Acquisition of Noun Plurals among Early Sequential Russian-Hebrew Speaking Bilinguals: A Longitudinal Multiple Case Study

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Abstract

The focus of the present study was the trajectory of the acquisition of noun pluralization in Hebrew as a window into the development of inflectional morphology among early sequential Russian-Hebrew speaking bilinguals. Our participants were six early sequential bilingual children between 36 and 42 months of age at the beginning of the study, who acquired Russian (L1) at home and at preschool within a 'first language first approach' and whose age at the onset of their acquisition of Hebrew (L2) was about 3 years. We investigated both qualitative and quantitative features of noun pluralization in Hebrew (L2) acquisition in order to determine (1) whether early sequential bilingual children are delayed or accelerated in this domain; (2) whether they show similar or different patterns of errors in comparison to the L1 children; and (3) at what age sequential bilingual children acquire regular versus irregular noun plural forms compared with the L1 children.

We relied on a multi-faceted longitudinal analysis of noun pluralization, examining both correct and incorrect production- in structured elicitations as well as in (semi-) spontaneous interactions. Comparing our data to those collected for Hebrew L1 speakers, the results for monolinguals and early sequential bilinguals show a striking similarity with respect to the development of pluralization. These findings suggest that the accelerated rate of ESBs' L2 pluralization mechanism provides evidence of the linguistic maturation hypothesis.

Keywords: Acquisition of noun plurals, early sequential bilinguals, Russian, Hebrew, longitudinal multiple case study

1. Introduction

A growing body of research in the past two decades has indicated that the grammar acquisition patterns of simultaneous bilinguals show similarities with monolinguals' acquisition of the (typically) two languages being acquired (e.g., De Houwer, 1995; Döpke, 1992). Language acquisition among Early Sequential Bilinguals (henceforth ESBs) has been insufficiently investigated to date compared to the acquisition of simultaneous bilinguals (Unsworth & Hulk,

2009). Montrul (2008) has defined ESBs as Child Heritage Speakers – e.g., children from immigrant families who grow up exposed both to their home minority language and to the

society's majority language. In this context, child heritage speakers are exposed to the second and dominant language of the host society only after entering a pre-school educational setting, that is, sequentially to their first and heritage language. As such, these are children whose onset of L2 acquisition lies between the ages of 1 and 4 years of age (e.g., Meisel, 2009; Unsworth & Hulk, 2009).

Two main characteristics differentiate simultaneous bilinguals (whose age of onset of L2 is from birth to the end of the first year of life) from ESBs: the sequence of ESBs' L2 acquisition and the acquisition of their grammatical knowledge in L1 before acquiring L2. It has been suggested that ESBs' L2 grammar emerges following the initial stages of L1 grammar acquisition, and not concurrently as in the case of simultaneous bilinguals (Meisel, 2008; Rothweiler, 2008). As a result, the ESBs' L2 onset occurs after reaching some level of linguistic maturity in their L1 acquisition. Nonetheless, with time and academic progress, these children acquire a strong command of the majority language.

The current paper aims to examine the acquisition of noun pluralization as a window into ESBs' L2 development. Plural marking is the most basic morphological marker on nouns: if a language has a single category of morphological marking on the noun, it is grammatical number (El'konin, 1973). Moreover, noun plurals play a central role in the morphology of noun phrases and serve as the trigger of grammatical agreement, thus constituting a basic category in acquisition, although the trajectory of acquisition may span well into school age. The path to noun pluralization acquisition among monolingual children has been the topic of many studies (Clahsen et al., 1992; Marcus et al,. 1995). However, to date, in the context of childhood bilingualism, few studies have directly focused on this facet of inflectional morphology. The present study investigates the domain of plural acquisition among Russian-Hebrew-speaking child heritage speakers who are ESBs.

1.1 The Plural System of Hebrew

Hebrew nouns take one of two genders - masculine (e.g., *shulxan* 'table') or feminine (e.g., *mita* 'bed'). The plural formation of masculine nouns typically involves concatenating the *–im* suffix to the stem (e.g., *tik* ['bag']~ *tik-im* ['bag~s']), and the plural of feminine nouns are inflected with the suffix *–ot* (e.g., *tmuna* ['picture']~ *tmun- ot* ['picture~s']). However, some nouns take irregular or unpredictable suffixes when pluralized. As illustrated in Table 1, some masculine plurals take the feminine suffix*–ot*; similarly, some feminine nouns are inflected with the masculine suffix *–im* (see Table 1). According to Ben Or (1967), over 200 masculine nouns in modern Hebrew take the *-ot* suffix and about 50 feminine nouns take the *-im* suffix.

Table 1

Irregular Suffix Assignment in Hebrew

Singular form	Irregular plural form	Expected regular plural form
kir 'wall(MASC)'	*kir-ot* 'wall~s'	*kir-im*
rexov 'street(MASC)'	*rexov-ot* 'street~s'	*rexov-im*
beyca 'egg(FEM)'	*beyc-im* 'egg~s'	*beyc-ot*
nemala 'ant(FEM)'	*nemal-im* 'ant~s'	*nemal-ot*

Another form of irregular pluralization is associated with morpho-phonological alternations of the stem. As presented in the Table 2, these alternations include the reduction or deletion of vowels, vowel change, or vowel epenthesis; dropping of the base-final consonant in feminine nouns (*–t*), or stop/spirant alternations (Berman, 1985; Ravid, 1995b).

Table 2

Main Morpho-phonological Alterations of the Stem in Hebrew

Type of morpho-phonological alternation	Example
deletion of vowel	*s**i**mla ~ smal-ot*, 'dress(FEM)~es' *kélev ~ klav-im,* 'dog(MASC)~s'
change of vowel	*x**e**c ~ x**i**c-im* 'arrow(MASC) ~s'
vowel change combined with vowel deletion	*dégel ~ dgalim* 'flag(MASC)~s'
dropping of the base-final consonant in feminine nouns *–t*	*kapit ~ kapiy-ot* 'teaspoon(FEM)~s'
stop/spirant alternations	*kaf~kapot* 'spoon(MASC)~s'

What is possibly the most complex type of plural formation in Hebrew is a category that combines a full stem change and unpredictable suffixation, presenting a case of radical irregularity. For example, in the case of the feminine noun *iša*, 'woman', the plural form has both an irregular masculine instead of a feminine suffix and a full stem alteration: *naš-im*, 'women.' This category includes a relatively small number of items, and according to Schwarzwald (1991) these items need to be memorized as words in the lexicon, as no sub-rule, or regularized irregularity, can capture its idiosyncrasies.

1.2 The Acquisition of the Plural System in Hebrew

The regularization of morphological exceptions is consistently observed among preschoolers. In fact, the system of noun pluralization for Hebrew has been shown to be mastered only well into school age (Berman, 1985; Ravid & Schiff, 2009; Schiff, Ravid & Levy-Shimon, 2011). More specifically, developmental studies on Hebrew have shown that irregular forms are mastered considerably later than regular ones (see Berman, 1981a; Ravid, 1995a; Ravid & Schiff, 2009). This developmental trajectory has been the focus of recent study, both from a longitudinal perspective, examining a corpus of naturalistic speech samples of four Hebrew-speaking children between the ages 1;5 - 3;0 in interaction with their parents (Nir-Sagiv, 2006), and from a cross-sectional investigation of children in 6 age groups (2-7 years) collected from semi-spontaneous conversations (Zwilling, 2008).

A rigorous experimental design was used in Lavie's (2006) cross-sectional study that tested the developmental trajectory of plural noun acquisition among 180 native Hebrew speaking participants: 20 children in 8 age groups (ages 3-10), two control groups of 20 children (ages 11-13), and 20 adults. All participants came from mid-to high socioeconomic status, were monolinguals, and exhibited normal speech and language development. These participants were asked to complete a structured plural elicitation task, where items were presented in a booklet containing 56 pairs of pictures – one depicting a single item and the other multiple instances of the same item. The results of the study showed that accuracy in the production of plural forms improves with age. The age of acquisition of irregular forms was higher as a function of increased complexity, measured by different levels of suffix predictability (fully predictable, partially predictable, and unpredictable) and of stem change (non-changing stem, slightly changing-stem, and substantially changing stem). In most cases, performance on suffixation was better than performance on stem change at all levels of analysis.

1.3 The Acquisition of the Plural System in Hebrew as a Second Language

The plural system in Hebrew represents a rich area for study since (a) it is characterized by both regular and transparent forms as well as irregular and non-transparent forms; and (b) data collected on monolingual children indicate delayed acquisition of irregular forms. To date, few studies have examined the acquisition of noun plurals by speakers of Hebrew as a second language. Both child and adult acquisition was investigated as part of Alfi-Shabtay's (2006) extensive study of six basic morphosyntactic categories in Hebrew, which examined 123 native Russian-speaking immigrants compared to 20 native Hebrew-speaking controls. A grammaticality-judgment task showed that the youngest group of Russian-speaking immigrants, who arrived in Israel between the ages of 0 to 7 years, commanded irregular noun plurals similarly to monolingual speakers. However, adult speakers who arrived in Israel above the age of 7 years and had lived in the country for at least 8 years performed the task significantly less accurately that their comparable Hebrew-speaking controls.

