Children's command of plural and possessive marking on Hebrew nouns: a comparison of obligatory versus optional inflections*

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ABSTRACT

We compare learning of two inflection types – obligatory noun plurals and optional noun possessives. We tested 107 Hebrew-speaking children aged 6–7 on the same tasks at the beginning and end of first grade. Performance on both constructions improved during this short period, but plurals scored higher from the start, with improvement only in changing stems. The main remaining challenge in mastering noun plural marking in grade school is thus to learn the various types of stem changes. In contrast, possessives improved across the board in first grade, with higher success on non-changing stems and first person suffixes respectively. This intense gain in first grade occurs when children learn to read and write and turn to the written modality as their main source of linguistic input. The study thus testifies to the impact of the shift from spoken language to the 'language of literacy' on children's construal of Hebrew morphology.

INTRODUCTION

The current study investigates the development of two inflectional systems in Hebrew – NOUN PLURALS, an obligatory system, and NOUN POSSESSIVES,

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a non-obligatory inflectional system, in a longitudinal design. The study targeted first grade as a critical time of introduction to Hebrew literacy, an intensive period of exposure to both spoken and written language, and explicit instruction about their relationship.

Grammaticizable notions expressing a limited set of relational meanings constitute a special domain of language, usually denoted by a small, limited and closed set of grammatical morphemes and constructions. According to Slobin (2001 : 410), these grammatical elements provide a schematization of experience for language users. Among them, inflectional morphemes – 'prototypical grammatical morphemes … affixed to content words … general in meaning, phonologically reduced, and not etymologically transparent' (p. 413) mark the grammatical relations of a word within larger structures (Bickel & Nichols, 2007). From a semantic point of view, inflection can exhibit transparency, regularity and predictability. From a distributional point of view, inflection is extremely productive, characterized by high token frequency and general and obligatory applicability (Bybee, 1985).

These semantic and distributional aspects of inflection render it highly salient for young children and facilitate the initial mapping of meaning or function onto inflectional segments. Therefore, inflection is marked early on in child language across a wide variety of languages (Brown, 1973; Dabrowska & Szczerbinski, 2006; De Houwer & Gillis, 1998; Narasimhan, 2005; Slobin, 1985). It is no surprise, then, that the vast majority of developmental studies of inflection focus on children's emerging inflectional categories and how they 'break into the system' in early childhood (Lieven, 2005; Tomasello, 2003).

However, inflectional systems are also fraught with morphological and morphophonological complexity, opacity, inconsistency, irregularity and unpredictability. These STRUCTURAL aspects of inflection render the acquisition of such systems a long developmental route well into the school years (Laaha, Ravid, Korecky-Kröll, Laaha & Dressler, 2006; Levin, Ravid & Rapaport, 2001; Ravid, 1995). During this time, children are exposed to numerous and diverse inflected lexical items in different communicative contexts and learn to draw appropriate generalizations from both spoken and written language. The current study focuses on this later phase of the acquisition of inflection in Hebrew.

Hebrew, a Semitic language with a rich inflectional morphology, marks gender, number, person and tense on the three content word classes, and in addition incorporates these grammatical features on prepositions and several other closed-class categories (Schwarzwald, 2006). The current study focuses on two systems of nominal inflection in Hebrew. One – NOUN PLURALS – falls within the conventional characterization of inflection as an obligatory and highly frequent system. The other – NOUN POSSESSIVES – constitutes a

Hebrew-specific case of non-obligatory and less frequent inflectional system, with interesting implications for the study of inflectional acquisition. Knowledge of these two systems was tested in a longitudinal design in six- to seven-year-old children, at a time when first-graders' linguistic abilities change dramatically under the impact of reading and writing instruction.

Obligatory inflection: noun plurals

Count nouns refer to discrete, individuated entities designating 'a bounded region' in some domain which form class membership on the basis of their kind, and can be quantified as plural nouns (Langacker, 1991: 69). Quantification is critically important to children's emerging understanding of noun properties: noun plurals constitute an INTERPRETABLE or inherent inflection (in contrast to UNINTERPRETABLE inflection such as agreement), marking information which is to a large extent selected in order to carry a meaningful distinction about nouns (Chomsky, 1995). Slobin (2001: 413) cites plural markers on nouns – together with temporal inflection on verbs – as examples of prototypical and early emerging grammatical morphemes.

