Acquisition of definiteness marking in Latvian: evidence from monolinguals and bilinguals
Olga Urek, Agrita Tauriņa, Marit Westergaard and Anna Vīlāne

Abstract

1. Introduction

Acquisition of determiners presupposes mastery of both formal and interpretational aspects of their use. The former necessitates the knowledge of syntactic contexts where certain determiners are required, and the latter involves the understanding of referential distinctions that they encode. While both ‘I saw a cat today’ and ‘I saw the cat today’ are grammatical sentences of English (as opposed to, say, ‘*I saw cat today’), they differ with respect to their pragmatic interpretation. In the first case, the animal in question is unfamiliar to the addressee, as signaled by the indefinite article a. In the second case, the sentence refers to the entity familiar to the addressee from either the previous discourse or shared experience.

It has been observed (Karmiloff-Smith 1979:50-51) that determiners have a plurifunctional status in the adult language. That is, depending on the context, the same marker may be used to encode one of the multiple referential distinctions, or, in other words, realize one of its multiple referential functions. In this work, we employ the classification of referential functions proposed in Karmiloff-Smith (1979:46-50) (see also Kupisch 2006). For instance, in its nominative (naming) function, the indefinite article is used to identify the class membership of the referent, as in “This is a green house”. In the numeral function, the indefinite article picks out a single member of a given class (e.g. “one/a car”). In the non-specific reference function, the indefinite article signals “any non-particular member of a class” (Karmiloff-Smith 1979:49), as in “Give me an apple”. In the generic reference function, on the other hand, “no concrete instantiation of a class” is implied, as in “Apples are rich in vitamins”/ “The lion is a dangerous animal”. As for the definite markers, in the deictic function, they are used as a kind of demonstrative to identify the referent in a context where several members of the same class are present, and it is often accompanied by paralinguistic markers such as pointing (Karmiloff-Smith 1979:48, Parker 1996, Kupisch 2006), as in “Give me the/that apple” when several identical apples are present. In its exophoric function, the definite article is used when a referent is the only member of its class in the current extra-linguistic context, as in “The red ball disappeared” vs. “A ball disappeared” (Karmiloff-Smith 1979, Park 1996, Kupisch 2006). In the anaphoric function, the definite article refers back to the antecedent that has been mentioned previously, as in “Today I saw a cat. The cat was white”.

The development of referential functions of determiners has been a subject of a number of naturalistic (Kupisch 2006, Serratrice 2000, Anderssen 2005) and experimental studies (Karmiloff-Smith 1979, Maratsos 1976). Research shows that
different referential functions of determiners are acquired gradually and in a certain sequence (Karmiloff-Smith 1979, Kupisch 2006), with some functions being mastered earlier and others later. For example, while the use of indefinite articles in the naming function and definite articles in the deictic function is not problematic for children already at the age of 3;0, the appropriate use of definite articles in the exophoric function is not mastered until the age of 6;0, while anaphoric and generic functions are acquired around the age of 8;0 (Karmiloff-Smith 1979).

Although languages may employ a wide variety of formal markers to encode referential distinctions, the functions of such markers are “universally expressed” (Karmiloff-Smith 1979:22). In other words, while surface markers of specific/non-specific reference might range from word order to nominal clitics (Kramsky 1972, as cited by Karmiloff-Smith 1979), the distinctions that they realize are language-independent. In turn, the acquisition of the referential functions of determiners has been linked to “general cognitive maturation” (Kupisch 2006:141, Karmiloff-Smith 1979), which makes it reasonable to expect that acquisition paths would be qualitatively similar across languages despite the formal differences of the surface markers. In other words, we would not expect the anaphoric function of some marker to develop prior to its deictic function in any language, etc. Quantitative differences, on the other hand, are to be expected due to cross-linguistic differences in frequency and relative saliency of referential markers.

The current study focuses on the use of certain referential functions by monolingual and bilingual (Russian-speaking) children acquiring Latvian, a language that marks specific/non-specific reference by means of adjectival inflections. Specifically, we investigate the use of indefinite adjectives in the naming function (i.e. the function that has been previously shown to develop very early), and the use of definite adjectives in the exophoric function (i.e. the function that is acquired relatively late). The use of definite and indefinite adjective forms is investigated in two experimental settings: in the first experiment reported here, only extralinguistic cues to the target-appropriate form were present, while in the second experiment both syntactic and contextual cues were given to the participants.