Another study that focused on the acquisition of the plural system in Hebrew by child second language speakers was conducted by Schwartz, Kozminsky and Leikin (2009). The study compared Russian-Hebrew speaking children with Hebrew-speaking monolingual children in their command of four measures of irregular forms of Hebrew plural nouns at two points of data collection: the beginning of second grade (age 7) and the beginning of third grade (age 8), a period when the acquisition of these forms is still in progress. While results showed significant improvement of both groups over one school year in all categories of irregular plural forms, the bilingual children continued to be significantly less accurate in their responses compared to their monolingual peers at both points of data collection. These data contrast with the results provided by Alfi-Shabtay's (2006) study that did not show a significant difference between primary school-age L1- and L2-speaking children (up to age 7). However, Schwartz, Kozminsky, & Leikin's (2009) study did not provide exact information as to participants' age of onset of acquisition (hereafter AOA) of their L2, and therefore it was not possible to conclude whether differences in background were the source of this variation in results.

1.4 Acquisition of Inflectional Morphology in the Second Language among ESBs

Two hypotheses have been proposed with respect to the acquisition of morphology among young bilinguals. According to the *Domain-by-Age* Model, proposed by Schwartz (2003), L2 acquisition by children (cL2) is more like monolingual child-language acquisition with regard to the domain of inflectional morphology as opposed to the domain of syntax. Two studies that investigated the predictions of Schwartz's model revealed quantitative and qualitative similarities between cL2 and L1 children. Blom (2008) investigated verb inflections among Dutch L2 children and adults speaking Turkish or Moroccan Arabic as their L1. It was found that the Dutch L2 children showed similar levels of success and patterns of errors (i.e., high accuracy in usage of the bare verb stem as a default form and very rare overuse of the regular plural suffix–*en* in finite position) compared with monolingual Dutch speakers. At the same time, adult L2 learners of Dutch showed qualitatively different patterns of errors compared with cL2 and L1 children. In another study, Blom, Polišenská and Weerman (2008) compared error profiles for grammatical gender for Dutch attributive adjectives among Dutch (L1) speaking children and Moroccan-Arabic (L1) speaking children and adults. The results showed that monolingual children and cL2 learners pattern similarly while differing from aL2 learners.

Importantly, all of these studies relate to a population of children whose AOA of L2 was from four years of age and onwards. It is thus assumed that in terms of ESBs (that is, children whose AOA is between one and four years), the acquisition of inflectional morphology should also show patterns that are similar to those emerging from L1 studies.

In contrast to the Domain-by-Age Hypothesis, Meisel (2009; 2010) suggests that noticeable differences emerge in the morphological acquisition of young bilinguals with AOA as early as 3-4 years compared to monolinguals. According to these and other studies, during the first three to four years of life, children's ability to acquire some of the grammatical subcomponents of L2

begins to diminish, and the acquisition of these subcomponents is qualitatively different than those suggested by studies on simultaneous bilinguals and monolinguals; ESBs' acquisition at this stage is similar to adults' acquisition of L2 (Meisel, 2009; Sopata, 2009).

Evidence supporting Meisel's hypothesis comes from studies of the acquisition of subject clitics in French among German-speaking children (see Meisel, 2009). In this longitudinal study, the children's natural speech was recorded individually every 3 to 5 months over a period of nearly two years. It was found that almost all children who were first exposed to French at or before age 3;6 showed similarities with monolingual French-speaking children and simultaneous bilinguals in their use of clitic forms (i.e., combining subject clitics with non-finite verb forms). One exception was a child with AOA of 3;3. At the same time, all children – again, with one exception — with AOA at 3;7 or older were classified as non-monolingual learners. These children made errors in French clitic forms that are unattested in monolingual and bilingual L1 acquisition but are attested in adult L2 learning.

The evidence from Meisel's study points to AOAs of 3;6 years and above as a turning point for the acquisition of inflectional morphology. The group defined as ESBs seems to include children who follow either monolingual or non-monolingual-like patterns of acquisition, depending on their AOAs. However, although Meisel relates to the 3-to-4 age range as critical, it is not clear what to predict for ESBs with AOAs that are below 3;6 years of age.

Note that both hypotheses presented above are still insufficiently examined, which could explain the inconsistency of the existing results. This inconsistency also might be linked to methodological issues, such as the research design, since some of the studies collected longitudinal data (e.g., Meisel, 2009; Sopata, 2009) while others relied on cross-sectional data (e.g., Blom, 2008). Moreover, as suggested by Yip and Matthews (2007), the findings may be affected by the choice of tools. Natural speech collection avoids "the artificiality induced by experimental methods such as elicited production tasks" (p. 58). At the same time, data from natural speech samples might be less informative and result in underestimating a subject's knowledge.

1.5 The Present Study

The aim of the present study is to address the issue of L2 inflectional morphology acquisition in the domain of noun pluralization. Our focus is on Russian L1/Hebrew L2 speakers, that is, on ESBs who were exposed to two languages characterized by morphological richness. There is limited evidence on ESBs's acquisition of inflectional morphology in these languages, since most existing data up to now are from language dyads where at least one of the two languages is Germanic (i.e., German or Dutch).

In the study presented below, we take a longitudinal perspective on both qualitative and quantitative features of noun pluralization by applying a mixed-methods design: an experimental plurals task combined with data collected from a corpus of naturalistic child speech. Our population was second generation immigrants from the former Soviet Union with AOA ranging between 36 and 42 months.

Based on findings that emerged from studies of monolingual development (Lavie, 2006; Nir-Sagiv, 2006), older cL2 (Schwartz et al., 2009) and adult bilinguals (Alfi-Shabtay, 2006), we can derive a number of predictions and questions for early sequential bilingual acquisition of noun pluralization in Hebrew (L2) within the target age range (around 3 to 4 years). First, we expect clear developmental trends, with improvement in noun pluralization from the first to the third data point. Second, we expect that regular forms will be more easily acquired compared to irregular ones, and that the most challenging type of plurals will involve radical morpho-phonological changes in the stem combined with a lexically irregular suffix. Yet another question that emerges from the work of Schwartz (2003) and Meisel (2009) is whether ESBs show similar or different patterns of Hebrew noun plural acquisition compared to monolingual Hebrew-speaking children, and whether there are qualitative differences in their respective patterns of acquisition. Specifically, we aim to investigate whether ESBs show delay or acceleration in the process of acquisition compared to the monolingual Hebrew-speaking children.

2. Method

The present study aims to provide data on the sequential acquisition of noun pluralization in Hebrew (L2) by considering such factors as the history of L2 acquisition and by relying on a mixed method of L2 data collection.

2.1 Participants

The study focuses on young learners of Hebrew from Russia, currently the largest immigrant population in Israel, with AOA ranging between 36-42 months. Six Russian-speaking bilingual children (three girls and three boys) participated. The children were approximately three years old at the beginning of the study with no observable delay in L1. When the study was conducted they had all reached high levels of proficiency in noun pluralization in their L1 as indicated by the results of a structured elicitation task administered in Russian (see Russian Plural Task section). All families had medium-to-high socio-economic status, with a mean of 15 years of education for the parents.

Table 3

Means of Background Measures for the Participants (n = 6)

Child's name / **Variables**	AVI	FIM	YAI	MAS	UMA	DAN
Gender	Female	Male	Male	Female	Female	Male
Age of Onset of L2 Acquisition in the pre-school (in months)	40	36	42	36	39	39
Age at the beginning of the study (in months)	42	38	44	38	41	41
Mother's education (in years)	18	12	13	19	15	16
Overall number of words in Hebrew (L2)	1,916	2,356	2,293	1,218	2,335	3,984
Overall number of utterances in Hebrew (L2)	745	755	925	747	926	1,073
Screening tests:						
PPVT-R in Hebrew (% of success)	35	33	33	35	39	38
Expressive vocabulary in Hebrew (% of success)	29	37	32	29	36	30

All participants are Israeli-born children of families who immigrated from the former Soviet Union. Russian was the first language of the children's parents and the dominant language among all family members as part of a 'first language first' practice at home (this information was obtained by means of a questionnaire on language practices and background data administered to the parents). All the children attended the same bilingual kindergarten located in northern Israel, where only second-generation children (aged 1 to 4 years) are enrolled. Significantly, this kindergarten adheres to a 'first language first' approach until the age of 3 years, such that all teacher-child communication and instructions are conducted in Russian (L1) by a Russian native-speaking teacher. From the age of 3 to 4 years, intensive immersion in Hebrew is conducted by a native Hebrew-speaking teacher. During this period, Hebrew is used for most (70%) of classroom time.

This educational and linguistic environment created a favorable context for the study of L2 acquisition among ESBs since it permitted us to follow children from the onset of L2 intensive immersion at age 3 after the acquisition of L1 (Russian) morpho-syntax while controlling for the Hebrew (L2) input. Moreover, it provided us with a consistent environment for data collection and for extensive documentation of ESBs' linguistic development.

2.2 Procedure and Materials

In light of the methodological issues discussed in the introduction, we relied on two complementary research tools: an experimental plurals task and a corpus of naturalistic child speech. The research was conducted during one year and in two stages. In the first stage, two screening language tasks: receptive vocabulary (Peabody Picture Vocabulary Test, PPVT-R, Dunn, 1965) and expressive vocabulary (Schwartz, Leikin, Shaul, Fuhrman-Engel, & Skarbovsky, 2007) in Hebrew were administered to all children (n = 11) after one full month of explicit and systematic exposure to Hebrew. The aim of the screening was to select participants from the entire pool of children at a comparable, near-basic level of Hebrew language knowledge (see the results of the screening tests for our six children in Table 3).

At the second stage, during the first year of L2 immersion, elicitations of a plural naming task and recordings of naturalistic speech samples data were collected. The plural task was completed by each child three times during the experimental period (three data points (DPs)): half a year following the onset of Hebrew immersion (March, 2009), three months later, at the end of the school year (July, 2009), and after the beginning of the following school year (November, 2009). Note that by the third data point collection, four children (DAN, MAS, UMA and AVI)[1] were attending a monolingual Hebrew-speaking kindergarten. In addition, the Russian plural task was administered with a gap of two weeks after the second and third data-points defined for collection of the Hebrew plural task. Each child's natural speech was recorded once a month over a period of 7 months (from February until August, 2009) for approximately 20-minutes.