Hebrew nouns are pluralized by stem suffixation as in *bakbuk/bakbuk-im*[1] 'bottle/s', typical of Hebrew inflectional processes which are mostly linear (Ravid, 2006). Plural suffixes fall into two categories: regular masculine nouns take the plural suffix *-im* (e.g. *sir/sirim* 'pot/s'), while regular feminine nouns take the plural suffix *-ot* (e.g. *sira/sirot* 'boat/s'). Choice of plural noun suffix is determined by the inherent gender of the singular noun, formally expressed in its final phonology. Singular feminine nouns end with stressed *-a* (e.g. *sira* 'boat') or with *-t*[2] (*saparit* 'hairdresser, Fem.'). Singular masculine nouns end with a consonant (e.g. *pil* 'elephant') or with *-e* (e.g. *mixse* 'lid').[3] Evidence for the early emergence of noun plurals in Hebrew comes from a variety of sources – longitudinal case studies (Levy, 1980), sampling of spontaneous speech (Ravid, 1995) and cross-sectional experimentation in Hebrew-speaking preschoolers (Berman, 1981; Ravid, 1995). These studies indicate that the masculine plural suffix *-im* is learned very early on in toddlerhood, governed by the high frequency of masculine noun plurals suffixes in the core lexicon of Classical Hebrew (Tubul, 2003) and in current child-directed Hebrew (Ravid *et al.*, 2008).

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[1] Unless specifically required for the purposes of contrasting stress patterns, stress is marked only penultimately, with the understanding that all non-marked forms are stressed on the final syllable.

[2] Spelled by ת ﬨ (Ravid, 2005).

[3] Masculine stems ending with *-e* result from *-y*-final roots. For example, *mixse* 'lid' from root *k-s-y* 'cover'.

Suffix (*ir*)*regularity*. Problems in plural suffixation arise when nouns take irregular plural suffixes. In the current study, we mainly focus on one type of irregular plurals termed LEXICAL EXCEPTIONS. In such cases, the stem has regular gender phonology but takes the opposite gender suffix. That is, masculine nouns may take the feminine plural suffix -*ot* (e.g. *rexov/rexovot* 'street/s' rather than regular *rexovim*), while feminine nouns may take the plural masculine suffix -*im* (e.g. *mila/milim* 'word/s', rather than regular *milot*). A second category of irregular plurals which is not analyzed separately here involves nouns with misleading phonological markers, such as feminine nouns with masculine phonology, i.e. ending in a consonant, e.g. *kaf* 'spoon' (Ravid & Schiff, 2009). Suffix irregularity constitutes a stumbling block to young children acquiring Hebrew plurals (Berman, 1981; 1985; Ravid *et al.*, 2008). Research reveals a long developmental route in the acquisition of irregular noun plurals, which are less frequent in everyday Hebrew (Kaplan, 2008; Ravid, 1995; Ravid & Schiff, 2009).

Optional inflection: noun possessives

In addition to prototypical obligatory inflection such as noun plurals, Hebrew has several systems of optional inflection originating in Classical periods in the history of the language. The term 'optional morphology' refers to grammatical categories which may take either morphological form by attaching a bound suffix to a lexical stem; or else syntactic form by a semantically synonymous periphrastic construction (Cahana-Amitay & Ravid, 2000). The morphological option is denser and more structurally opaque, while the analytic option is perceptually salient and transparent. This type of CONSTRUCTION ALTERNATION – using two different constructions for the same grammatical phenomenon – is not widespread in the languages of the world.[4]

The optional system under investigation in this study is POSSESSIVE, expressed either by noun inflection as in *armon-a* 'palace-her = her palace', or by syntax, as in *ha-armon shela* 'the-palace of-her = her palace'.[5] Possessive nouns optionally incorporate the number, gender and person of the possessor, e.g. *beyt-xa* 'house-your + Sg.,Masc. = your house'. The linguistic literature is unclear in terminology regarding the classification

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[4] Croft (1990: 225–26) gives the example of inflection by the possessive pronoun alternating with a periphrastic construction in Amharic, another Semitic language.