This article is structured as follows. In Section 2, we briefly introduce morphological marking of definite/indefinite distinction in Latvian. Section 3 presents the research questions and predictions of this study. In Section 4, we introduce our methodology. In Section 5, we present the experimental results. Section 6 contains summary and discussion.

2. Definiteness marking in Latvian

In a number of Indo-European languages (mostly Slavonic, Baltic and Germanic) (see Lyons 1999:82-85), indefiniteness/definiteness is marked on adjectives, either in addition to other definiteness markers (e.g. determiners or nominal suffixes) or as the only marker. Latvian (and the related Lithuanian language) falls into the second category: here, definiteness is only overtly marked on adjectives and certain
attributive participles. Thus, a noun phrase can be marked as definite or indefinite only in the presence of an attributive element. Latvian has a rather complex morphological system, distinguishing between five cases and two genders (masculine and feminine) in the adjectival declension. Definiteness marking comes in addition to that, such that every adjective has a definite and an indefinite paradigm for each gender (see Stolz 2010: 237-238 for further discussion and a diachronic overview). In the nominative singular, definite adjectives are marked by means of the inflection [-ai-] in masculine forms, and as a lengthening of a theme vowel in feminine forms, as shown in (1):

(1)
\[
\begin{array}{ll}
\text{a. } & \text{Meln-Ø-s} \quad \text{kak-i-s} \\
& \text{Black-Nom.sg.masc} \quad \text{cat-Nom.sg.masc} \\
& \text{‘A black cat’} \\
\text{b. } & \text{Meln-a-Ø} \quad \text{krūz-e-Ø} \\
& \text{Black-Nom.sg.fem} \quad \text{cup-Nom.sg.fem} \\
& \text{‘A black cup’} \\
\text{c. } & \text{Meln-ai-s} \quad \text{kak-i-s} \\
& \text{Black-DEF-Nom.sg.masc} \quad \text{cat-Nom.sg.masc} \\
& \text{‘The black cat’} \\
\text{d. } & \text{Meln-ā-Ø} \quad \text{krūz-e-Ø} \\
& \text{Black-DEF-Nom.sg.fem} \quad \text{cup-Nom.sg.fem} \\
& \text{‘The black cup’}
\end{array}
\]

The examples in (2) illustrate definite and indefinite paradigms of the adjective *jauns* 'new'. There are three ways in which definiteness can be marked on the adjective throughout the paradigm, irrespective of its gender: (i) insertion of the marker */-ai/- (realized as [-ai-] prevocally) before the case-number suffix, as in [jaun-s] ~ [jaun-ai-s]; (ii) lengthening of the theme vowel, as in [jaun-a] ~[jaun-a:]; or (iii) diphthongization of the case-number suffix, as in [jaun-u] ~ [jaun-uo] or [jaun-i] ~ [jaun-ie] (see also Stolz 2010:237-238 for some discussion on this point and a diachronic overview; see Urek 2016, Halle & Zeps 1966, Halle 1987, 1992, Steinbergs 1977 on inflectional morphology of Latvian).

(2)
\[
\begin{array}{|c|c|c|c|c|}
\hline
& \text{Singular} & \text{Plural} \\
\hline
& \text{INDEF} & \text{DEF} & \text{INDEF} & \text{DEF} \\
\hline
\text{Nom} & jaun-s & jaun-ai-s & jaun-i & jaun-ie \\
\hline
\text{Gen} & jaun-a & jaun-a: & jaun-u & jaun-uo \\
\hline
\end{array}
\]
In the majority of cases, the choice between definite and indefinite form is determined solely by the intended pragmatic meaning, and neither form leads to the ungrammaticality (Sokols et al. 1959:434-456, Ceplīte 1970, Auziņa et al. 2015). There is, however, a number of constructions where either a definite or an indefinite form is required by the syntactic context. For example, indefinite NPs are strongly preferred in copular possessive constructions like the one illustrated in (3). In turn, only definite adjectives are grammatical in possessive NPs, as shown in (4).