2.2.1 The Hebrew Plural Task

The plural task was based on materials used by Lavie (2006). The original task included 56 nouns; however, the task used for the present study only included items that were assessed by the first author and the Hebrew-speaking kindergarten teacher as familiar to non-native speakers. The task avoided nouns unfamiliar to the children as well as nouns that cannot be represented in pictures. Eleven items that were assessed as infrequent in the kindergarten teacher's vocabulary were replaced by comparable but more frequent items (e.g., the item *agas* 'pear' was replaced by the item *tapuz* 'orange'; the item *kalétet* 'cassette' was replaced by the item *rakévet* 'train').[2]

Test items were balanced for gender and for the morpho-phonological categories that emerge from the combination of different levels of stem transparency and suffix regularity (see Appendix 1 for the list of test items) and included (a)words with a transparent, non-changing stem that take a regular suffix (nine items in total), (b) words with a transparent, non-changing stem that take an unpredictable/irregular suffix (six items in total), (c) words with either slightly or substantially changing (and thus, opaque) stems that take a regular suffix (nine items in total), and (d) similarly opaque items that take an unpredictable/ irregular suffix (11 items in total). In total, the task included 35 stimulus items.

Children were tested orally and individually in a quiet room at their kindergarten. Plural forms were elicited in the following way: participants were shown a booklet containing pairs of pictures. Each child was first presented with the picture depicting the singular noun (e.g., בֵּיצָה,

beyca 'egg'), and the investigator said: 'This is an egg'. Then, a picture depicting three instances of the same noun was shown to the child, and the investigator asked: 'And what are these? These are three/many _____'. Test items were presented in random order and were preceded by two training items (*dov ~ dubim* 'bear~s', *tmuna ~ tmunot* 'picture~s').

Coding procedures follow Lavie's (2006) original design. The items were coded for gender (masculine and feminine), type of plural suffix (*-im, -ot*), and level of stem change. In addition, each response was scored for level of correctness, taking into account the three variables defined for the nouns used in the test: gender, suffix regularity, and stem transparency. The stem and suffix of each word were scored on separate (but similar) 3-point scales, ranging from 0 to 2, with '0' representing Type I responses, '1' representing Type II responses, and '2' representing Type III responses (see Table 4).

Table 4

Types of Responses in Pluralizing Hebrew Nouns

Types of responses	Description	Example
Type I	• no response • repetition of stimulus word • replacement of target word by another word in plural form	-- -- *banot* 'girls/daughters(FEM)' instead of *yeladot* 'girls' for the singular form *yalda* 'girl(FEM)'
Type II	• overgeneralization of suffix	*beyca ~ *beyc-ot* 'egg(FEM)~*s' instead of *beyc-im* *šulxan ~ *šulxan-im* 'table(MASC)~*s' instead of *šulxan-ot*
	• assignment of incorrect suffix	*menora ~ *menor-im* 'lamp(FEM)~*s' instead of *menor-ot* *tik ~ *tik-ot* 'bag(MASC)~*s' instead of *tik-im*
	• no stem change when required	*dégel ~ *dégel-im* 'flag(MASC)~*s' instead of *dgal-im*
	• partial stem change instead of full change	*iparon ~ *efaron-ot* 'pencil(MASC)~*s' instead of *efron-ot*
	• incorrect change	*péca ~ *pic-ot* 'wound(MASC)~*s' instead of *pca-im*

Table 4 (con't.)		
Type III	Successful production of target plural form:	
	• assignment of correct suffix	*sulam~ sulam-ot* 'ladder(MASC)~s' *nemala~nemalim* 'ant(FEM)~s'
	• correct stem change	*kélev ~ klav-im,* 'dog(MASC)~s'

The baseline for comparison is the data collected by Lavie (2006). As noted above, it included 7 age groups of 20 children each. For the purposes of the present study, we present data of Levie (2006) for the two groups that are comparable in age to the participants in our study: children around the age of 3 years (M = 40.85, SD = 12.4) and children around 4 years of age (M = 55.57, SD = 10.3). Since Lavie's elicitation task included a larger set of nouns, her data were re-analyzed for overall success in pluralization of the sub-set of nouns that is comparable to the one used for the present study.

A second baseline for the present study is represented by the children's ability to pluralize nouns in their L1. Our results section below provides data on the success rate of our six ESBs in a Russian pluralizing task.

2.2.2 *Acquisition of Russian Noun Pluralization and the Russian Plural Task*
Russian nouns have three genders (masculine, e.g., *stol* 'table', feminine, e.g., *doroga* 'road', neuter, e.g., *okno* 'window') and number (singular, plural). Most masculine and feminine plural forms are produced with the suffix ending -*ы* /ɨ/. Neuter singular nouns that end in *–o* or *–e* take the suffix *–a* in the plural. The plural system in Russian is highly regular, and very few and infrequent forms are irregular and require rote-learning (similarly to Hebrew, these involve morpho-phonological alternations of the stem, e.g., *uxo ~ ushi* 'ear~s', Taraban & Kempe, 1999; Zejtlin, 2000).

Plural noun forms in Russian were also shown to appear relatively early among monolingual children. Gagarina and Voeikova (2009) reported that the onset of use of nominative plural forms is around age 1;8. Children start to use plural forms of nouns in oblique cases only at about 30 months. Overall, similarly to Hebrew, the basic, regular plural forms of masculine, feminine, and neuter nouns are acquired in the second and third years of life (Gvozdev, 1961; Zejtlin, 2000).

As noted above, the Russian plural task was designed specifically for the purposes of this study and was administered to determine the relative proficiency of the children in pluralizing nouns in their L1. As in Hebrew, the task included only items that were assessed for subjective familiarity, including words that were considered by Russian-speaking preschool teachers (n = 5) as frequent in the children's usage. The test contained 16 nouns (6 masculine nouns, e.g., *dom ~ doma* 'house~s', 6 feminine nouns, *ruka ~ ruki* 'hand~s', 4 neuter nouns, e.g., *derevo ~ derevja*

'tree~s'). Due to the highly regular nature of the system in Russian, all nouns used for the elicitation task take regular suffixation and only nominative case involved a slight change in the singular stem to form the plural. The Russian plural task was administered to all children except for one boy, DAN, who declined to communicate with the investigators in Russian although Russian was his dominant language of home communication.

2.2.3 Child Speech Corpus

Longitudinal speech samples were collected from each child separately in order to assess the naturalistic production of nouns and noun plurals. The overall size of our spoken corpus of child speech (CS) is 13,913 words across 4,967 utterances. The data were collected during the morning hours, following a communal session with the Hebrew-speaking kindergarten teacher, in order to ensure that the target language was primed. Data were collected by a native speaker of Hebrew. All sessions consisted of free play with games, toys, and books that were available at the kindergarten and thus familiar to the children, and that were used at the discretion of the investigator based on her familiarity with each individual child. In order to maximize the production of nouns and noun plurals, the investigator encouraged the child by using elicitation questions such as: "What is this?" or "What do we have here?" (pointing at a picture or a toy).

The child-investigator interactions were transcribed, coded, and analyzed according to the CHILDES format (MacWhinney, 2000). All nouns in the data were coded as singular, dual, or plural (*singularia/pluralia tantum* nouns and proper names were excluded). Dual and plural nouns were further coded for stem gender, stem change, and suffix predictability/regularity. The transcriptions and coding were double-checked by one of the authors and by a senior research assistant. Disagreements were discussed and resolved.

3. Results

Results are presented in three sections. First, we present relevant data on success in pluralizing nouns by native speakers, for both Russian and Hebrew. The data for Russian and Hebrew were collected as described above in the Methods section. The data for Hebrew were re-analyzed to represent native speakers' performance in comparable age groups. The second part of our results provides data on the success rates of our six ESBs in the Hebrew pluralization task. Finally, we report the data obtained from the bilingual corpus. Results are analyzed throughout with regard to the dependent variables of gender, suffix predictability, and base transparency.

3.1 Overall Success of Native Speakers of Russian and Hebrew on the Pluralization Task

As noted above, proficiency in L1 noun pluralization was determined both for the research population and for a comparable Hebrew-speaking population.

The Russian plural task included six masculine nouns, six feminine nouns, and four neuter nouns. At the second and third points of data collection, success rates for masculine nouns were 78 and 71 percent respectively. For feminine nouns, success rates were 92 and 93 percent respectively. Neuter nouns showed the lowest percentages of success, 68 and 58 in the second and third data points respectively. These results are consistent with previous studies of Russian-speaking

monolinguals at this stage of development (Gvozdev, 1961; Zejtlin, 2000). Across the board, success rates for this task approximated 80% at the third data point. A summary of these results is presented in Table 5.

Table 5

Levels of L1 Success in Pluralizing Russian Nouns: Means and Standard Deviations, by Data Point (n = 5)

Type of Noun	**Child**									
	AVI		FIM		YAI		MAS		UMA	
	DP2	DP3	DP2	DP3	DP2	DP3	DP2	DP3	DP2	DP3
Masc.	91.67	91.67	66.67	41.67	100	91.67	66.67	58.33	66.67	66.67
Fem.	100	100	91.67	75	83.33	100	83.33	100	100	91.67
Neuter	62.50	50	25.00	37.50	62.50	62.50	87.50	62.50	100	75
Overall	87.50	84.38	65.63	53.13	84.38	87.50	78.13	75	87.50	78.13

These results indicate that the children have a good command of plural nouns in Russian.

