurrence of unrecoverable expressions, the remainder of the Results section will present the effects of our set of predictors on reintroduction and maintenance separately, both on the *type of referring expression*, and on the proportion of *unrecoverable expressions*. First, we will describe the distribution of those two variables with respect to the individual predictors (Section 4.2). After that, we will present four multifactorial regression analyses, testing the effects of all predictors combined (Section 4.3).

4.2. Individual predictors

4.2.1. Age group

4.2.1.1. *Type of referring expression.* Fig. 1 shows the proportion of each of the four types of referring expressions (indefinite NPs, definite NPs, pronouns and null forms) per age group, for reintroduction and maintenance separately. The difference in the distribution of pronouns and definite NPs between reintroduction and maintenance (Table 4) generally seems to hold for all three age groups: more pronouns and fewer definite NPs were used in maintenance than in reintroduction. For reintroduction, there was a difference between the age groups in the use of referring expressions ($\chi^2(4, N = 424) = 18.085; p < .001^8$). Post-hoc tests (Bonferroni-corrected) showed that there was only a significant difference in the use of indefinite NPs: the 4-year-olds produced a higher proportion of indefinite NPs (12.9%) than the 6-year-olds (1.6%), with the 5-year-olds (5.6%) not differing significantly from the other two groups. For maintenance, the chi-square test for age differences did not reach significance ($\chi^2(6, N = 538) = 12.556; p = .051$).

4.2.1.2. *Unrecoverable expressions.* Fig. 2 shows the proportion of unrecoverable expressions across the three age groups for reintroduction and maintenance. In Fig. 2, we see tendencies that the younger groups produced a higher proportion of unrecoverable referring expressions. However, no significant differences were found between the age groups, neither for reintroduction ($\chi^2(2, N = 424) = 2.028, p = .363$) nor for maintenance ($\chi^2(2, N = 538) = 5.163, p = .076$).

⁸ Since we are performing separate chi-square tests for each of the three variables (Age group, Animacy and Topic/TopicPrevious), we only consider effects significant when the p-value is below $\alpha = .05/3 = .017$.

Table 4

Reintroduction vs maintenance, proportion of indefinite NPs, definite NPs, pronouns and null forms (absolute frequencies in brackets).

	Reintroduction	Maintenance	Total
Indefinite NP	5.9% (25) ^a	2.0% (11) ^a	3.7% (36)
Definite NPs	71.0% (301) ^a	29.6% (159) ^a	47.8% (460)
Pronouns	23.1% (98) ^a	54.5% (293) ^a	40.6% (391)
Null forms	0% (0) ^a	13.9% (75) ^a	7.8% (75)
Total	100% (424)	100% (538)	100% (962)

Note. Overall chi-square test: $\chi^2(3, N = 962) = 210.983$; $p < .001$.

^a Marks which column-wise comparisons were significant at the $\alpha = .05$ level (Bonferroni-corrected).

Table 5

Reintroduction vs maintenance, proportion of recoverable and unrecoverable expressions (absolute frequencies in brackets).

	Reintroduction	Maintenance	Total
Recoverable	85.4% (362)	90.7% (488)	88.4% (850)
Unrecoverable	14.6% (62)	9.3% (50)	11.6% (112)
Total	100% (424)	100% (538)	100% (962)

Note. Overall chi-square test: $\chi^2(1, N = 962) = 6.546$; $p < .05$.

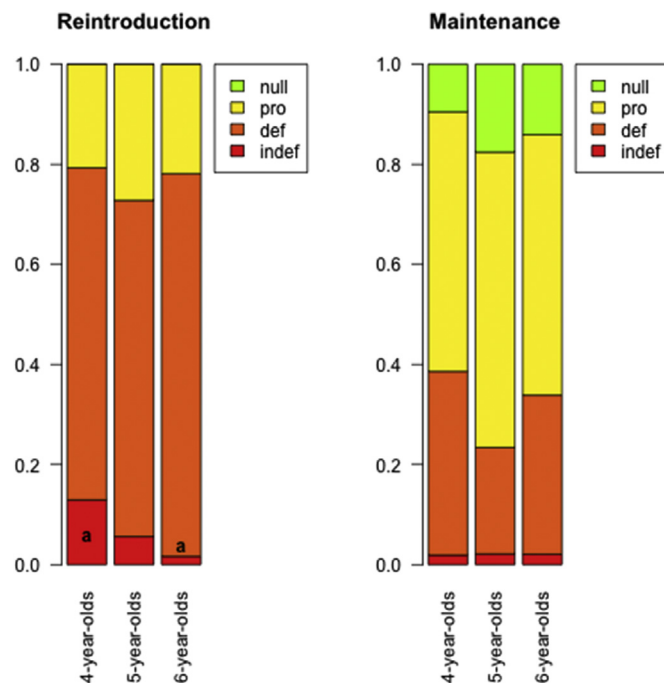


Fig. 1. Proportion of 4 categories of referential expressions in the three age groups, split by reintroduction and maintenance. The letter a marks the post-hoc pairwise comparison that was significant at the $\alpha = .05$ level (Bonferroni-corrected).