(3) a. Ilzei ir sarkans ābols
   Ilze-DAT is red-indef apple-NOM
   ‘Ilze has a red apple’

   b. ?? Ilzei ir sarkanais ābols
   Ilze-DAT is red-def apple-NOM
   ‘Ilze has the red apple’

(4) a. Ilzes sarkanais ābols
   Ilze-GEN red-def apple-NOM
   ‘Ilze’s red apple’

   b. *Ilzes sarkansābols
   Ilze-GEN red-indef apple-NOM
   ‘Ilze’s red apple’

3. Research questions and predictions
In this study we investigate the use of referential functions of definite and indefinite adjective forms in monolingual and bilingual pre-school children acquiring Latvian. The study aims to answer the four main questions formulated in (5):

(5) Research questions

1. Do Latvian-speaking children follow the timeline and the order of acquisition of referential functions proposed for the languages where such functions are realized by articles?

2. Are the differences in performance between monolingual and bilingual children mainly quantitative, or do they follow qualitatively distinct acquisition paths?

3. How does the amount of exposure to Latvian affect the acquisition of referential functions of adjectives in bilinguals?

4. Does the presence of syntactic cues in addition to the contextual ones improve performance for both monolingual and bilingual children?

Our predictions for the study are summarized in (6). To the extent that the available descriptions of the normative use of definite and indefinite adjective forms expected from the point of view of the literary standard (e.g. Sokols et al. 1959:434-456, Ceplīte 1970, Auziņa et al. 2015) accurately reflect the actual use of these forms, we expect that the adult controls will perform at ceiling in both experiments. Based on what has been previously found with respect to the development of the referential functions in children (Karmiloff-Smith 1979, Kupisch 2006), we predict that monolingual children will not perform equally well with respect to the use of the two referential functions tested. Given the mean age of our monolingual participants (4.0 years in Experiment 1, 4.8 years in Experiment 2), we expect the use of the indefinite adjectives in the naming function to be (nearly) target-like. At the same time, we expect that monolingual children will still struggle with the use of the definite forms in the exophoric function. However, we predict that the introduction of the syntactic cues in addition to the contextual ones will have a positive effect on performance.

Although it has been suggested that the development of referential functions is linked to the general cognitive maturation and is therefore language-independent, the link between a given function and the surface marker realizing it has to be learned from the ambient language. It is, therefore, reasonable to expect that the amount of target language input will positively correlate with performance. For this reason, we predict that bilingual participants, as a group, will score lower than monolingual children across conditions. However, we do expect to find the positive effect of cumulative exposure to Latvian on their performance.

(6) Predictions
a. At-ceiling performance for the adults with respect to the use of both referential functions;
b. At-ceiling performance for the monolingual children with respect to the use of the naming function, but not the exophoric function;
c. Quantitative differences between bilingual and monolingual children;
d. Positive effect of cumulative exposure to Latvian on performance in bilinguals;
e. Positive effect of syntactic cues for both groups of children;

4. Methodology

4.1. Participants

For Experiment 1, we recruited 29 monolingual Latvian-speaking children aged between 3.2 and 4.8 years (mean age = 4, SD = 0.43) and 19 bilingual Latvian-Russian children aged between 4 and 6.8 years (mean age = 5.2, SD = 0.87). For Experiment 2, 18 monolingual children aged between 4 and 5.9 years (mean age = 4.8, SD = 0.48) and 14 bilingual children aged between 5.1 and 6.6 years (mean age = 5.8, SD = 0.4) were recruited. In addition, ten adult native speakers of Latvian were used as a control group for each experiment.

All participants were recruited in Riga, Latvia. However, we did not control for exposure to other languages. Given the demographic situation in Latvia, exposure to the Russian language must be assumed, and at least some command of Russian is extremely likely in the adult population of Riga. All children participating in the study were born in Latvia and attended kindergartens with Latvian as the only language of instruction. The monolingual children come from families where both parents speak Latvian natively, and they do not receive any systematic instruction in Russian (or any other language). As in the case with the adults, however, at least some exposure to Russian is to be expected also for this group.