For native speakers of Hebrew, the data collected by Lavie (2006) were re-analyzed to represent their performance with the sub-set of nouns comparable to those used for the present study (Appendix 1). The means and standard deviations for children around 3 years of age (M = 40.85, SD = 12.4) and around 4 years of age (M = 55.57, SD = 10.3) are presented in Table 6.

Table 6

Levels of L1 Success in Pluralizing Hebrew Nouns: Means and Standard Deviations, by Age (n = 20 per group)

	Age	**Mean (%)**	**Std. Deviation**
Overall Success	3 years	40.85	14.00
	4 years	55.57	10.64
Overall Success: Suffix	3 years	53.85	13.79
	4 years	67.42	9.56
Overall Success: Stem	3 years	52.28	12.4
	4 years	66.42	10.26
Success by Gender: Masculine nouns	3 years	33.94	11.51
	4 years	43.57	12.11
Success by Gender: Feminine nouns	3 years	49.06	16.38
	4 years	66.25	12.56

Table 6 (con't.)			
Success by Suffix Predictability: Regular Suffix	3 years	47.38	14.11
	4 years	63.33	12.36
Success by Suffix Predictability: Irregular Suffix	3 years	31.07	13.96
	4 years	43.93	14.34
Success by Stem Transparency: No-change in Stem	3 years	53.21	10.22
	4 years	60.71	8.82
Success by Stem Transparency: Change in Stem	3 years	32.62	15.24
	4 years	52.14	13.33

A series of one-way ANOVAs showed significance beyond the .01 level for the differences between age-groups for the following variables: Overall Success, $F_{(1, 38)} = 16.71$, $p < .001$; Overall Success for Suffix, $F_{(1, 38)} = 13.8$, $p < .01$; Overall Success for Stem, $F_{(1, 38)} = 13.9$, $p < .01$. A series of ANOVAs with repeated measures were performed on the success rates for the dependent variables of gender, suffix predictability, and base transparency. Both age groups were more successful in pluralizing feminine nouns than they were masculine nouns, $F_{(1, 38)} = 68.79$, $p < .001$. No interactions between group and gender were found. A statistically significant difference emerged between 3- and 4-year-olds, $F_{(1, 38)} = 16.79$, $p < .001$. Children pluralized nouns with predictable suffixation more successfully than nouns with irregular suffixation, $F_{(1, 38)} = 54.5$, $p < .001$. No interactions were found between suffix predictability. A statistically significant difference emerged between 3- and 4-year-olds, $F_{(1, 38)} = 16.06$, $p < .001$. Pluralizing nouns with transparent stems was found to be a significantly easier task than pluralizing nouns that undergo stem changes, $F_{(1, 38)} = 68.26$, $p < .001$. Here an interaction with age emerged, such that at the age of four children's success rates in pluralizing non-transparent nouns are closer to those for transparent nouns compared to the percentages achieved by three year olds, although the difference between the two dependent variables was still statistically significant. A statistically significant difference emerged between 3- and 4-year-olds, $F_{(1, 38)} = 15.6$, $p < .001$.

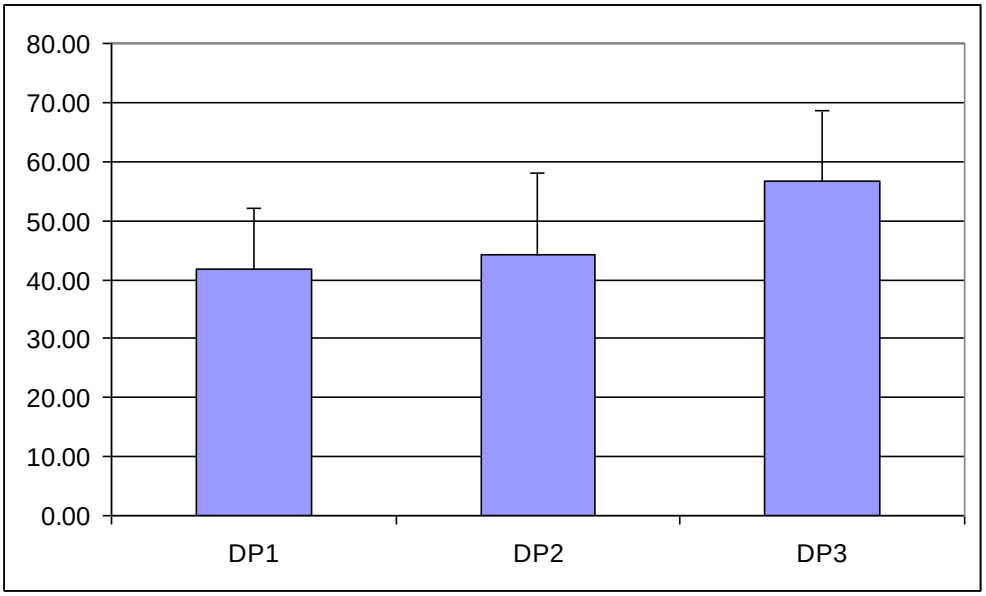
Considering the results of the pluralization task in the two languages, the higher levels of success in Russian can be attributed to the overall regularity of the system compared with the Hebrew system. As noted above, the plural system in Russian is characterized by a relatively high level of transparency which allows overall acquisition of the basic plural forms of masculine, feminine, and neuter nouns by the age of three (Taraban & Kempe, 1999; Zejtlin, 2000). In general, these results show that native speakers of Russian reach medium to high levels of success in pluralizing nouns at around 4 years of age.

3.2 Performance of ESBs on the Hebrew Pluralization Task

3.2.1 *Overall Success of ESBs*

The mean percentages of the six children's correct responses in the noun pluralization task at each data point are presented in Figure 1.

Figure 1. L2 overall success (in percentages, with standard deviations) in pluralizing Hebrew nouns, by data point (n = 6)



The mean proportion of correct responses obtained for the 35 nouns used in the pluralization test ranges between 41.65% to 56.67% across the three data points. Our participants were between 3.5 and 4 years of age at the first point of data collection. At that time their success rate (M = 41.66; SD = 10.49) was almost identical to that of 3-year-old L1 speakers who were tested with the highly comparable battery used by Lavie (2006) (M = 40.85; SD = 12.4). Half a year later, the bilingual children's level of success (M = 56.66; SD = 11.9) matched that of their 4-year-old L1 counterparts (M = 55.57; SD = 10.3).

As illustrated by the data in Figure 1, the overall success rate of our bilingual children increases as a function of development between the second and third data points. Notwithstanding the very small sample size, a Wilcoxon matched-pairs, signed ranks test showed that the difference between the overall success rate in noun pluralization at the second data point (M = 44.28; SD = 13.6) compared to the third data point (M = 56.67; SD = 11.9) was statistically significant, Z = -2.032, p < .05 (one-tailed).

In order to examine whether our group of ESBs shows the same trends as native speakers of Hebrew when considering the different dependent variables (gender, suffix predictability, and stem transparency), we combined data across the three data points, thus maximizing the amount of observations for the following analyses.

As in the case of native speakers, the children pluralized the 16 feminine items (M = 51.04; SD = 13.93) more accurately than the 19 masculine items included in our test battery (M = 44.47; SD = 14.04). A Wilcoxon matched-pairs, signed ranks test showed that this difference was statistically

significant, Z = -2.55, p < .01 (one-tailed). Results comparable to native-speakers' performance also emerged when grouping the data by suffix regularity: success was higher for the 17 nouns that take a fully predictable suffix (M = 57.09; SD = 17.61) compared to the 18 that are inflected by the morpheme typically used with nouns of the opposite gender (M = 37.69; SD = 13.37). A Wilcoxon matched-pairs, signed ranks test again showed that this difference was statistically significant, Z = -3.15, p < .001 (one-tailed). Better success also emerged for the 15 nouns with unchanged stems in the plural form (M = 71.64, SD = 14.49) compared to the 20 nouns that undergo some level of morpho-phonological change in their stem (M = 31.12, SD = 14.92), Z = -3.72, p < .001 (one-tailed).

The developmental trajectory of noun pluralization was assessed by comparing overall success rates at the three data points: six months following AOA, nine months following AOA, and one year following AOA. A set of Wilcoxon matched-pair, signed ranks tests showed no significant difference. However, marginal significance was found between the 2nd and 3rd data points for both masculine and feminine nouns (p = .062 [one-tailed] for both variables) and with nouns that take an irregular suffix in the plural (p = .062 [one-tailed]). A statistically significant difference emerged for success in pluralizing nouns that undergo stem changes, p < .05 (one-tailed). In other words, the children's ability to pluralize forms that are more irregular improved significantly in the period between nine months and one year of exposure to Hebrew.

Developmental differences also emerged within categories. While feminine nouns elicited overall higher rates of correct responses compared to masculine nouns, the difference between pluralization of nouns of each gender was statistically significant only at the first point of data collection, six months after initial immersion in Hebrew, Z = -1.78, p < .05 (one-tailed). When analyzing for the level of success depending on suffix regularity, no significant differences emerged for the first data point when comparing nouns taking regular (M = 49.62, SD=18.61) versus irregular (M = 34.52, SD = 8.35) suffixation. However, the difference between the two conditions was statistically significant for the second data point (M = 55, SD = 18.7, M = 32.14, SD = 11.73 respectively; p = 0.031 [one-tailed]) as well as for the third data point (M = 66.66, SD = 13.29, M = 46.43, SD = 16.13 respectively; Z = -1.99, p < .05 [one-tailed]). As shown by these data, while success rates for nouns taking regular suffixation steadily increase, they remain similarly lower for irregular suffixation at the first and second data points. Although the proportion of correct responses for such nouns improves significantly at the third data point, as shown above, it still lags behind that of nouns with regular suffixes. An even more pronounced developmental trend is apparent for the variable of stem transparency: at all three data points, the children succeeded significantly more when pluralization did not involve a change to the noun stem. A Wilcoxon matched-pairs signed ranks test showed that these differences were statistically significant for all three data points, Z = -2.2, p < .05 (one-tailed).