4.2.2. Animacy

4.2.2.1. Type of referring expression. Fig. 3 shows the proportion of the different types of referential expressions in each animacy category (human, animate, inanimate). There was a highly significant difference in the children's use of different types of referring expressions depending on the animacy of the referent, both for reintroduction ($\chi^2(4, N = 424) = 136.271, p < .001$) and for maintenance ($\chi^2(6, N = 538) = 73.631, p < .001$). Post-hoc tests (Bonferroni corrected) revealed that the proportion of pronouns was significantly higher for human referents than for both animates and inanimates, in both reintroduction (64.1% vs 10.5% and 9.1%) and maintenance (72.3% vs 44.9% and 55.3%). Conversely, definite NPs were used much less frequently when the referent was human, also both in reintroduction (33% vs 85.5% and 79.3%) and in maintenance (7.1% vs 38% and 36.6%). Furthermore, for reintroduction, inanimate referents were more likely to be referred to with indefinite NPs than both

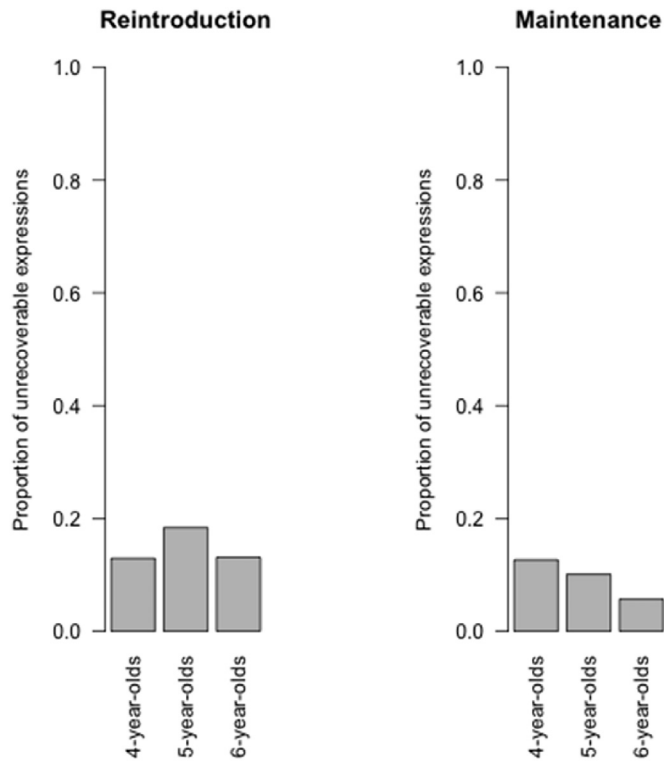


Fig. 2. Proportion of unrecoverable expressions in the three age groups, split by reintroduction and maintenance.

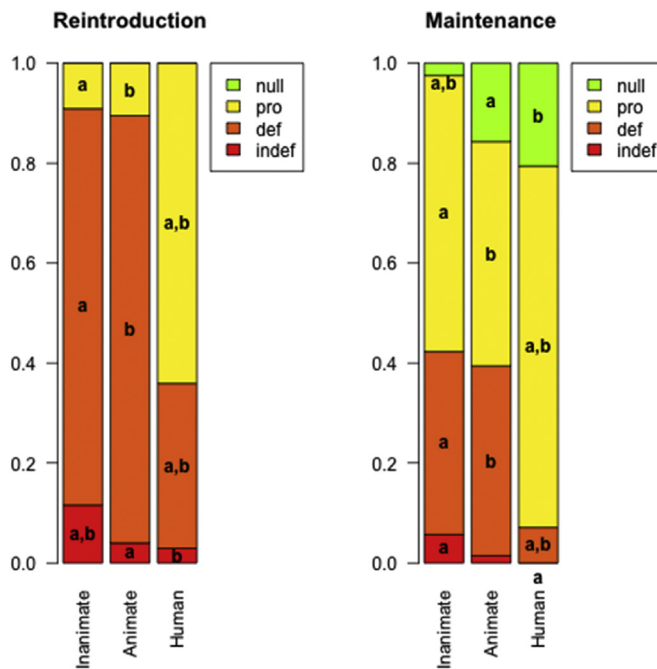


Fig. 3. Proportions of 4 categories of referential expressions (indefinite NPs, definite NP, pronouns and null forms) for the 3 animacy categories (inanimate, animate, human), split by reintroduction and maintenance. Pairs of identical letters mark which post-hoc pair-wise comparisons were significant at the $\alpha = .05$ level (Bonferroni-corrected).

animate and human referents (11.6% vs 4% and 2.9%). For maintenance, inanimate referents were less likely to be referred to with null forms than animate and human referents (2.4% vs 15.7% and 20.6%) and human referents were less likely to be referred to with indefinite NPs than inanimate referents (0% vs 5.7%), whereas animate referents did not differ from the other groups (1.5%).