All the bilingual children in our sample have one Latvian-speaking and one Russian-speaking parent. To estimate the cumulative amount of exposure to Latvian and Russian in these children, we used the Utrecht Bilingual Language Exposure Calculator (UBiLEC, Unsworth 2013), a tool that allows us to investigate the language environment of bi- and multilingual children in detail from birth. For this study, UBiLEC was translated into Latvian and Russian and adapted to be administered as a questionnaire (as opposed to a parental interview, which is the original format). The questionnaire was filled out by one of the parents, who was given a choice between a Latvian and a Russian version. Parental responses were entered into the UBiLEC algorithm by one of the authors, and cumulative and present exposure to Latvian and Russian was calculated automatically. Although all bilingual children in our study attend kindergartens where Latvian is the only language of
instruction, the amount of exposure to Latvian and Russian varies somewhat from child to child, due to factors such as the dominant language of communication at home, family composition (e.g. number of grandparents, siblings etc.), extracurricular activities, input from TV and other sources, etc.

4.2. Procedure

4.2.1. Experiment 1

For this experiment, we used a picture-based elicitation task adapted from Rodina & Westergaard (2013, 2015 a, b). Stimuli used for the study consisted of 12 masculine and 19 feminine nouns denoting everyday objects and common animals. Target nouns were evenly distributed across the five declension classes1. The nouns were selected so as to be easily picturable and familiar to the children of the target age.

Participants were tested individually in a quiet room by one of the authors, who is a native speaker of Latvian. Pictures of the target nouns were presented as Power Point slides on a laptop screen. During each trial, two identical objects of different colors appeared on the screen. The name of the objects was introduced to the participant in the lead-in sentence (e.g. To sauc "ābols"/ ‘This is called “apple”’). To elicit an indefinite adjective form in the naming function (henceforth “indefinite condition”), the participant was prompted to name the objects on the screen along with their colors (e.g. Salīdzini pēc krāsas! / ‘Compare (them) by color!’). The response expected from the participant was two indefinite noun phrases identifying the objects and their colors (e.g. Te ir sarkans ābols, un te ir zils ābols / ‘Here is a red apple, and here is a blue apple’). After the participant had named the objects, the experimenter pressed the button causing one of the objects to disappear. To elicit a definite adjective in the exophoric function (henceforth “definite condition”), the participant was prompted to name the object that disappeared along with its color (e.g. Kas tagad pazuda? / ‘What has disappeared now?’). The expected second response was the definite noun phrase (e.g. Sarkanais ābols! / ‘The red apple’). The experiment was preceded by two practice trials (one from each gender), where the children were familiarized with the experimental procedure. Adult and child participants followed the exact same procedure. All responses were audio-recorded using a dictaphone and later orthographically transcribed by three transcribers. Transcriptions were then verified by one of the authors of this study.

1 Latvian nouns fall into 6 declension classes depending on their gender and a theme vowel that they take (Urek 2016, Halle & Zeps 1966, Halle 1987, 1992, Steinbergs 1977). In this study, we included 5 nouns of each of the two open masculine declensions (declensions I and II in traditional classification) and the two open feminine declensions (IV and V). In addition, six nouns of the closed feminine declension were also included (declension VI). We did not include any nouns belonging to the closed declension III (masculine u-stems), because they do not denote easily picturable objects (e.g. tirgus ‘market’, klepus ‘cough’, etc.).
4.2.2. Experiment 2

In Experiment 2, we used the same set of stimuli as in Experiment 1, i.e. 12 masculine and 19 feminine nouns denoting familiar objects and animals. However, while in Experiment 1 the pictures were presented on a laptop screen, in Experiment 2 we used laminated cut-out pictures placed on an improvised stage. In addition, two dolls – Ilze and Jānis - were introduced.

Unlike in Experiment 1, where only contextual cues to the target-appropriate form of the adjective were given, in Experiment 2 we also introduced the syntactic cues. During each trial, two identical objects of different colors were placed on the stage. The name of the objects and their possessor was introduced to the participant in the lead-in sentence (e.g. Jānis ir ābols/ ‘Jānis has an apple’). Just as in Experiment 1, the participant was then prompted to name the objects along with their colors. However, this time the participant was asked to name the possessor as well (e.g. Jānis ir zils ābols un sarkans ābols / ‘Jānis has a red apple and a blue apple’). After the participant named the objects, one of them was removed from the stage. The participant was then prompted to name the object that disappeared along with its color and its possessor (e.g. Kas tagad pazuda? / ‘What has disappeared now?’). The expected second response was a possessive construction (e.g. Jāņa sarkanais ābols / ‘Jānis’s red apple’). Again, adult and child participants followed the exact same procedure.