Failure in pluralizing nouns can result from either the incorrect assignment of the plural suffix or from failing to make the expected change in the stem (see the section on the plural system in Hebrew). However, the reason for success in each of the categories examined in this section remains unknown.

3.2.2 *Success in Assigning the Plural Suffixes*

Percentages and standard deviations of success in assigning the correct plural suffix to nouns categorized by gender, suffix predictability, and stem transparency are presented in Table 7.

Table 7

L2 Success in Suffix Assignment and Stem Changes by Data Point (n = 6)

		Suffix Assignment		Stem Change	
	Data Point	Mean (%)	SD	Mean (%)	SD
Overall Success	1	61.61	9.32	48.25	7.7
	2	69.52	10	50.95	10.72
	3	77.15	8.67	62.38	8.55
Success by Gender: Masculine Nouns	1	60.78	12.71	40.69	9.9
	2	70.17	10.35	42.1	11.04
	3	77.19	11.37	56.14	11.85
	OVERALL	69.38	12.83	46.31	12.55
Success by Gender: Feminine Nouns	1	62.5	6.85	56.25	6.84
	2	68.75	13.11	61.45	12.75
	3	77.08	7.56	69.79	9.2
	OVERALL	69.44	10.9	62.5	10.93
Success by Suffix Predictability: Regular Suffix	1	70.37	13.9	55.17	13.9
	2	83.33	11.25	56.67	15.7
	3	89.17	8.61	68.33	11.7
	OVERALL	80.95	13.46	60.06	14.36
Success by Suffix Predictability: Irregular Suffix	1	52.38	9.76	42.86	6.39
	2	50	12.78	46.43	10.83
	3	59.52	15.43	58.33	11.44
	OVERALL	53.97	12.78	49.2	11.46
Success by Stem Transparency: No Change in Stems	1	75	9.84	80.76	10.66
	2	75.55	12.41	84.44	13.1
	3	84.44	12.41	92.22	5
	OVERALL	78.33	11.78	85.81	10.75
Success by Stem Transparency: Change in Stem	1	50.92	10.78	25.92	8.36
	2	64.03	13.06	27.19	10.21
	3	72.8	6.99	41.23	14.28
	OVERALL	62.58	13.58	31.45	12.73

Although the proportion of correct responses increases as a function of time, no significant difference emerged among the three data points indicating an interaction of gender and suffixation. Regarding the difference between two types of suffixes, the correct suffix was

generally chosen more often for nouns taking a regular suffix ($p < .001$). Statistically significant differences between nouns taking a regular suffix and nouns taking an irregular suffix emerged for each of the three data points (DP1: $Z = -1.99$, $p < .05$; DP2: $Z = -2.2$, $p < .05$; DP3: $Z = -2.2$, $p < .05$). The variable of stem transparency also interacts with the assignment of the correct suffix such that, across the three data points, nouns that do not undergo stem changes present less difficulty than nouns undergoing stem changes, $Z = -3.46$, $p < .01$ (one-tailed). Success rates increase for both types of nouns by age, although this increase emerges only between the second and third data points for nouns with regular suffixes, while it is more pronounced between the first and second data points for nouns with irregular suffixes.

3.2.3 *Success in Changes Made to the Stem*

Percentages and standard deviations of success in changes made to noun stems for nouns based on gender, suffix predictability, and stem transparency are presented in Table 7 above.

Success with stem changes is at 53% across the three data points. A significant difference was noted only between the second and third data points ($Z = -2.03$, $p < .05$). An interaction with gender emerged such that feminine nouns obtain higher success rates ($M = 62.5$, $SD = 10.9$) compared to masculine nouns ($M = 46.31$, SD=12.55): $Z = -3.68$, $p < .001$ (one-tailed). This difference was consistently significant for each of the three data points (DP1: $Z = -2.2$, $p < .05$; DP2: $Z = -2.2$, $p < .05$; DP3: $Z = -1.99$, $p < .05$). Success rates for masculine nouns improved significantly again only between the second and third data points ($Z = -2.03$, $p < .05$ [one-tailed]). An additional interaction emerged for suffix predictability such that, across data points, higher success in stem modification was obtained for nouns taking a regular suffix ($Z = -2.59$, $p < .05$ [two-tailed]). However, no significant differences were found within or between data points. As expected, the rate of success for stems that undergo change ($M = 31.44$, $SD = 12.73$) was substantially lower than for nouns that remain unchanged ($M = 85.81$, $SD = 10.74$): $Z = -3.72$, $p < .01$ (one-tailed). This difference was statistically significant for all data points ($Z = -2.2$, $p < .05$ for all data points). However, while the proportions for the two conditions remain almost the same for the first and second data points, they both increase at the third data point, with a statistically significant difference between the second and third data point for nouns with changing stems, $Z = -2.02$, $p < .05$ [one-tailed].

3.2.4 *Analysis of Incorrect Responses*

As noted in the Method section above, the data were coded for two general types of incorrect responses: No response/Replacement/Singular Base (Type I) and Incorrect Suffix/Stem Change (Type II). Type I responses decreased from 33% out of all incorrect productions at the first point of data collection to 23% at the second data point to only 3.3% of all such cases at the third session. Higher percentages of omissions were noted for nouns that require stem modification compared to nouns with transparent stems (73.5 % of all Type I responses were related to forms that required stem modification). Around half of all these incorrect responses (42%) were instances where the participants used the syntactic construction Numeral+Singular Base to express plurality.

The bulk of incorrect responses were of Type II, that is, the incorrect assignment of a suffix or an incorrect treatment of the stem. Incorrect responses are illustrated in the matrix in Table 8.

Table 8
Pluralization Matrix: Example of Correct and Incorrect Items

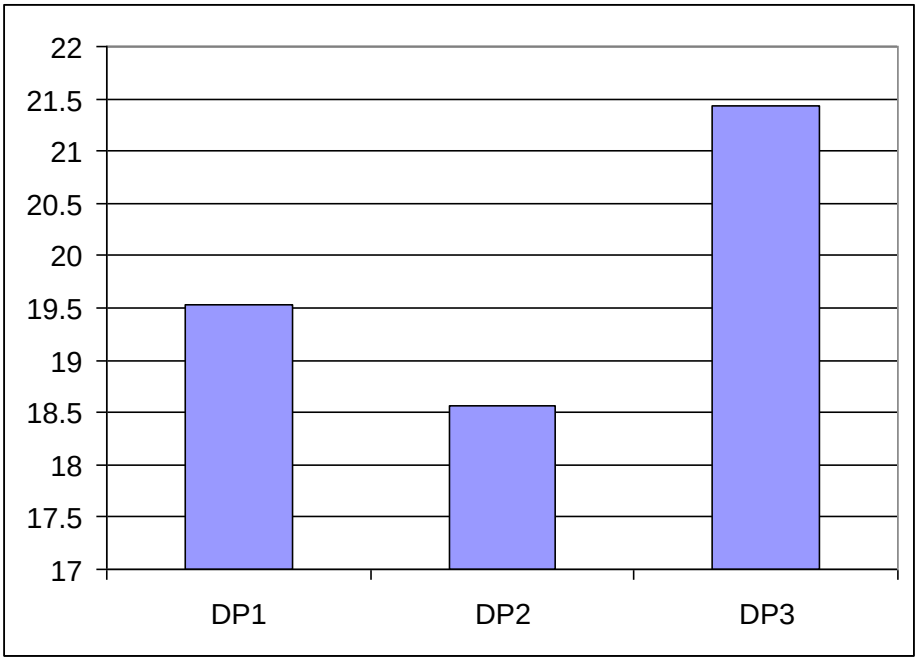
Suffix / **Stem**		**Predictable**		**Unpredictable**	
		Correct	**Incorrect**	**Correct**	**Incorrect**
No Change	Feminine	*menora~menor-ot* 'lamp~s'	*menora~menor-im*	*nemala~nemal-im 'ant~s'*	*nemala~nemal-ot*
	Masculine	*yalkut~yalkut-im* 'schoolbag~s'	*yalkut~yalkun-im*	*sulam~sulam-ot* 'ladder~s'	*sulam~sulam-im* *sulam~sul-im* *sulam~sul-ot*
Change	Feminine	*karit~kari-yot* 'pillow~s'	*karit~karit-im* *karit~kar-ot*	*tola'at~tola-im* 'worm~s'	*tola'at~tolat-im* *tola'at~tali-yot*
	Masculine	*dli~dla-yim* 'bucket~s'	*dli~dli-yim* *dli~dli-yot* *dli~dlil-im*	*lev~levav-ot* 'heart~s'	*lev~lev-ot* *lev~lev-im* *lev~levi-yot* *lev~lelev-ot*

The examples in Table 6 illustrate the varying possibilities of incorrect responses across the matrix: In the case of **menor-im*, a phonologically-marked feminine base that takes a predictable suffix was assigned the incorrect masculine suffix *–im*; this type of error was less prevalent, and is less expected, than in the case of **nemal-ot*, a lexical exception where the same type of feminine base takes the unpredictable masculine suffix. In the case of **yalkun-im* and **sul-ot* the transparent bases undergo an un-required change in their final syllables; **sul-im* is an example of the same unnecessary change of base together with an incorrect assignment of the plural suffix. In **karit-im* the participant avoided final *–t* deletion for the phonologically-marked feminine base and assigned the masculine suffix; another participant deleted the entire final syllable while assigning the correct suffix. **tolat-im* illustrates another case of avoiding *–t* deletion, while preserving the syllabic structure of the target word; and **tali-yot* illustrates a drastic, unnecessary change to the same stem as well as the assignment of an incorrect, though predictable, feminine suffix. Similarly, both **dli-yim* and **dli-yot*, **lev-im* and **lev-ot* illustrate cases of stems that do not undergo the required change and the correct or incorrect suffixation. **dlil-im*, **levi-yot* and **lelev-ot* all represent cases where participants were aware that a change in the stem was required, although clearly these lexical exceptions have not yet been acquired. The following two sections provide quantitative analyses of incorrect responses, focusing separately on the suffix and on the stem.