4.2.2.2. *Unrecoverable expressions.* Fig. 4 shows the proportions of unrecoverable expressions across the animacy categories. There was a significant difference in the use of unrecoverable expressions depending on the referent's animacy category, both for reintroduction ($\chi^2(2, N = 424) = 55.036, p < .001$) and for maintenance ($\chi^2(2, N = 538) = 9.635, p = .008$). In reintroducing referents, human referents were more likely to be referred to with an unrecoverable expression than animate or inanimate referents: 36.9% of the expressions used to reintroduce human referents were unrecoverable, compared to 9% and 5% for animate and inanimate referents, respectively. In maintaining reference, animate referents were more likely to be referred to with unrecoverable expressions (12.8%) than were inanimate referents (3.3%), whereas human referents (7.8%) did not differ from the other groups.

4.2.3. Topic and TopicPrevious

4.2.3.1. *Type of referring expression.* Fig. 5 shows the proportion of the different types of referring expressions for the different levels of topicality. Differences were found in the use of referring expressions depending on the referent's topical status, both for reintroduction ($\chi^2(2, N = 424) = 26.761, p < .001$) and for maintenance ($\chi^2(9, N = 538) = 124.750, p < .001$). For referents reintroduced as topic (Reint + T), pronouns were almost three times as frequent as when the referent was not reintroduced as topic (Reint–T; 29.5% vs 10.5%). Indefinite and definite NPs were instead used more often for Reint–T referents than for Reint + T referents (11.2% and 78.3% vs 3.2% and 67.3%, respectively). When referents were maintained in a topical position while also being the topic of the previous sentence (Maint + T + TP), they were less likely to be referred to using a definite NP and more likely to be referred to using a null form compared to the other topical categories. In fact, null forms were almost exclusively used for these “persistent topics”. For the use of pronouns, a difference was found between persistent topics and referents that were maintained as non-topic while not being the topic of the previous sentence either (Maint – T – TP): for those referents, pronouns were less likely to be used. The other two topical categories (Maint – T + TP and Maint + T – TP) did not differ from each other or from the maintained referents with the highest and lowest level of topicality.

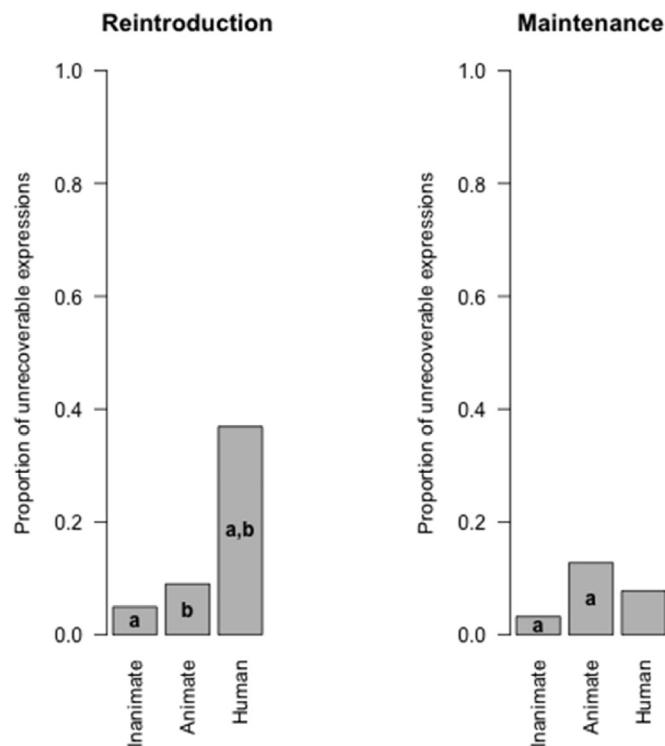


Fig. 4. Proportions of unrecoverable expressions for the 3 animacy categories (inanimate, animate, human), split by reintroduction and maintenance. Pairs of identical letters mark which post-hoc pair-wise comparisons were significant at the $\alpha = .05$ level (Bonferroni-corrected).

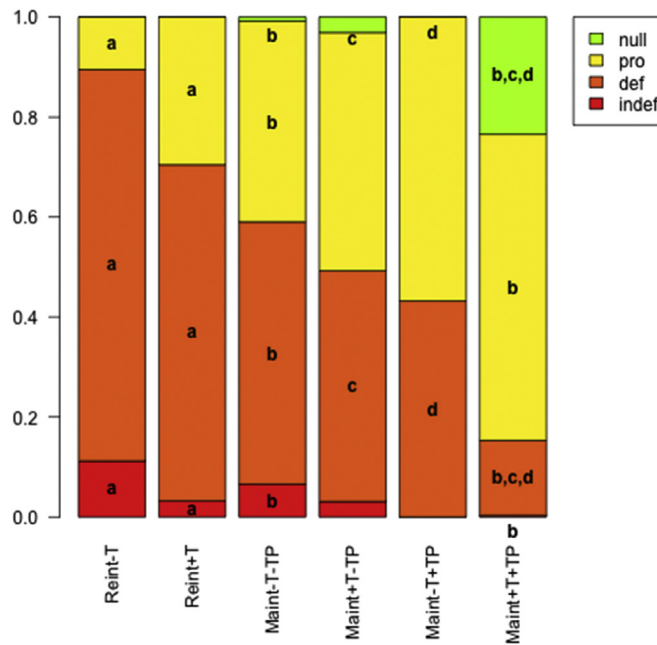


Fig. 5. Proportion of 4 categories of referential expressions in different referential statuses (Reint = Reintroduction; Maint = Maintenance; -T = non-topic of current clause; +T = topic of current clause; -TP = non-topic of previous clause; +TP = topic of previous clause). Pairs of identical letters mark which post-hoc pair-wise comparisons were significant at the $\alpha = .05$ level (Bonferroni-corrected).