5. Results

Transcription revealed that some children in our sample still struggle with maintaining the length contrast between [aː] and [a] in word-final position. Since it is this contrast that also marks the distinction between definite and indefinite feminine adjectives in the nominative singular, incomplete mastery of the length contrast in vowels obscures the presence of definite/indefinite contrast in feminine forms. This was especially evident for children who consistently used target-appropriate definite/ indefinite masculine forms, while at the same time being inconsistent in their use of definite/indefinite feminine forms. Since most children in our sample used a certain proportion of non-target-appropriate forms (both masculine and feminine) in both conditions, in the majority of cases it was impossible to judge with certainty whether a given feminine form appears with a short final vowel due to its being intended as an indefinite form by the participant, or due to the incomplete mastery of the length contrast. For this reason, feminine forms were excluded from the final analysis.

5.1. Experiment 1

Figure 1 illustrates the mean proportion of target-like responses given in each condition by adults, as well as monolingual and bilingual children. As expected, the adults are essentially target-like in both conditions, with a mean proportion of correct responses in the definite condition of 0.9 (SD = 0.11), and a mean proportion of correct responses in the indefinite condition of 0.88 (SD = 0.27). However, as evident
from the plot, the mean accuracy is quite low for both groups of children, and the
dispersion of individual scores about the mean is large. For the monolinguals, the
mean accuracy is 0.51 (SD = 0.41) in the definite condition and 0.62 (SD = 0.37) in
the indefinite condition. The mean accuracy for the bilinguals is 0.41 (SD = 0.41) in
the definite condition, and 0.64 (SD = 0.39) in the indefinite condition.
Unsurprisingly, a logistic mixed effects model with “Group” (monolingual adults,
monolingual children, bilingual children) as a fixed effect and “Participant” and
“Item” as random effects revealed that both the monolingual (β = -1.96 (SE = 0.38), z
= -5.126, p = 2.96e-07) and the bilingual children (β = -2.31 (SE = 0.4), z = -5.775, p
= 7.68e-09) score significantly lower than the monolingual adults.

In order to compare the two groups of children with respect to their performance in
the two conditions, a logistic mixed effects model was fit with “Group” (monolingual
vs. bilingual) and “Condition” as fixed interacting effects, while allowing varying
intercepts for participants and items. The results of the model are summarized in
Table 1. The model revealed that monolinguals score significantly higher than
bilinguals in the definite condition (β = 0.534 (SE = 0.27), z = 1.961, p = 0.0498),
while no difference in performance was found in the indefinite condition (p = 0.318).
Condition turned out to be a reliable predictor of accuracy, with bilinguals scoring
higher in the indefinite condition as compared to the definite condition (β = 0.87 (SE
= 0.15), z = 5.8, p = 6.76e-09). The effect of the condition on monolinguals is slightly
smaller, but the difference between the groups is insignificant (p = 0.1558).

To investigate whether the bilingual children’s performance is influenced by their
chronological age and cumulative exposure to Latvian, a separate multilevel logistic
A regression model was used (see Table 2). However, the model revealed no reliable effect of either predictor (p = 0.598 for age and p = 0.472 for exposure).

(8) Table 1: Effect of condition and bilingual status on accuracy

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon. vs. Bil (def)</td>
<td>0.534</td>
<td>0.2722</td>
<td>1.961</td>
<td>0.0498</td>
</tr>
<tr>
<td>Mon. vs. Bil (indef)</td>
<td>0.2506</td>
<td>0.2509</td>
<td>0.999</td>
<td>0.31779</td>
</tr>
<tr>
<td>Indef. (Bil.)</td>
<td>0.8747</td>
<td>0.1509</td>
<td>5.797</td>
<td>6.76e-09</td>
</tr>
<tr>
<td>Mon.: Indef.</td>
<td>-0.2833</td>
<td>0.1996</td>
<td>-1.419</td>
<td>0.1558</td>
</tr>
</tbody>
</table>