3.2.5 *Incorrect Formation of Plural Suffix*

Figure 2 presents the proportions of incorrect responses at each data point.

Figure 2. Percentages of ESBs' incorrect assignment of plural suffix, by data point (n = 6)



As shown in Figure 2, approximately 20% of all responses were incorrect formations of the Type II plural form. This percentage remained relatively constant across the three data points. Additional analysis of the data reveals that most of these responses (73.6%) were obtained, as expected, for nouns taking an irregular suffix. Slightly higher percentages occurred with nouns that undergo a change in the stem (22%) compared to a lower percentage for non-changing stems (17%).

An analysis of the items themselves revealed that 16, or 45%, of all noun plurals used in the task were successfully inflected by the children at the first point of data collection, and that the children were able to provide the correct inflected form across the three sessions.[3] Of the other 19 nouns, 13 were forms that the children attempted to inflect (Type II response) with only partial success such that the answers were incorrect (the remaining 6 plural forms were either omitted or replaced [Type I response]). Only one item did not receive any correct responses: the noun *kivsa* 'sheep,' with the target plural form *kvasim* 'sheep,' which combines both a change in the stem and an unpredictable plural suffix. A breakdown by type of incorrect response is provided in Table 9.

Table 9

ESBs' Incorrect Suffix Assignment – Analysis by Item

Target Form	Type of Incorrect Response
sulam~sulamot 'ladder(MASC)~s'	Overgeneralization of *–im* suffix
iparon~efronot 'pencil(MASC)~s'	Overgeneralization of *–im* suffix
xilazon~xelzonot 'snail(MASC)~s'	Overgeneralization of *–im* suffix
mafteax~maftexot 'key(MASC)~s'	Overgeneralization of *–im* suffix
zanav~znavot 'tail(MASC)~s'	Overgeneralization of *–im* suffix
ariye~arayot 'lion(MASC)~s'	Overgeneralization of *–im* suffix
peca~pca'im 'wound(MASC)~s'	Assignment of *–ot* suffix, e.g. **pca-ot*, **peca-ot*, **pic-ot*, **kapic-ot*
beyca~beycim 'egg(FEM)~s'	Overgeneralization of *–ot* suffix
nemala~nemalim 'ant(FEM)~s'	Overgeneralization of *–ot* suffix
even~avanim 'stone(FEM)~s'	Overgeneralization of *–ot* suffix, e.g. **evot*
kaf~kapot 'spoon(FEM)~s'	Assignment of *–im* suffix, e.g. **kafim*, **kafafim*, **kofim*, **kaftim*
menora~menorot 'lamp(FEM)~s'	Assignment of *–im* suffix, **menor-im*
yalda~yeladot 'girl(FEM)~s'	Assignment of *–im* suffix, **yelad-im*

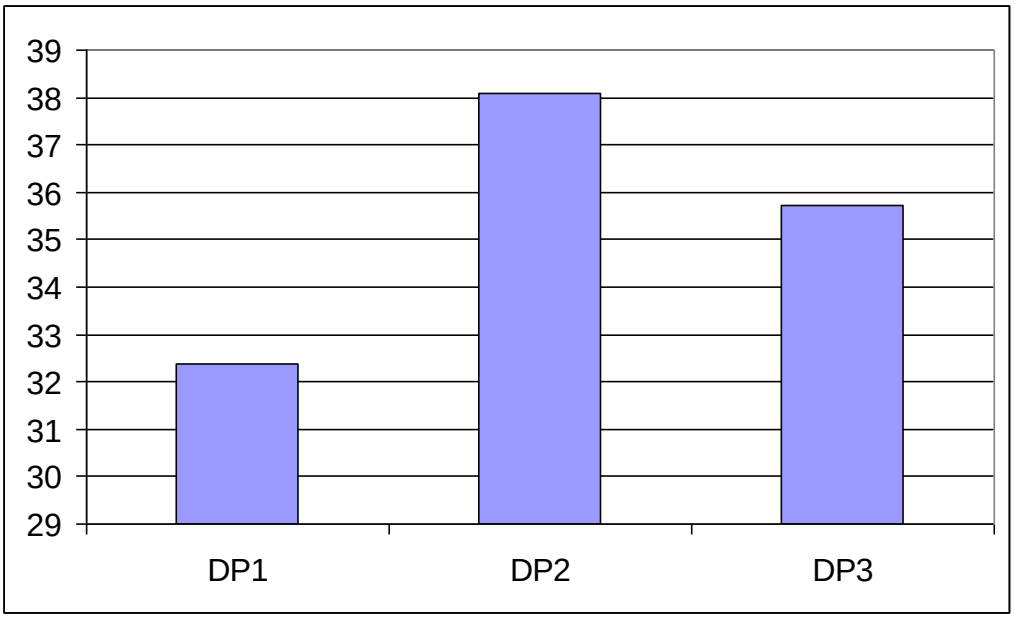
As shown by Table 7, in most cases incorrect responses were the result of the expected strategy of over-generalizing the use of the suffix that matches the gender of the base nouns.

At the first point of data collection, 63.4% of all incorrect responses were due to suffix overgeneralization, while 34.1% were due to incorrect suffixation; at the second data point, 69.3% resulted from suffix overgeneralization and 15.4% involved incorrect suffix assignment; and, finally, at the third data point, 71.1% resulted from suffix overgeneralization and 17.8% were due to incorrect suffixation.

3.2.6 Incorrect Formation of Plural Stem

The proportions of incorrect responses in the three data points are presented in Figure 3.

Figure 3. Percentages of ESBs' incorrect stem modification, by data point (n = 6)



As Figure 3 shows, 35% of all responses resulted from incorrect changes made to the stem. This percentage remained constant across the three data points. Type II responses were similarly prevalent for nouns with regular (32%) and irregular (37%) suffixes. Most of these responses (90.5%) were applied, as expected, to nouns with changing stems, although 8% of nouns with transparent stems were modified incorrectly.

An analysis of items revealed that 13 out of all noun plural forms were successfully modified at the first data point and the children continued to produce correct forms across the three sessions. Of the other 22 nouns, 14 were forms that the children had attempted to modify unnecessarily (Type II response) or with only partial success such that most of their answers were incorrect (the remaining plurals were either omitted or replaced [Type I response]). The remaining eight items were nouns that undergo change in their stems; the children were overall unsuccessful in modifying them and did not provide the correct answer but rather gave a variety of incorrect formations of the type presented in Table 6 above. The target nouns such as *dla-yim* 'buckets' emerged as a particularly difficult item that yielded formations without a change of the stem for all participants.

At the same time, the children successfully inflected some less transparent nouns, including *dégel~dgalim* 'flag~s', *tolá'at~tola'im* 'worm~s', *éven~avanim* 'stone~s', *magévet~magavot* 'towel~s', *rakévet~rakavot* 'train~s', *ariye~arayot* 'lion~s', *mafté'ax~maftexot* 'key~s', *ša'on~šeonim* 'clock~s', *tof~tupim* 'drum~s', and *naxaš~nexašim* 'snake~s'.

As noted above, incorrect responses for stem modification included cases of Type II responses where stems remained unchanged although modification was required, where changes were made to the stem when they were not called for, and where only partial or incorrect changes were attempted. Between 40 and 45% of all stem-related errors resulted from failing to make required changes to the stem (DP1=39.7%; DP2=36%; DP3=45.3%), and between 25 and 35% of errors resulted from incorrect or partial changes (DP1=36%; DP2=25%; DP3=28%).

3.3 Corpus Data of ESBs

Our next set of analyses examines the distribution of different types of plurals and the incorrect production of noun plurals in a semi-naturalistic spoken corpus collected from the six early sequential bilinguals (see Method above). As in the monolingual corpus study, we count types as form types (word forms) rather than word types (lemmas).

The distributions that emerged from our data are slightly different than the ones found for Hebrew-speaking children aged 1;4-3;3 years in the study by Ravid, Dressler, Nir-Sagiv, Korecky-Kröll, Souman, Rehfeldt, Laaha, Beril, Basboll and Gillis (2008). Unlike their monolingual peers, who produced a high percentage (21%) of noun plurals (out of total noun forms), the current data base yielded only around 6% of such forms but a higher percentage of noun plural tokens (15% versus 8% among monolinguals).

Table 10 shows the number of noun plurals produced by all six children. It is significant that more than half of the noun plurals in the corpus were produced in response to a question such as "what is this?" rather than in repetition of the investigator. The difference in the amount of plural production correlates with the general level of each child's talkativeness (Kendall's tau $b = 0.733$, $p = 0.039$).