4.2.3.2. *Unrecoverable expressions.* Fig. 6 shows the proportion of unrecoverable expressions for the different topicality categories. There was a significant difference in the use of unrecoverable expressions depending on the referent's topical status for reintroduction ($\chi^2(1, N = 424) = 14.087, p < .001$) but not for maintenance at the adjusted α -level ($\chi^2(3, N = 538) = 8.671, p = .034$). Referents that were reintroduced as topic were more likely to be referred to with an unrecoverable expression than non-topical referents (19.2% compared to 5.6%). Unrecoverable expressions thus seem to be used most frequently to refer to referents that are the current topic.

4.3. Multifactorial analysis

The exploration of the individual factors shows clear differences in the distribution of referring expression types and unrecoverable expressions depending both on the degree of animacy and on topicality. To establish the combined effects of our discourse factors on the choice of referring expression and their interaction with age, we performed logistic regression analyses including all factors and their interactions as predictors. Given the relatively small numbers of null forms and indefinite NPs in our data set, we collapsed pronouns and null forms into one category, and compared the occurrence of these forms with all other types of expressions (lexical NPs). In addition, we analyzed the effects of our factors on the occurrence of unrecoverable expressions. Thus, we report the following four models (after model selection):

- Model 1: Reintroduction, proportion of pronouns vs other expressions;
- Model 2: Maintenance, proportion of pronouns vs other expressions;
- Model 3: Reintroduction, proportion of unrecoverable expressions;
- Model 4: Maintenance, proportion of unrecoverable expressions.

4.3.1. Model 1: reintroduction, proportion of pronouns vs other expressions

Model 1 was built to predict the use of pronouns out of all referring expressions for referent reintroduction. The final logistic regression model is summarized in Table 6.

As can be seen in Table 6, the only significant predictor is Animacy: human referents were more likely to be reintroduced with a pronoun than other referents. Surprisingly, the main effect of Topic was not significant, although this would have been expected based on Fig. 5. Finally, there was a non-significant trend for a negative interaction between Topic and Age group 5 vs 4, suggesting that the 5-year-olds might use more pronouns than the 4-year-olds, but only for non-topical referents.

4.3.2. Model 2: maintenance, proportion of pronouns vs other expressions

Model 2 was built to predict the use of pronouns (including null forms) out of all referring expressions for referent maintenance. The final logistic regression model is summarized in Table 7.

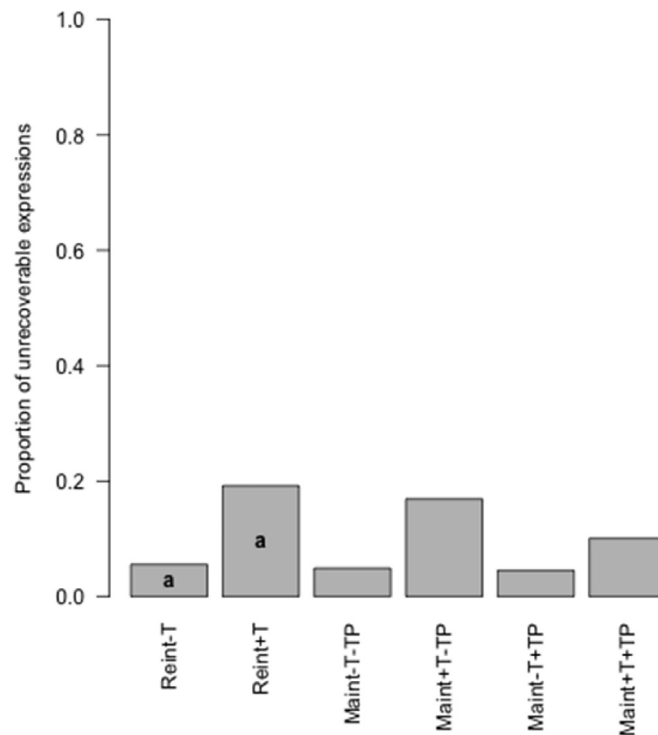


Fig. 6. Proportion of unrecoverable expressions in different referential statuses (Reint = Reintroduction; Maint = Maintenance; -T = non-topic of current clause; +T = topic of current clause; -TP = non-topic of previous clause; +TP = topic of previous clause). The letter a marks the post-hoc pair-wise comparison that was significant at the $\alpha = .05$ level (Bonferroni-corrected).

Table 6

Summary of logistic regression model 1.