(9) Table 2: Effect of age and CLoE on accuracy in bilinguals

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.501</td>
<td>0.794</td>
<td>0.630</td>
<td>0.528</td>
</tr>
<tr>
<td>CLoE</td>
<td>0.115</td>
<td>0.159</td>
<td>0.719</td>
<td>0.472</td>
</tr>
<tr>
<td>Age</td>
<td>-0.007</td>
<td>0.014</td>
<td>-0.528</td>
<td>0.598</td>
</tr>
</tbody>
</table>

Thus, we found that both monolingual and bilingual children score significantly lower than adults in using definite and indefinite forms in the relevant contexts, although both groups of children have a significantly higher proportion of target-like responses in the indefinite condition. We also saw that the monolingual children perform better than the bilinguals with respect to the use of definite forms, while their accuracy in the indefinite condition is at the same level. The large standard deviation values in Figure 1 suggest a very high degree of individual variation and warrant a closer look at the distribution of individual scores. Figure 3 and Figure 4 show the proportion of definite and indefinite responses in each condition for each participant for monolinguals, while Figure 5 and Figure 6 illustrate the same data for bilinguals (where blue bars indicate the proportion of definite responses, and red bars indicate the proportion of indefinite ones for each participant).

(10) Distribution of responses: monolinguals

a. Figure 3: Definite condition

b. Figure 4: Indefinite condition
If we consider the distribution of responses in (10) and (11), a rather curious pattern becomes apparent: many monolingual and bilingual children demonstrate a strong preference for either a definite or an indefinite form, and use it across the board in both conditions. In the most extreme case, only responses of one type are given in both conditions. Nevertheless, the logistic mixed effects model with “Condition” as fixed effect and “Participant” and “Stimulus” as random effects reveals that the condition still predicts the distribution of responses. Thus, the proportion of definite responses in the definite condition is significantly higher than the proportion of definite responses in the indefinite condition ($\beta = 1.67$ (SE = 0.17), $z = 9.944$, $p = 2e-16$). This suggests that, as a group, children in our sample tend to use indefinite forms in the nominative function, and definite forms in exophoric references when the referent is the only member of its class in a given setting.

Let us now summarize the results. First, Experiment 1 revealed that both monolingual and bilingual Latvian-speaking children still struggle with the target-like use of indefinite forms in the naming function well after the age of three. This is surprising given the findings of the previous experimental studies that show that the naming function is acquired very early (Karmiloff-Smith 1979, Kupisch 2006). One possibility is that this finding is an artifact of the procedure used here. However, no evidence for the overuse of definite forms in the nominative function is found in the study by Rodina & Westergaard [Rodina & Westergaard 2015 a,b], who, as mentioned above, used a very similar experimental procedure with Norwegian-speaking preschool children. In Norwegian, indefinite nouns are marked by an article preceding the noun, e.g. *en bil* ‘a car’, while definiteness is expressed by a suffix, e.g. *bilen* ‘the car’. Rodina (personal communication) indicates that children in their sample were essentially target-like in their use of indefinite forms. Another potential explanation for the apparent late acquisition of a nominative function can be a relatively low saliency of definiteness/indefiniteness marking in Latvian as compared to the languages where the distinction is marked by means of articles and/or nominal suffixes. Since adjectives are significantly less frequent than nouns, it might take
longer for Latvian-speaking children to grasp the referential function of adjective forms. Nevertheless, both groups of children showed a significantly higher proportion of target-like adjective forms in the nominative function than in the exophoric function. Experiment 1 also showed that the target-like use of adjective forms in the exophoric function is not yet mastered at this age, which could be expected based on previous findings (Karmiloff-Smith 1979). As expected, bilinguals scored significantly lower than monolinguals in this condition, which indicates that the problem is lack of exposure to Latvian.