[5] Other optional morphology systems include accusative verbs (e.g. *re'iti-v˜ra'iti oto* 'saw-1st-him = I saw him') and 'double' compounding (e.g. *sipur-av shel Agnon˜ha-sipurim shel Agnon* 'the-stories-his of Agnon = Agnon's stories'). In addition, a variety of other function elements and adverbials take less systematic optional inflection, among them infinitival verbs (e.g. *be-lexta* 'in-leaving-hers = upon her leaving'), *od* 'still' (e.g. analytic *od hu / odénu* 'still he'), negative *eyn* (e.g. *eyn hi / eynéna* 'she is not').

of such incorporation, which usually designates genitive constructions in languages with case systems (Lyons, 1968). Thus we have decided to label nouns incorporating possessor markers as POSSESSIVE NOUNS, rather more in line with Croft's possessive constructions in the typology of the world's languages (1990: 145–46).

The main expression of possession, one of the initial acquisitions in Hebrew around age 2;0, is syntactic, while command of the inflected option is gained during the school years (Berman, 1985; 1997; Cahana-Amitay & Ravid, 2000). Although optional morphology involves no fundamental semantic changes, it does require language users to condense more information than noun plurals, incorporating the gender–number–person coordinates and the possessive meaning to the stem. This incorporation may be one of the reasons possessive nouns do not constitute part of preschool language development (Levin *et al.*, 2001). Another reason may be the dense and often opaque morphology of noun possessives, which detracts from their saliency. For example, the third person masculine singular suffix alternates between -*o* as in *imo* 'his mother' and -*iv* as in *axiv* 'his brother'. In addition, noun possessives contribute to clause complexity by creating heavy noun phrases (Ravid & Berman, 2010). Importantly for our theme of child language acquisition, occurrence of possessive nouns crucially depends on the acquisition of nominals serving as 'landing sites' for the possessive suffixes. Acquisition of optional possessives thus requires attention to nominal morphology and a large open-class vocabulary from which to extract generalizations.

The optionality and opacity of noun possessives entails their scarcity in child-directed speech and their concomitant status as a literate high-register marker (Ravid & Berman, 2009). Possessive nouns are rare in everyday spoken communication, except for a small class of kinship terms (e.g. *aviv* 'his father') and formulaic expressions used during playtime (e.g. *torxa* 'your turn'. They characterize expert written, especially literary, style, including children's literature, *belles letters*, essays, reportage, encyclopedias and textbooks. In contrast, their incidence in texts produced by non-expert, though experienced, older Hebrew speakers/writers is not high (Cahana-Amitay & Ravid, 2000). Optional morphology can thus be taken as a yardstick for acquiring 'the language of literacy' in Hebrew (Berman & Ravid, 2008), and therefore it is important to examine its acquisition in depth and detail at the time of formal literacy instruction. Increased exposure to written texts, literacy-related activities and growing familiarity with a diverse array of lexical items should enable learners to extract the generalizations necessary for the construal of possessives during the school years, despite their relative scarcity.

The current analysis of possessives is grounded in two kinds of extant data. Children's spontaneous productions show anecdotal use of bound forms as

a strategy deployed by grade-schoolers – sometimes even imprecisely by kindergarten-age children when trying to produce higher-register language (Berman, 1981). Levin *et al.* (2001) examined the acquisition of noun possessives experimentally as one task in the framework of a longitudinal study from kindergarten (ages five–six) to first grade (ages six–seven) investigating the relationship between orthographic skills and language knowledge. This seminal study showed that kindergarteners can understand noun possessives, and that by first grade they reach 50 percent correct scores in possessives with first person suffixes. We can thus assume that possessive nouns will follow plural nouns in acquisition.