Predictor	Coefficient	Std. Error	z	p value
Intercept	-1.3930	0.1806	-7.712	<.001***
Age: 6 vs 4, 5	-0.1862	0.3247	-0.574	0.57
Age: 5 vs 4	0.7782	0.4604	1.690	0.09
Animacy: Hum vs Anim, Inan	2.8402	0.3793	7.487	<.001***
Animacy: Anim vs Inan	0.1989	0.5559	0.358	0.72
Topic	0.3977	0.5628	0.707	0.48
Age: 6 vs 4, 5 * Topic	-0.1756	0.8133	-0.216	0.83
Age: 5 vs 4 * Topic	-2.1608	1.2074	-1.790	0.07
Model evaluation				
R^2	0.383			
C	0.824			
Dxy	0.649			

Note. *** = $p < .001$. Hum = human, Anim = (non-human) animate, Inan = inanimate.

Table 7

Summary of logistic regression model 2.

Predictor	Coefficient	Std. Error	z	p value
Intercept	0.7589	0.1614	4.701	<.001***
Age: 6 vs 4, 5	-0.2283	0.2244	-1.017	0.31
Age: 5 vs 4	0.7001	0.2715	2.578	<.01**
Animacy: Hum vs Anim, Inan	1.0538	0.3803	2.771	<.01**
Animacy: Anim vs Inan	-1.3592	0.3069	-4.428	<.01**
Topic	1.1132	0.2823	3.943	<.01**
TopicPrevious	1.4620	0.2606	5.610	<.01**
Topic * TopicPrevious	0.9609	0.4948	1.942	0.05
Model evaluation				
R^2	0.331			
C	0.803			
Dxy	0.606			

Note. ** = $p < .01$, *** = $p < .001$. Hum = human, Anim = (non-human) animate, Inan = inanimate.

Model 2 shows significant main effects of the predictors Age group 5 vs 4, Animacy, Topic, and TopicPrevious: The use of pronouns was more frequent for 5- than 4-year-olds, for reference to human than animate or inanimate referents, and for referents that were either the topic of the current or the previous clause. Pronouns turned out to be used significantly less to refer to non-human animates than to inanimate referents, which is surprising given that animates are considered more accessible than inanimates. Finally, there was a non-significant trend for a positive interaction between Topic and TopicPrevious ($p = .05$). Fig. 5 suggests that the effect of Topic on pronoun use was stronger when the referent was a topic in the previous clause than when it was not, indicating that the likelihood of pronominalization may be boosted when a referent is a persistent topic.

4.3.3. Model 3: reintroduction, proportion of unrecoverable expressions

Model 3 was built to predict the use of unrecoverable expressions out of all referring expressions for reintroduction. The final logistic regression model is summarized in Table 8.

As shown in Table 8, unrecoverable expressions were more likely when children were referring back to human referents compared to animate and inanimate referents. Other predictors did not have a significant effect. This includes the effect of Topic, which was present in the chi-square analysis (see Fig. 6). Further inspection revealed that all cases of unrecoverable expressions in topic position in fact referred to human or animate characters. Thus, the apparent effect of topicality may in fact be an effect of animacy, due to human referents being more likely to be topics.

4.3.4. Model 4: maintenance, proportion of unrecoverable expressions

Table 9 summarizes the final model for the use of unrecoverable expressions for referent maintenance.

As shown in Table 9, there was a significant negative interaction between Animacy and Topic. Paired comparisons showed that for topical referents, Animacy did not affect the proportion of unrecoverable expressions, while for non-topical referents, there was a significant positive effect of Animacy ($\beta = 3.0528$; $SE = 1.1395$; $z = 2.679$; $p < .01$), suggesting that expressions referring to non-topical human referents were more likely to be unrecoverable. Furthermore, there were non-significant trends for 6-year-olds producing fewer unrecoverable expressions to maintain reference ($p = .05$), and for expressions being less likely to be unrecoverable when the referent was the topic of the previous clause ($p = .08$). These trends are visualized in Figs. 2 and 6, respectively.

5. Discussion

Our study has shown that Swedish-speaking preschool children are sensitive to several discourse factors in choosing referring expressions in a picture-based storytelling task. First, they are more likely to use pronouns when maintaining

Table 8
Summary of logistic regression model 3.

Predictor	Coefficient	Std. Error	z	p value
Intercept	-1.9182	0.1788	-10.726	<.001***
Age: 6 vs 4, 5	-0.3072	0.3055	-1.006	0.32
Age: 5 vs 4	0.5045	0.3889	1.297	0.19
Animacy: Hum vs Anim, Inan	1.8975	0.4128	4.596	<.001***
Animacy: Anim vs Inan	0.2943	0.6525	0.451	0.65
Topic	0.5007	0.5798	0.864	0.39
Model evaluation				
R^2	0.205			
C	0.758			
Dxy	0.517			

Note. *** = $p < .001$. Hum = human, Anim = (non-human) animate, Inan = inanimate.

Table 9
Summary of logistic regression model 4.