5.2. Experiment 2

Let us now turn to the results of Experiment 2. Recall that in Experiment 2, NPs were elicited in lead-in sentences that provided additional cues to the definiteness/indefiniteness of the adjective. Figure 7 illustrates the mean proportion of target-like responses given in each condition by monolinguals and bilinguals. As the plot reveals, adults are essentially at ceiling in both conditions, with a mean proportion of correct responses of 1 (SD = 0) in the definite condition, and a mean proportion of correct responses of 0.99 (SD = 0.03) in the indefinite condition. Again, for children the mean accuracy is comparatively low, and the dispersion of individual scores around the mean is considerable. For the monolinguals, the mean accuracy is 0.82 (SD = 0.38) in the definite condition, and 0.68 (SD = 0.44) in the indefinite condition, while for bilinguals it is 0.44 (SD = 0.41) in the definite condition, and 0.77 (SD = 0.23) in the indefinite condition. Just as in Experiment 1, a logistic mixed effects model with “Group” (monolingual adults, monolingual children, bilingual children) as a fixed effect and “Participant” and “Item” as random effects showed that both monolinguals (β = -4.69 (SE = 1.098), z = -4.27, p = 1.96e-05) and bilinguals (β = -5.49 (SE = 1.126), z = -4.873, p = 1.10e-06) perform significantly worse than the adults.

(12) Figure 7: Mean accuracy by condition
In order to examine whether bilingual status and condition influence performance, we ran a logistic mixed effects model that predicted accuracy based on “Group” (monolingual vs. bilingual) and “Condition”, while including participants and items as random effects. The results of the model are summarized in Table 3. We can conclude that monolinguals outperform bilinguals in the definite condition ($\beta = 2.44$ (SE = 0.64), $z = 3.81$, $p = 0.000138$), while being slightly worse than bilinguals in the indefinite condition (although this difference is not significant, $p = 0.869$). Bilinguals are significantly more target-like in the indefinite condition ($\beta = 1.738$ (SE = 0.193), $z = 9.002$, $p < 2e-16$), but for monolinguals the relationship between accuracy and condition is reversed ($\beta = -0.8088$ (SE = 0.21), $z = -3.842$, $p = 0.000122$). A separate logistic regression revealed that the cumulative exposure to Latvian positively affects accuracy in bilinguals ($\beta = 0.5734$ (SE = 0.23), $z = 2.543$, $p = 0.011$), while no such relationship was found between accuracy and chronological age ($p = 0.722$).

(13) Table 3: Effect of condition and bilingual status on accuracy

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon. vs. Bil (def)</td>
<td>2.44</td>
<td>0.64</td>
<td>3.81</td>
<td>0.000138</td>
</tr>
<tr>
<td>Mon. vs. Bil (indef)</td>
<td>-0.108</td>
<td>0.619</td>
<td>-0.164</td>
<td>0.869</td>
</tr>
<tr>
<td>Indef. Bil. vs. Def. Bil.</td>
<td>1.738</td>
<td>0.193</td>
<td>9.002</td>
<td>&lt; 2e-16</td>
</tr>
<tr>
<td>Indef. Mon. vs. Def. Mon</td>
<td>-0.8088</td>
<td>0.2105</td>
<td>-3.842</td>
<td>0.000122</td>
</tr>
<tr>
<td>Mon.: Indef.</td>
<td>-2.5471</td>
<td>0.286</td>
<td>-8.908</td>
<td>&lt; 2e-16</td>
</tr>
</tbody>
</table>

(14) Table 4: Effect of age and CLoE on accuracy in bilinguals

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-1.7808</td>
<td>2.2637</td>
<td>-0.787</td>
<td>0.431</td>
</tr>
<tr>
<td>CLoE</td>
<td>0.5734</td>
<td>0.2255</td>
<td>2.543</td>
<td>0.011</td>
</tr>
<tr>
<td>Age</td>
<td>0.1496</td>
<td>0.4205</td>
<td>0.356</td>
<td>0.722</td>
</tr>
</tbody>
</table>

Summarizing the discussion so far, we can state that both bilinguals and monolinguals perform significantly lower than the adults even in cases where lead-in sentences provide additional cues to the target-appropriate form of the adjective. However, monolinguals outperform bilinguals in the definite condition, which suggests that monolinguals are more sensitive to the cues provided by possessives than bilinguals are. We also found that bilingual children with larger cumulative exposure to Latvian perform significantly better than their peers with less exposure, while chronological age plays no role for accuracy.
We may also check whether introducing the syntactic cues to definite/indefinite distinction in addition to the contextual ones significantly affected accuracy in the two groups of children. For ease of reference, the results of both experiments are repeated as Figure 8.