Stem changes

The two inflectional constructions under investigation share the structural factor of stem change. Nominal suffixation processes in Hebrew generally shift the stress to the final syllable in native words, as in plural *xatul-ím* 'cat-s', possessive *xatul-á* 'her cat', or derived *xatul-í* 'feline' – all based on *xatúl* 'cat' (Meir, 2006). In addition, the bound nominal stem may undergo morphophonological changes as in possessive *cel/cil-a* 'shadow / her shadow' or plural *kélev/klav-im* 'dog/s' (see Ravid & Schiff, 2009, for a full presentation of stem change types). Toddlers prefer to retain the original structure of nouns in their initial inflections, e.g. juvenile *zaken/zakena* 'old man / old woman' for correct *zkena*, or *ca'if/ca'ifim* 'scarf/scarves' for correct *ce'ifim* (Ravid, 1995). Beyond early childhood, substantial stem changes (e.g. the combination of vowel reduction and *-t* insertion) and changes to less common morphophonological classes such as *CiCCa* continue to challenge schoolchildren (Kaplan, 2008; Lavie, 2006). Early and extensive encounters with plural and feminine formation serve as an initial window on nominal operations and a testing ground for this crucial nominal property (Ravid & Shlesinger, 2001). Initial knowledge about nominal stem changes can then be applied to less familiar morphological classes such as possessive nouns and denominal adjectives encountered in children's stories and school-type texts (Levin *et al.*, 2001; Ravid, 2006; Ravid & Levie, 2010). Thus we can assume that stem changes will affect the development of both plural and possessive noun inflection.

Against this background, the current study systematically compares, for the first time, the development of these two similar yet different Hebrew nominal inflections – the obligatory PLURALS and the optional POSSESSIVES – in first-graders aged six–seven. At this time, children receive explicit reading and writing instruction, focusing on the phonological properties of Hebrew words, with increased exposure to both spoken and written discourse – and are thus expected to be especially susceptible to the acquisition of complex linguistic information.

PREDICTIONS

Based on the literature review, we expected obligatory inflection – represented by the noun plurals task – to score higher at both Times I and II. We also expected changing stems to score lower on both tasks. Finally, we expected regular plural suffixes, on the one hand, and first person possessive suffixes, on the other, to achieve higher scores than their counter-parts. The reasoning for regular plural suffixation is obvious; the prediction for first person is based on the early emergence of first person singular pronouns in children (Chiat, 1986), as well on the Hebrew-specific findings in Levin *et al.* (2001) and Kaplan (2008), showing that children produce many more first person verbs, prepositions, double compounds and optional possessives than the same constructions with other person markings.

METHODS

The current developmental study compares the production of obligatory versus optional inflection in Hebrew-speaking first-grade children using an experimental longitudinal design, which ensured that the same children were tested twice on the same task.

Participants and procedures

The study population consisted of 107 first-graders – 53 boys and 54 girls aged six to seven years. They were all native, monolingual speakers of Hebrew with no diagnosed hearing impairment, learning or reading disability, from a middle-high socioeconomic background. We focused on six- to seven-year-old first-graders since by this time children have acquired the bulk of Hebrew inflection and some of its morphophonological variations (Berman, 1985; Ravid, 1995). This ensured that the tasks were not too difficult and that all typically developing children could cope with them.

Participants were tested twice on the same tasks at two data collection points: in October (Time I of testing, the beginning of the school year) and in June (Time II of testing, the end of the school year). At Time I, our participants had a mean age of 6;2 (range 6;0–6;9), and at Time II, their mean age was 6;10 (range 6;8–7;5). Developmental school-age studies of morphology and the lexicon often focus on longer time intervals (e.g. Berman, 2008). We, however, were interested in finding out whether the combination of metalinguistic instruction and intensive exposure to written language in first grade would result in developmental changes despite the short time frame between the two points of data collection (eight months).

Tasks were administered orally and individually in a quiet room at the children's school, by a trained investigator (the third author).

Plurals. Participants were presented with a set of sentences containing singular nouns, with the target noun repeated at the end, and were prompted to produce its plural form, e.g. *Danny saw **pil** 'an elephant' at the zoo. One **pil** 'elephant' – many … ?'*. Testing started after three training demonstrations.