Predictor	Coefficient	Std. Error	z	p value
Intercept	-2.1919	0.2385	-9.189	<.001***
Age: 6 vs 4, 5	-0.7129	0.3641	-1.958	0.05
Age: 5 vs 4	-0.2693	0.3499	-0.770	0.44
Animacy: Hum vs Anim, Inan	0.7333	0.5066	1.448	0.15
Animacy: Anim vs Inan	1.0039	0.6245	1.608	0.11
Topic	0.3881	0.5121	0.758	0.45
TopicPrevious	-0.6793	0.3865	-1.757	0.08
Animacy: Hum vs Anim, Inan * Topic	-3.1010	1.1130	-2.786	<.01**
Animacy: Anim vs Inan * Topic	-0.4465	1.2012	-0.372	0.71
Model evaluation				
R^2	.104			
C	.703			
Dxy	.405			

Note. ** = $p < .01$, *** = $p < .001$. Hum = human, Anim = (non-human) animate, Inan = inanimate.

reference to a character than when reintroducing a character. Moreover, the rate of pronominalization of a referent increases for all age groups at the cost of definite NPs as the referent becomes more topical. More specifically, the topic status of the referent in the previous clause seems to be a crucial factor in the choice of a referring expression: pronouns are most likely to be used when the referent was the topic of the previous clause. They are least likely when the referent was not mentioned in the previous clause at all (reintroduction). However, it also matters whether the referent is mentioned as a topic in the current clause: topical referents are more likely to be referred to with pronouns than non-topical referents. This suggests that current topic and previous topic are two factors that affect the choice of referring expression independently. In general, these findings are in line with what has been found for adult reference production (e.g. Arnold, 1998; Brennan, 1995; Grosz et al., 1995), and confirm previous studies showing that preschool children (age 4–7) are sensitive to local discourse factors (e.g. Hickmann and Hendriks, 1999; Matthews et al., 2006).

Second, animacy plays an important role in the children's choice of referring expressions. Pronouns are highly preferred in reference to the boy (the only human character in the stories), even in cases of reintroduction. For animate and inanimate referents, the use of definite NPs is more frequent, especially to reintroduce referents. This corroborates results from story completion experiments for other languages in both adult (e.g. Fukumura and Van Gompel, 2011; Vogels et al., 2013b) and child (Serratrice, 2013) populations, and shows that preschool children are sensitive to global discourse factors as well.

These effects are in line with the hypothesis that referential choices are based on a combination of the referent's accessibility on a local discourse level and its accessibility in the global discourse (cf. Vogels, 2014): animate entities and especially humans are more interesting to talk about, e.g. because they are more likely to be agents than inanimate objects, and hence can instigate actions and events (e.g. Dowty, 1991). The higher level of salience of animates may be hard-wired in the human cognitive system, as humans have evolved to pay more attention to living beings (New et al., 2007). Hence, animates may be inherently more accessible than inanimates at the global discourse level, already before any linguistic material is present (Prat-Sala and Branigan, 2000; Vogels et al., 2013b). This high global accessibility is then combined with the referent's local accessibility (e.g. topicality) at each point where it is mentioned in the discourse, as shown for example by the additive effects of animacy and sentence position found for adults in a sentence completion task by Fukumura and Van Gompel (2011).

At the same time, the children in the present study did not behave fully adult-like. The high number of pronouns used for referent reintroduction suggests that they have not completely mastered the appropriate use of referring expressions for reintroducing characters (cf. Gundel et al., 1993). This finding is in line with studies showing that preschool children often overuse pronouns (e.g. Hendriks et al., 2014; Karmiloff-Smith, 1985; Leclercq and Lenart, 2013), and may be due to these children's limited cognitive capacities, leading them to resort to more economical referential forms. Alternatively, it may be the case that preschool children lack the ability to assess the perspective of the addressee, and hence choose referring expressions based on their own perspective (Gundel and Johnson, 2013; Hendriks et al., 2014). This may be linked to Theory of Mind, i.e. the ability to understand that another person's knowledge state may differ from one's own (e.g. Tomasello, 2003), still being under development in this age group.

In addition, the children in our study sometimes used indefinite NPs to reintroduce or maintain reference to a character, whereas adults would be expected to reserve those for introducing a new referent (Gundel et al., 1993). These might partly be cases where the child had forgotten that he or she had already introduced the referent. Alternatively, some children using indefinites to refer to discourse-given characters might not be narrating events, but describing the pictures separately.⁹ However, it is interesting to note that indefinites were mainly used for reference to non-topical referents that were not the topic of the previous clause either (cf. Fig. 5). We also saw that inanimate entities were more frequently referred to with indefinite NPs. Hence, the children that used indefinites seemed to do so systematically in reference to low-accessibility referents.

Furthermore, 11.6% of the children's referring expressions were unrecoverable if presented to a naïve listener. All unrecoverable expressions were pronouns with no clear antecedent, either because the previous clause contained more than one possible antecedent or only incorrect antecedents, or because of inconsistent use of pronominal gender. In cases of referent reintroduction, unrecoverable expressions primarily referred to the human referent. In fact, almost 40% of the total number of references to the boy were unrecoverable (see Fig. 4). Unrecoverable expressions were much less frequent for animals and inanimate objects. Thus, children from all three age groups were highly likely to pronominalize references to the human character in the two stories, even when it led to unrecoverable pronouns because one or more other referents were more salient in the local discourse. This suggests that a high degree of animacy can override local discourse cues. The example in (8) illustrates this.