(15) Figure 8: Accuracy by language status and condition: Exp. 2 vs. Exp. 1

A mixed effects model was fit that predicted accuracy based on design, condition and language status (controlling for age), while allowing for varying intercepts for participants and items. The results of the model are shown in (16).

(16)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>old vs. new (mon. def.)</td>
<td>1.4250</td>
<td>0.4360</td>
<td>3.268</td>
<td>0.00108</td>
</tr>
<tr>
<td>old vs. new (bil. def.)</td>
<td>-0.2109</td>
<td>0.4594</td>
<td>-0.459</td>
<td>0.646</td>
</tr>
<tr>
<td>old vs. new (mon. indef)</td>
<td>0.04</td>
<td>0.407</td>
<td>0.1</td>
<td>0.92</td>
</tr>
<tr>
<td>old vs. new (bil. indef)</td>
<td>0.6214</td>
<td>0.4447</td>
<td>1.397</td>
<td>0.1623</td>
</tr>
</tbody>
</table>

The model revealed that, on average, monolinguals are significantly more accurate in the definite condition in Experiment 2 (β = 1.4 (SE = 0.43), z = 3.268, p = 0.001) as compared to Experiment 1, which suggests that for them the possessive noun is a cue to the form of a following adjective (recall that only definite adjectives are grammatical in possessive NPs in Latvian). For bilinguals, on the other hand, no such effect is observed (p = 0.646), indicating that they are not sensitive to this syntactic context. In the indefinite condition, on the other hand, no group shows a significant improvement.
6. Summary and discussion

As expected, the analysis revealed that adult controls perform at ceiling with respect to the use of naming and exophoric functions in both experiments. As predicted, both monolingual and bilingual children scored significantly lower than the adults in the definite condition, which indicates that they still struggle with the target-appropriate use of the definite adjectives in the exophoric function at this age. However, contrary to our expectations, it was found that both groups of children are not adult-like in their use of indefinite adjectives either. A possible reason for the apparent late acquisition of the naming function of indefinite adjectives in Latvian might be the relatively low frequency of adjectives in the ambient language (as compared, for instance, to the frequency of nominal articles in languages like English and French). At the same time, both monolinguals and bilinguals were found to perform better in the indefinite condition as compared to the definite one, which supports our prediction that the naming function is acquired before the exophoric one.

As predicted, we found quantitative differences between monolinguals and bilinguals in both experiments. However, contrary to our expectations, the statistically significant difference in performance was only found in the definite condition, while both groups of children scored approximately the same in the indefinite condition. In addition, cumulative amount of exposure to Latvian turned out to be a reliable predictor of performance in bilinguals, when controlling for chronological age. However, the effect was only significant in the second experiment. As expected, no obvious qualitative differences were observed between monolingual and bilingual participants. Performance of both groups was characterized by a high degree of individual variation. Many children in our sample appeared to be biased towards either the definite or the indefinite form, which they overused across conditions. Interestingly, neither form emerged as a clear default, which precludes any conclusions about their relative markedness.

Turning now to the effect of syntactic cues, a significant improvement in performance was found for monolinguals in the definite condition of the second experiment, which indicates that they are sensitive to the fact that only definite forms are grammatical in possessive NPs (bilingual children, on the other hand, showed no improvement in the second experiment). However, no significant effect of syntactic context was found in the indefinite condition for either monolinguals or bilinguals, meaning that children of this age are not yet sensitive to the strong preference for indefinite forms in copular possessive constructions characteristic of adult Latvian.

In conclusion, the results of our study suggest that while referential functions of definite/indefinite adjective forms in Latvian are mastered considerably later than referential functions of articles in languages like English and French, the claim that referential functions are acquired gradually and in a specific order is supported by our data. Bilingual children, as a group, have more difficulties with the adult-like use of definite/indefinite adjective forms in both referential functions studied, although cumulative amount of exposure to Latvian positively affects their performance. While
the addition of syntactic cues improves performance in monolinguals, the effect is limited to possessive NPs.

References