Possessives. Participants were presented with a set of sentences containing analytic possessive constructions, with the target noun repeated at the end, and were prompted to compose a bound possessive form from the analytical components. For example, *Danny saw Acc. **ha-xatul shelo** 'the-cat his'. How would you say **ha-xatul shelo** in one word?* Although this method of testing differed from the classical 'wug-like' plural task, it was necessary to elicit the optional bound form. Testing started after three training demonstrations. Children's responses were recorded and scored for stem and suffix correctness.

Materials

Two measuring tools were employed in this study: The Noun Plurals Task and Noun Possessives Task. The Noun Plurals task was constructed to reflect the combination of the two main components in Hebrew plurals – stem and suffix types – and thus consisted of thirty-two words in four morphophonological categories (eight items in each category): (i) non-changing stem with regular suffix; (ii) non-changing stem with irregular suffix; (iii) changing stem with regular suffix; (iv) changing stem with irregular suffix. Each category represented both masculine and feminine nouns (four words in each gender class). In the absence of word frequency data for Hebrew child-directed speech, task items were all concrete nouns[6] (Ravid, 2006) selected in consultation with kindergarten teachers to ensure that they were familiar to children attending first grade. Table 1 presents the structure of the Noun Plurals task, first used in Ravid & Schiff (2009), with sixteen examples.

The Noun Possessives Task also contained two stem types – changing and non-changing stems; and three suffix types – first person, second person and third person singular. Singular and plural possessive nouns take different allomorphs of the same suffix, e.g. *efron-i* 'my pencil' vs. *efronot-ay* 'my pencils'; moreover, non-first person suffixes have different forms for masculine and feminine, e,g, *efron-xa* 'your pencil,Masc.' vs. *efron-ex* 'your pencil,Fem.'. These variations render the full possessive paradigms too complex to test in first grade. We thus selected only singular noun stems for our task, focusing on the three different person suffixes, sampling one stem gender for each. The possessive task thus consisted of twenty-four concrete

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[6] Except for the noun *mila* 'word'.

TABLE 1. *Structure of the plural task, with sixteen examples*

Stem type	Non-changing stem		Changing stem	
Stem gender	Masculine	Feminine	Masculine	Feminine
Regular suffix	*pil/pil-im* 'elephant/s' *agas/agas-im* 'pear/s''	*mita/mit-ot* 'bed/s' *sira/sir-ot* 'boat/s'	*tof/tup-im* 'drum/s' *dli/dlay-im* 'bucket/s'	*axot/axay-ot* 'sister/s' *dim'a/dma'-ot* 'tear/s'
Irregular suffix	*ner/ner-ot* 'candle/s' *sulam/sulam-ot* 'ladder/s'	*beyca/beyc-im* 'egg/s' *shana/shan-im* 'year/s	*arye/aray-ot* 'lion/s' *lev/levav-ot* 'heart/s'	*isha/nash-im* 'woman/en' *ir/ar-im* 'city/s'

TABLE 2. *Structure of the possessive task, with twelve examples*

Stem type	Non-changing stem	Changing stem
First person singular suffix	*armon/armoni* 'palace / my palace' *xatul/xatuli* 'cat / my cat'	*ben/bni* 'son, boy / my son' *kélev/kalbi* 'dog / my dog'
Second person singular suffix	*sus/susxa* 'horse / your horse' *sakit/sakitxa* 'bag / your bag'	*safa/sfatxa* 'language / your language' *kaf/kapxa* 'spoon / your spoon'
Third person singular suffix	*sod/soda* 'secret / her secret' *mexonit/mexonita* 'car / her car'	*iparon/efrona* 'pencil / her pencil' *báyit/beyta* 'house / her house'

nouns in six morphophonological categories – four items in each category: (i) non-changing stem with first person suffix; (ii) changing stem with first person suffix; (iii) non-changing stem with second person suffix (masculine); (iv) changing stem with second person suffix (masculine); (v) non-changing stem with third person suffix (feminine); (iv) changing stem with third person suffix (feminine). Table 2 presents the structure of the Noun Possessives task (constructed along the lines of the task used in Levin *et al.*, 2001), with twelve examples.