- (8) Då kom grabben med en ballong. Och sen sprang (.) hunden ut igen. Och (.) så blev han ledsen därför han tappa(de) ballongen men då fick han tag på ballongen igen. Och hunden tog alla korvar och smaskade. Och så hade han ballongen igen. (MoSwe5–20, 5;9)
 'Then the boy came with a balloon. And then the dog ran out again. And so he [boy] became sad because he [boy] lost the balloon, but then he [boy] caught the balloon again. And the dog took all the sausages and munched. And so he [boy] got his balloon again.'

⁹ A more detailed account of indefinite use lies outside the scope of the current study, but would be an interesting topic for further research.

In (8), the child consistently refers back to the boy using a pronoun, even when the topic had shifted to the dog in the preceding clause. By contrast, a reintroduction of the (non-human) dog is appropriately indicated by the use of a definite NP.

Thus, the occurrence of unrecoverable referential links due to the increased use of pronouns for human referents, as well as the use of indefinites to refer to inanimate entities even though the referent is already given in the discourse context, suggest that, as predicted, the referent's global accessibility outweighs its local accessibility in pre-school children's reference productions. We conjecture that the greater use of global accessibility is a sign of children's insufficient cognitive capacity to maintain a detailed mental model of the discourse, leading to difficulties in keeping track of the accessibility of referents in the discourse (e.g. [Whitely and Colozzo, 2013](#)). Since the animacy of a character or whether the character is the protagonist of a story usually does not change within a single discourse, such global factors do not require continuous updating in the discourse model. Hence, it is less cognitively demanding to use them as accessibility cues in the choice of referring expression than aspects of the local discourse context that may constantly change.

Our prediction that the older children would increasingly shift from using global discourse factors to local discourse factors as their cognitive capacities expand was not borne out by the data: the prevalence of global accessibility in choosing referring expressions seems to be present in all three age groups. We only saw potential age effects in two specific cases. Firstly, indefinite NPs were used more frequently by the youngest group: the 4-year-olds made use of indefinite NPs to reintroduce referents in almost 15% of the cases, but this percentage steadily decreased with age (see [Fig. 1](#)), suggesting a development in the appropriate use of indefinite NPs. This mirrors the increase with age in the *correct* use of indefinite NPs for introducing referents found in a recent study of the same children ([Lindgren, 2018a](#)). Secondly, the 6-year-olds seemed to be slightly less likely (although not significantly) to use unrecoverable expressions in referent maintenance than the other age groups.

The preference to pronominalize the boy irrespective of local discourse salience did not decrease with age. This stands in stark contrast to findings for referent introduction for the same children and the same stories ([Lindgren, 2018a](#)), in which there was a clear effect of age: 6-year-olds had mastered the use of adult-like character introductions and 5-year-olds also performed significantly better than 4-year-olds. There are thus much clearer age effects for introduction than for reintroduction and maintenance in the studied age range. One explanation for this finding might be that referent introduction is more readily acquired, because the child only needs to determine whether the referent is new or given in the discourse. The choice between a pronoun and a definite NP for referent maintenance or referent reintroduction may be more cognitively complex, requiring the consideration of multiple discourse factors. Therefore, children may take longer to learn to produce appropriate anaphoric references. Still, other studies on oral narratives have found clear development in referential adequacy in all three referential functions for a similar age range, with the highest performance on referent maintenance (e.g. [Hickmann, 2003](#); [Whitely and Colozzo, 2013](#); [Wong and Johnston, 2004](#)). Therefore, differences in the rate of acquisition may also be due to such factors as the type of narrative used or the structure of the child's native language (cf. [Aksu-Koç and Nicolopoulou, 2015](#)), as well as to the way in which referring expressions are assessed as appropriate or not. In addition, since pronouns are the preferred forms for referent maintenance, better performance on maintenance coincides with the general preference to produce pronouns as economical forms ([Hendriks et al., 2014](#)). Therefore, this does not need to imply that children are taking into account discourse accessibility.

Another reason why we did not find clear age effects on anaphoric reference may be variation between individual children. Indeed, substantial individual differences in reference production can be found in our data. These may be due to children using different referential strategies. For example, some of the older children may already have employed an adult-like 'anaphoric strategy' (e.g. [Bamberg, 1986](#)), in which pronouns are primarily used to maintain reference to a locally discourse-salient referent, whereas definite NPs are used to reintroduce a less discourse-salient referent. An example of this strategy is seen in (9), where the child is using the pronoun *han* 'he' to refer back to both the boy and the dog, but is consistent in the use of the pronoun for referent maintenance, and lexical NPs for reintroduction.

- (9) Och då kom en pojke med korv. Och så lämna(de) han korvburken bredvid huset. Och sen så gick hunden fram till korven. Och så åt han upp dom. (MoSwe6-12, 6;0)
'And then a boy came with sausage. And then he left the "sausage box" next to the house. And then the dog went to the sausage. And then he ate them up.'