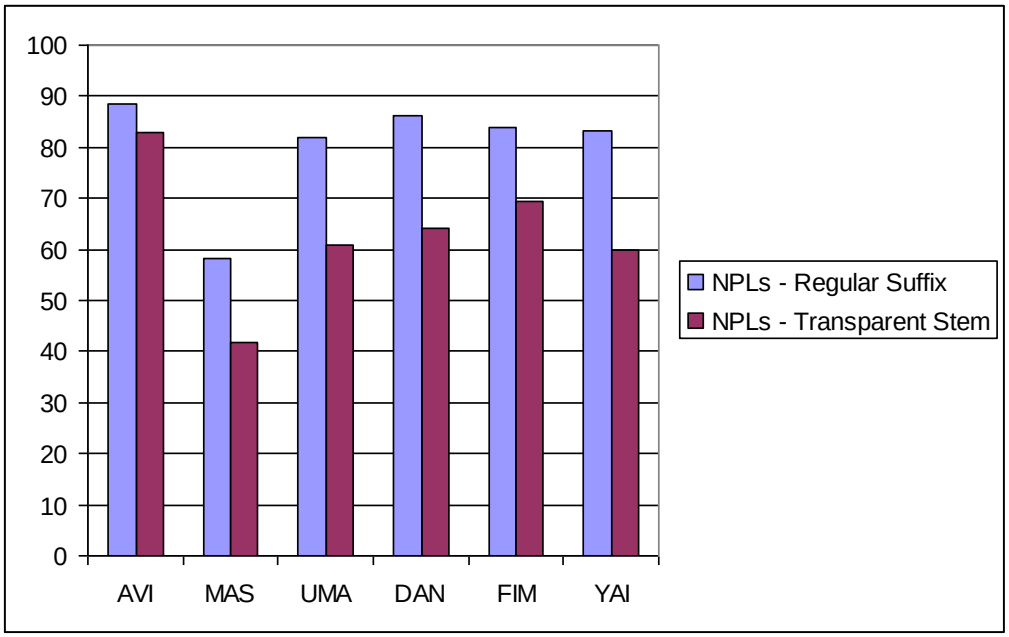
Table 10.

Raw Numbers of Feminine versus Masculine Nouns with Regular Suffix/non-changing Stem, by Child

Child	**Feminine Plural Nouns**			**Masculine Plural Nouns**		
	Total	Regular Suffix	No Change Stem	Total	Regular Suffix	No Change Stem
AVI	12	12	12	21	19	17
MAS	6	5	5	16	16	10
UMA	25	28	26	65	60	39
DAN	59	50	46	117	111	74
FIM	10	10	9	45	42	34
YAI	11	10	10	41	40	26

The bulk of all tokens are masculine nouns (71%), and most of them take a regular suffix. Approximately 90% of the feminine nouns produced do not require stem changes in the plural, in contrast to the masculine nouns, 35% of which require stem changes. Figure 5 shows percentages of nouns taking a regular suffix and those that do not undergo stem change across two genders.

Figure 5. Percentages of nouns taking a regular suffix and of nouns that do not undergo stem change (n = 6)



As Figure 5 shows, with the exception of data collected for MAS, over 80% of produced plural tokens take a regular suffix. Four of the six children produced between 60% to 70% of noun tokens with transparent stems.

Only 33 cases of all noun tokens across the six samples were qualified as incorrect forms, around 7% of all noun plurals produced. The bulk of these cases were phonological deviations typical to early child language, such as simplification at the segmental level (e.g., stopping: **tiporim* → *ciporim* 'birds', velar fronting: **tubyot* → *kubiyot* 'cubes') and at the syllabic level (e.g., initial syllable deletion: **tot* → *sritot* 'scratches', cluster reductions: **paxim* → *praxim* 'flowers', **zarim* → *gzarim* 'carrots'). Only 13 forms were classified as morphologically incorrect suffix assignments (e.g., the overgeneralized phonological deviations **xalonim* and **tinoqim* instead of *xalonot* 'windows' and *tinoqot* 'babies'), stem changes (e.g., no change when change is required, as in **karišim* → *krišim* 'sharks', and incorrect changes as in **regalim* → *ragláyim* 'legs'), and double marking of the plural (as in **prax-im-im* 'flower-s-s'). In one case, the plural form was expressed by a syntactic construction (a numeral+singular base, **štey giraf* 'two giraffes').

4. Discussion

This longitudinal study examines the trajectory of the acquisition of noun plurals among six Russian-Hebrew speaking ESBs by combining elicited measurements with corpus data. The study was undertaken to explore the question whether ESBs show similar or different patterns of acquisition of regular versus irregular noun plural forms in Hebrew compared to monolingual Hebrew-speaking children, and whether there are qualitative differences in their respective trajectories of acquisition. In the discussion, we will interpret our data against previous findings of corpus-based studies that examine both longitudinal and semi-structural spontaneous conversations of very young L1 Hebrew speakers.

4.1 Do Early Sequential Bilingual Children Show a Similar or Different Developmental Trajectory in Comparison to L1 Children?

A striking similarity was found between monolinguals and ESBs with respect to the developmental trajectory of pluralization by the three variables defined for the nouns used in the test: suffix regularity, stem transparency, and gender. For both groups of children, who are in similar age ranges, the general levels of success as well as developmental changes are parallel. Thus, in line with the monolingual trajectory, regular pluralization was achieved more easily than the irregular assignment of a suffix or the production of a non-transparent form of a pluralized stem. As in the category of overall success, the significant improvement in "stem transparency" and the marginally significant progress with respect to "suffix regularity" occurred between the second and third data points. Our results clearly suggest that after only one year of Hebrew immersion at pre-school our ESBs have already caught up with four year old monolingual children in the area of noun pluralization. This acceleration in the process of acquisition might be attributable to two complementary reasons: a year of immersion in Hebrew by the third data point, and the timing of their full day Hebrew education, which began in September for four out of six ESBs, two months before the last data collection point.

Notably, overall success in pluralizing masculine and feminine nouns improved with age for both mono- and bi-lingual speakers. Moreover, the two age groups examined in the monolingual study (3 and 4 years old) demonstrated higher success rates for feminine than for masculine nouns. Comparably, pluralization of masculine nouns was also less successful than for feminine nouns in the ESB data. This finding contrasts with that of Laaha, Ravid, Korecky-Kröll, Laaha and Dressler (2006), who did not find an overall effect for item gender on children's correct responses in German. In the present case, the difference between genders can be attributed to the greater number of masculine nouns that undergo stem modification (12/19 compared to 8/16 feminine nouns, see Appendix 1), and that of the 12 non-transparent masculine nouns, half can be understood as undergoing radical stem changes with more than one type of modification (typically a vowel change combined with a vowel deletion or insertion as in the case of *dégel ~ dgalim* 'flag~s', or with spirant/stop alternations as in *iparon ~ efronot* 'pencil~s'). In contrast, only one of eight feminine nouns undergoes a radical stem change (*kivsa ~ kvasim* 'sheep'), while the other five nouns that require more than one type of modification to the stem mostly combine vowel alternation or *–t* deletion. Of these, only one posed a consistent difficulty for both mono- and bilingual speakers of Hebrew: *tola'at* 'worm.' This seems to suggest that

varying levels of stem transparency entail different developmental trajectories depending not only on the scope of the stem change required but also on the type of change.

4.2 Do Early Sequential Bilingual Children Show Similar or Different Patterns of Errors in Comparison to the L1 Children?

A major source of information about children's morphological development consists of the errors they make en route to the adult system (Clark & Berman, 2004). Incorrect pluralization among ESBs, as identified and analyzed in this study, resembles monolinguals' patterns. More specifically, similar to the monolingual data, a lack of response or omission (Type I responses) where children failed to add the expected suffix or modify the stem, decreased from one third of all incorrect responses at the first data point to near to zero at the third data point. This may be taken as evidence for speedy acquisition, approximating that of monolinguals within one year of exposure to L2. Furthermore, as in the monolingual study, Type II responses (i.e., over-generalization of the default form of the suffix or a "developmental" mistake; Berman, 1985; Ravid, 1995b; Ravid & Schiff, 2009) were the most frequent type of incorrect responses.

Other types of unsuccessful pluralization included the partially predictable incorrect assignment of the suffix, based on conflicting phonological marking of the base form (Ravid et al., 2009). For example, the singular *péca* 'wound (MASC)' ends with the typically feminine *–a* vowel (even if unstressed), yielding **pca-ot*, and the singular **kaf* 'spoon (FEM)' ends with a consonant, a typically masculine syllabic structure, yielding **kafim*. The incorrect inflection of the noun *yalda* 'girl (FEM)' as **yelad-im* can be attributed to the participants' knowledge of the existing, highly frequent, masculine plural noun of the same form that means 'children'. Thus, only the form **menor-im* can be viewed as an unpredictable error. Lavie (2006) discusses comparable examples for monolinguals. Note also that this pattern of incorrect responses characterized monolinguals until at least age 7 (90% of success) and significant improvement was related to literacy acquisition with entering school. To complete the picture, only one item did not obtain any correct responses, the noun *kivsa* 'sheep,' with the target plural form *kvasim* 'sheep,' which combines both a stem change and an unpredictable suffix. Not surprisingly, this item was found the most challenging for monolinguals, and even adult monolingual Hebrew speakers did not all produce it correctly (Lavie, 2006).

Interestingly, the children inflected some of the less transparent nouns more successfully than others, particularly items such as *dégel~dgalim* 'flag~s', *éven~avanim* 'stone~s', and *tof~tupim* 'drum~s.' This may be the result of the frequency of the nouns in child-directed speech, as these nouns refer to items included in the kindergarten curriculum or daily routines (e.g., celebrating holidays, playing in the garden, or playing with musical instruments). This suggestion is supported by the difficulty that children had with the noun *yalkut* 'school bag', a non-changing stem noun that is more relevant to children in school than in kindergarten. One child responded at the first data point with the form **yalkutot* (incorrect plural suffix, predictable based on stem phonology), another with **taktonim*, and a third with **tikiyot* 'bags-DIM', a form that indicates that the semantics of the noun (a bag used to carry things to school) is accessible to the child. The same child produced the form *tikim* 'bags' in her second session and correctly inflected the

form by the third session. Another child used the form **yalkonim* at the second session (incorrect deletion of final consonant, predictable based on stem phonology). However, this form remained problematic for half the children at the third session, where only three provided the correct form. Concerning the monolingual data (Lavie, 2006), 90% of success was obtained for this particular noun only upon entering school, at age 6, which is consistent with our semantic-based explanation. Nonetheless, this hypothesis requires a separate investigation, which is beyond the scope of the present study.