All items used in the two tasks denoted KNOWN (that is, real) rather than nonce (or pseudo) nouns. Due to the low predictability of stem and suffix types, it is impossible to construct this task with nonce stems. To demonstrate this problem regarding stem changes, consider the three identical forms *ec* 'tree', *nes* 'miracle' and *cel* 'shadow'. Despite their phonological identity, the three nouns behave differently under pluralization due to historical reasons: *ec* has a non-changing stem, therefore *ecim* in plural; *nes* involves vowel change, thus *nisim* in plural; and *cel* has a completely changing stem, thus *clalim*. Regarding suffixes, again irregular suffixation prevents the use of nonce nouns. Consider *mila/milim* 'word/s', a feminine noun taking a masculine suffix, compared to *mita/mitot* 'bed/s', a feminine

TABLE 3. *Mean percentages and standard deviations of correct responses on the Plurals Task, by time of testing and morphophonological category*

Time	Time I	Time II
Non-changing stem Regular suffix	99·32 (2·61)	99·63 (1·8)
Non-changing stem Irregular suffix	92·88 (5·0)	95·43 (4·42)
Changing stem Regular suffix	76·18 (13·0)	82·88 (10·03)
Changing stem Irregular suffix	73·99 (11·18)	79·93 (9·92)

TABLE 4. *Mean percentages and standard deviations of correct responses on the Possessives Task, by time of testing and morphophonological category*

Time	Time I	Time II
Non-changing stem 1st person suffix	40·7 (34·87)	68·6 (34·14)
Non-changing stem 2nd person suffix	27·41 (34·29)	54·7 (36·67)
Non-changing stem 3rd person suffix	23·89 (32·42)	55·86 (37·38)
Changing stem 1st person suffix	27·71 (33·93)	59·3 (34·08)
Changing stem 2nd person suffix	20·68 (29·42)	47·38 (33·67)
Changing stem 3rd person suffix	19·72 (29·63)	53·18 (37·42)

noun taking a regular feminine suffix. Thus similar form does not ensure similar, predictable, morphological behavior; rather, suffix and stem types derive from historical categories rendered incoherent by the passage of time (Ravid, 1995), resulting in low predictability and requiring lexical learning.

RESULTS

The dependent variable was a percentage of correct responses for all items for each category (plurals, possessives) per child. Tables 3 and 4 present success scores on noun plurals and noun possessives respectively at the beginning (October) and the end (June) of first grade. We conducted a three-way ANOVA on the PLURALS data in Table 3 with three within-subject factors of time (2: October, June) × stem type (2: non-changing,
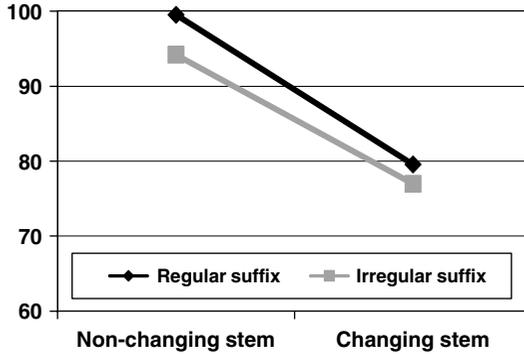
Fig. 1. Interaction of stem and suffix types in the Plurals Task.

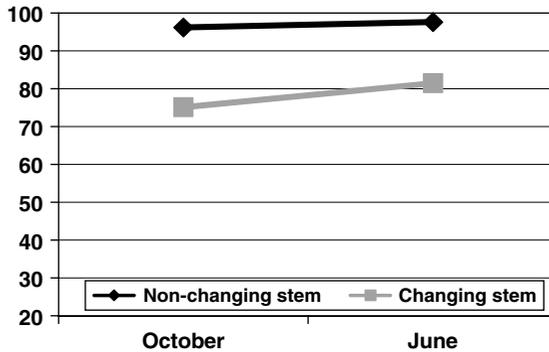Fig. 2. Interaction of time and stem type in the Plurals Task.

changing) × suffix type (2: regular, irregular) with repeated measures for each of the three factors. All three variables were significant: TIME ($F(1, 106) = 56.44$, $p < 0.001$, $\eta_p^2 = 0.35$) – correct scores improve from the beginning of first grade ($M = 85.59$, $SD = 5.97$) to its end ($M = 89.47$, $SD = 4.8$); STEM TYPE ($F(1, 106) = 691.09$, $p < 0.001$, $\eta_p^2 = 0.87$) – non-changing stems score higher ($M = 96.81$, $SD = 2.16$) than changing stems ($M = 78.25$, $SD = 8.16$); SUFFIX TYPE ($F(1, 106) = 68.19$, $p < 0.001$, $\eta_p^2 = 0.39$) – regular suffixes score higher ($M = 89.5$, $SD = 4.88$) than irregular suffixes ($M = 85.56$, $SD = 5.74$).