Furthermore, some of the younger children seemed to use what has been termed a 'nominal strategy' (e.g. [Karmiloff-Smith, 1985](#), also named 'over-explicitness' by e.g. [Hendriks, 2002](#)), where lexical NPs are used both for maintenance and reintroduction, resulting in a highly repetitive narrative, as illustrated by (10). This may be related to difficulties in using pronouns correctly. Some children may then avoid using pronouns, leading to overuse of lexical forms (cf. the discussion in [Allen et al., 2015](#)).

- (10) Pojken tittar upp i trädet för sin ballong. Pojken försöker nå den. Pojken får den. Hunden får korv. (MoSwe4-15, 4;7)
'The boy looks up the tree for his balloon. The boy tries to reach it. The boy gets it. The dog gets sausage.'

Other children used pronouns almost exclusively, either via a 'thematic subject strategy', or because they egocentrically use the shortest referential form available, irrespective of discourse constraints (cf. [Hendriks et al., 2014](#)). For example, the child who produced (11), of the same age as the child who produced (10), used pronouns to reintroduce and maintain both

animate and human referents. Additionally, the child used two different pronouns, *den* 'it' and *han* 'he', to refer to the cat. This resulted in a narrative that is difficult to follow for the listener.

- (11) Och sen fastna(de) den i busken. Och sen kom han loss. Och sen hitta(de) han en boll. Han fiskade upp den bollen. Han åt upp fisken. (MoSwe4-13, 4;7)
'And then it [cat] got stuck in the bush. And then he [cat] became unstuck. And then he [boy] found a ball. He [boy] fished out that ball. He [cat] ate up the fish.'

It is also possible for one child to employ different strategies at different points in the narrative or to not use any consistent strategy. Unfortunately, our study does not allow for an in-depth analysis of strategies employed by individual children. However, in addition to our logistic regression analyses, we ran a logistic mixed effects model with 'Child' as a random factor, to be able to separate variance resulting from individual differences from our fixed effects. This analysis yielded very similar results, suggesting that our effects were not due to the non-adult-like behavior of some children, but do capture general tendencies.

A number of open questions remain. First, we have assumed that adults are better at taking into account ambiguity in the local linguistic context and adjust their choice of referring expression accordingly. However, this is something that needs to be empirically tested for the stimuli used here. To be able to compare the degree to which children and adults use global accessibility cues in their referential choices, we plan to carry out the same narrative task with adult narrators in a future study. In addition, independent tests of working memory capacity and Theory of Mind skills may be included to investigate if these factors are a better predictor of referential behavior than age.

Second, we have taken animacy as an indicator of global accessibility in the present study. However, it is possible that other related factors, such as protagonistism or agentivity, are equally relevant to the choice of referring expressions. For example, it could be the case that children are more likely to establish a human character as the protagonist of the story, and subsequently pronominalize all references to this character. Inanimate objects, on the other hand, are very unlikely to be story characters and hence are not pronominalized as much (cf. Karmiloff-Smith, 1985). The finding that pronominal references to human non-topics are more likely to be unrecoverable in referent maintenance supports this: these references break the common pattern of putting the (human) protagonist in topic position throughout the narrative. Still, as our stimulus materials did not explicitly separate the global factors animacy, protagonistism, and agentivity, if they can be separated at all, the interplay between these factors remains unclear. Future research should investigate the interaction between different global factors.

Finally, a somewhat surprising finding was that for referent maintenance, pronouns turned out to be less likely to refer to non-human animates than to inanimate referents. One explanation is that this may be due to the nature of the pronominal expressions that can be used for referring to animals in Swedish. Whereas inanimate referents are referred to with the common gender pronoun *den* or the neuter gender pronoun *det* (based on the grammatical gender of the antecedent noun), and human referents are referred to with the masculine and feminine pronouns *han* and *hon* (based on the referent's natural gender), the situation is more complex with animals, as either a pronoun based on the grammatical gender or on the natural gender of the referent can be chosen. This makes the choice of pronoun more difficult. To avoid having to make a choice, some children may have resorted to using lexical NPs for maintaining reference to animals. Similar patterns have been shown for adult Chinese learners of German, whose overuse of nouns for referent maintenance where pronouns would be more appropriate has been explained by the complexity of the German pronominal system (Hendriks, 2002). Given the occurrence of such language-specific factors, we would strongly favor the comparison of children's referential strategies across more languages, using similar story elicitation methods (cf. Aksu-Koç and Nicolopoulou, 2015).

In conclusion, the study presented here has shown that Swedish preschool children are not using different types of referring expressions randomly when telling a story. They are sensitive to the accessibility of referents, using mainly lexical NPs in case of low accessibility, and pronouns or zero anaphora for a high level of accessibility. We propose that the difference with adult referent production lies in the weighting of different accessibility factors: global accessibility cues, such as animacy, may play a larger role in children's referential choices as compared to those of adults. The reason may be that such cues are more easily established than local discourse cues, which require continuous monitoring of the discourse. At the same time, children appear to be sensitive to fine-grained degrees of local discourse salience, suggesting that the cues necessary to become narrators of cohesive stories are already in place during the late preschool years.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.pragma.2018.06.007>.

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