4.3 Corpus-based Comparisons with the Monolingual Data

The bilingual corpus of our six children showed a lower percentage of plural word types but a higher number of plural tokens compared to the findings from the monolingual longitudinal corpus (Ravid et al., 2008). Zwilling (2008), who collected semi-structural spontaneous conversations between children, found similar patterns among monolingual between 2-2;6 years-of-age for plural word types (7%) and at around age 3 for plural noun tokens (14%). This discrepancy between the spontaneous speech of the monolingual corpus and the elicited corpus of ESBs can be attributed to the nature of the conversations between investigator and child, as specified in the Methods section above. Thus, the structured nature of the conversations, which made references to books and toys from the kindergarten environment, seems to have elicited a less varied set of noun plurals.

At the same time, the semi-structural spontaneous conversations resulted in a higher proportion of noun plural tokens out of all noun tokens (15% versus the original 8% found by Ravid et al., 2008). These results highlight the impact of research design on developmental research (see Rowland, Fletcher & Freudenthal, 2008) and calls for additional investigation of varied elicitation methodologies to test the hypothesis that language production as a measure of linguistic competence is inseparable from the particular communicative contexts in which it is embedded.

Further comparison of our corpus data with respect to gender, suffix regularity, and stem transparency reveals another resemblance to the monolingual production. Specifically, the majority of all tokens used with ESBs were masculine nouns. In addition, a majority of all noun tokens does not require stem modification or an irregular suffix. Overall, hardly any errors were found, and in most cases these errors presented phonological and not morphological deviations (Nir-Sagiv, 2007). As for gender distribution, our results reflect the historical primacy of masculine *–im* suffixation in Hebrew (Schwarzwald, 1983). Our monolingual corpus showed that the complex Hebrew plural system is reduced in child-directed speech mostly to masculine nouns predictably taking the masculine *–im* plural suffix, with regular suffixation of both masculine and feminine nouns. All of these qualitative patterns are echoed in the children's output.

The analysis of the longitudinal corpus of ESBs also pointed to individual differences in the children's plural production, which correlate with the general level of verbosity of each child. It appears that the three children, DAN, UMA and FIM, who were more talkative and cooperative,

were more fruitful and divergent in plural production and achieved the highest accuracy in the pluralization task. This data convergence enhances the validity of the elicited measuring applied in this study and confirms the importance of the methodological triangulation used here in the investigation of early sequential bilingualism.

4.4 Implications for Current Theories on Early Sequential Bilingualism

Similarly to Blom (2008) and Weerman, Bisschop, and Punt (2006) on Dutch as an L2 and various minority languages as L1, our data follow the predictions of the Domain-by-Age Model (Schwartz, 2003). We found that, similar to Unsworth, Argyri, Cornips, Hulk, Sorace and Tsimpli's (2010) data on the acquisition of morpho-syntax (analyzing neuter gender determiner *het* in Dutch), ESBs' proficiency matches that of L1 speakers in the domain of noun pluralization.

The results summarized in the previous section clearly suggest that the developmental trajectory of noun pluralization among early sequential Russian-Hebrew speaking bilinguals is parallel and comparable to that of monolingual children. This pattern of data can be seen in the success rates in experimental contexts, patterns of spontaneous but elicited productions, and patterns of incorrect responses/productions in both communicative contexts. However, because this interpretation of our results is limited to the specific inflectional domain considered here, clear support for the Domain-by-Age Model requires additional focus on developmental trajectories of syntactic domains that is beyond the scope of the present study.

In addition, our data did not show that the ESBs' acquisition of noun plurals as a particular domain in inflectional morphology at around age 4 is subject to gradual fading-out effects of the kind found for verbal morphology (Meisel, 2009; Sopata, 2009). Thus, additional study is required to determine whether noun morphology is still deficient while syntactic structures are already used correctly (as was found for verb morphology; see Haznedar, 2003). Developmental studies on L1 suggest that the acquisition of noun versus verb morphology is asymmetrical (e.g., for Hebrew, Berman, 1988), that overgeneralization emerges earlier for nouns than for verbs (e.g., for English, Maslen, Theakston, Lieven, & Tomasello, 2004), and that syntactic factors play a larger role in the acquisition of verbs than of nouns (Dressler, Stephany, Aksu-Koç, & Gillis, 2007). It remains to be seen to what degree these tendencies will be comparable for early L2 learners.

One notable difference between the ESBs and their age-comparable monolinguals was found. Our findings reflect a remarkably rapid rate of progress with which the ESBs under study here were able to reach the same level of success in pluralization as their monolingual 4-year-old peers following only one year of L2 immersion. Jia (2003) reported a similar phenomenon of accelerated mastery of English plural forms among Mandarin (L1) speaking children in the earlier period of L2 acquisition, followed by a period of leveling off. In this study, Jia found that it took an average of 20 months of exposure (range 7–33) for bilingual children (AOA ranged from 5 to 9 years) to master the use of plural in their L2 (English). At the same time, L1 children master this category within 19 months on average (with a range of 17 to 21 months after L1 production begins).[4] Along the same lines, Paradis (2007) also reported fast progress in terms of

L2 mean length of utterance among 24 children from various L1 backgrounds. The children reached an average MLU of 4.66 (*SD* = .89) in 21 months following the onset of L2 (English) acquisition, while the majority of English (L1) children achieve this level after 29 months of production.

This accelerated pattern of progress could be attributed to the influence of linguistic maturation, which, in turn, might be rooted in more general cognitive maturation (e.g., memory and attention capacity, overall processing speed, communication abilities; see Babyonyshev et al., 2001; Borer & Wexler, 1987; 1989). In other words, the relative linguistic maturation of the children studied here at the onset of L2 acquisition (age 3) seems to have a facilitating effect on their progress in Hebrew pluralization.

4.5 Conclusions and Further Research

By applying a multi-faceted longitudinal analysis of noun pluralization, and by examining both correct and incorrect production in structured elicitations as well as in (semi-) spontaneous interactions, we collected data on the trajectory of noun pluralization in L2. Two main conclusions were deduced. First, comparing our data to those collected for Hebrew L1 speakers we see a striking similarity between monolinguals and ESBs. Second, our ESBs showed a clear tendency for acceleration in L2 noun pluralization, possibly due to their relative linguistic and general maturation and to a favorable starting point in comparison to monolingual acquisition of the same domain. In order to provide substantial theoretical insights with respect to the Domain-by-Age Model (Schwartz, 2003) and Meisel's (2009, 2010) hypothesis on early fading out in L2 inflectional morphology acquisition, future research should focus on both syntactic development in L2 and domains of L2 grammar among ESBs.

Further research is also required to determine the quality of Hebrew speech directed to our ESBs and its comparability to the general patterns that emerged in previous studies. For this purpose, we aim to analyze a database of interactions between the Hebrew-speaking kindergarten teacher and the children. We will also focus on L1/L2 input analysis and its role in explaining individual differences among our children. Together with the findings of the current study, this highly controlled source of data will provide us with an opportunity to contribute substantively to the ongoing discussion regarding the role of input with respect to bilingual morphological acquisition.

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Appendix

Structure of the Plural Naming Test

Stem Transparency	**Non-changing Stem**		**Changing Stem**	
	Masculine	**Feminine**	**Masculine**	**Feminine**
Suffix Predictability				
Regular	*kadurim* 'balls'	*bubot* 'dolls'	*dgalim* 'flags'	*yeladot* 'girls'
	panasim 'flashlights'	*calaxot* 'plates'	*dlaim* 'buckets'	*kapot* 'spoons'
	pilim 'elephants'	*menorot* 'lamps'	*nexašim* 'snakes'	*kariyot* 'pillows'
	tapuzim 'oranges'	*xulcot* 'shorts'	*pcaim* 'wounds'	*magavot* 'towels'
	yalkutim 'school bags'		*šeonim* 'clocks'	*rakavot* 'trains'
			tupim 'drums'	
Unpredictable/ Irregular				
	šulamot 'tables'	*beycim* 'eggs'	*arayot* 'lions'	*avanim* 'stones'
	sulamot 'ladders'	*ciporim* 'birds'	*efronot* 'pencils'	*kvasim* 'sheep'
	kosot 'glasses'	*nemalim* 'ants'	*levavot* 'hearts'	*tolaim* 'worms'
			maftexot 'keys'	
			xelzonot 'snails'	

Notes

1. All participants' names given in this paper are pseudonyms.

2. Note that a sample of the kindergarten teacher's input was used to make sure that our test nouns were not highly familiar to the children, in order to avoid the possibility of rote learned items as much as possible.

3. The level of success for each noun was determined by the range of correct responses across the three data points. Success was defined as between 15 and 18 correct responses (with 18 correct responses serving as the ceiling, six correct responses (one for each child) x 3 data points). Partial success was defined as between seven and 14 incorrect responses across the three data points (e.g., when more than one but fewer than five children responded correctly). Failure was defined as between 15 and 18 incorrect responses across the three data points (e.g., when no fewer than five children responded incorrectly).

4. Note that a wider range was found among the bilingual children.