Two interactions emerged. One, stem type and suffix type ($F(1, 106) = 9.85$, $p < 0.003$, $\eta_p^2 = 0.09$), appears in Figure 1. Post-hoc Bonferroni analyses show differences between regular and irregular suffix types on changing stems. A second interaction of time and stem type ($F(1, 106) = 30.39$, $p < 0.001$, $\eta_p^2 = 0.22$) is depicted in Figure 2. Figure 2 shows that what actually changes at the two points of data collection is success on stems: While
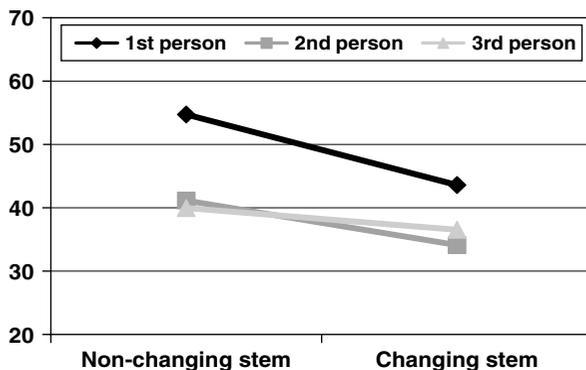
Fig. 3. Interaction of stem and suffix types in the Possessives Task.

high-scoring non-changing stems do not change from October to June, there is a significant improvement in noun plurals with changing stems. No other interactions emerged.

A three-way ANOVA with three within-subject factors of time (2: October, June) × stem type (2: non-changing, changing) × suffix type (3: first, second, third persons) was conducted on the POSSESSIVES data in Table 4. Here, again, all three variables were significant: TIME ($F(1, 106) = 105\cdot17$, $p < 0\cdot001$, $\eta_p^2 = 0\cdot50$) – correct scores improve from the beginning of first grade ($M = 26\cdot69$, $SD = 27\cdot95$) to its end ($M = 56\cdot5$, $SD = 31\cdot08$); STEM TYPE ($F(1, 106) = 57\cdot51$, $p < 0\cdot001$, $\eta_p^2 = 0\cdot35$) – non-changing stems score higher ($M = 45\cdot19$, $SD = 26\cdot61$) than changing stems ($M = 38$, $SD = 25\cdot2$); SUFFIX TYPE ($F(2, 212) = 36\cdot77$, $p < 0\cdot001$, $\eta_p^2 = 0\cdot26$) – first person suffixes score higher ($M = 49\cdot08$, $SD = 27\cdot18$) than both second person ($M = 37\cdot55$, $SD = 26\cdot16$) and third person suffixes ($M = 38\cdot16$, $SD = 27\cdot65$). An interaction of stem type and suffix type ($F(2, 212) = 5\cdot52$, $p < 0\cdot006$, $\eta_p^2 = 0\cdot05$) emerged, as depicted in Figure 3.

Post-hoc Bonferroni analyses show that, as predicted, the difference between first person, on the one hand, and second and third person, on the other, is larger in non-changing stems than in changing stems.

The analyses carried out so far indicate that stem changes are important variables in both domains of investigation. In order to compare development in both domains, we removed the suffix factor altogether, as it was different in the two categories. We then conducted a three-way ANOVA with three within-subject factors of construction (2: noun plurals, noun possessives) × time (2: October, June) × stem type (2: non-changing, changing). All three variables were significant: CONSTRUCTION ($F(1, 106) = 409\cdot03$, $p < 0\cdot001$, $\eta_p^2 = 0\cdot79$) – noun plurals scores outdo noun possessives ($M = 86\cdot08$, $SD = 4\cdot50$, $M = 37\cdot85$, $SD = 25\cdot91$); TIME ($F(1, 106) = 146\cdot06$, $p < 0\cdot001$,
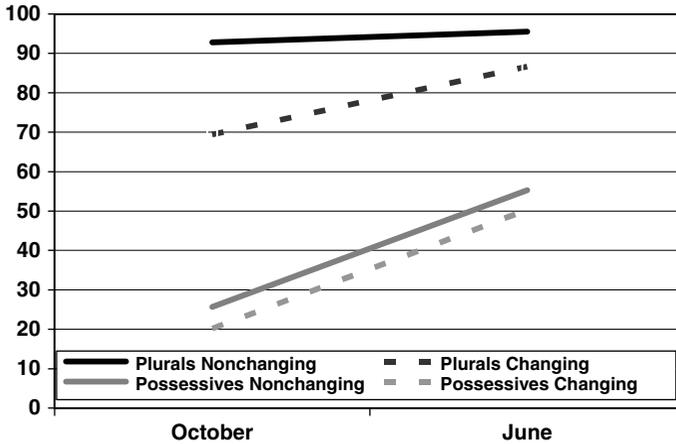
Fig. 4. Interaction of task (Plurals, Possessives), time and stem type.

$\eta_p^2 = 0.58$) – correct scores improve from the beginning of first grade ($M = 52.01$, $SD = 15.26$) to its end ($M = 71.93$, $SD = 17.32$); STEM TYPE ($F(1, 106) = 315.84$ $p < 0.001$, $\eta_p^2 = 0.75$) – non-changing stems score higher ($M = 67.31$, $SD = 14.68$) than changing stems ($M = 56.63$, $SD = 13.82$). All three two-way interactions were significant – between CONSTRUCTION and STEM ($F(1, 106) = 91.15$, $p < 0.001$, $\eta_p^2 = 0.46$), between CONSTRUCTION and TIME ($F(1, 106) = 36.75$, $p < 0.001$, $\eta_p^2 = 0.26$) and between STEM and TIME ($F(1, 106) = 61.93$, $p < 0.001$, $\eta_p^2 = 0.37$). Most important, the three-way interaction between CONSTRUCTION, STEM TYPE and TIME was significant ($F(1, 106) = 48.73$, $p < 0.001$, $\eta_p^2 = 0.32$), as depicted in Figure 4.

The post-hoc analyses showed that the high-scoring non-changing plural stems did not improve with time from October to June, while all other categories – changing plural stems as well as both stem types in the low-scoring possessive stems – did. Moreover, both plural stem types outscored possessives at both time-points.

Finally, we carried out a Pearson correlation analysis between the two constructions – noun plurals and noun possessives – at the two time-points. Success on the two constructions was not correlated at the beginning of first grade (October), but was significantly correlated ($r = 0.39$, $p < 0.001$) at its end (June).

DISCUSSION

The study compared for the first time how two different inflectional constructions develop in Hebrew-speaking children aged six–seven years during a relatively short yet critical period of eight months in the course of

first grade. Noun plurals are a typical inflectional category with obligatory application, while noun possessives constitute an optional inflectional category preceded in acquisition by the syntactic alternative. A major finding is that performance on both constructions increased during this short period – noun plurals improved from about 85% to 90%, while noun posses- sives improved from about 25% to over 55%. Success on the two constructions was, moreover, correlated at the end of the school year (June). This significant increase in performance within this short period is not self-explanatory. It indicates an intense period of extracting information about morphological classes from a growing and increasingly diverse lexical inventory. First grade provides a felicitous environment for this dramatic growth in morphological knowledge: in learning to read and write, first-graders are focused on language in a way that may not be paralleled at other grade levels. They are exposed to vast amounts of spoken and written language, are the target of intensive reading and writing instruction, and engage in a variety of structured activities intended to enhance their sensitivity to linguistic constructs – especially to phonology and the lexicon. Thus, although morphology is not formally or systematically taught in first grade, children's sensitivity to word structure is strengthened by the constant occupation with words, their sounds and their meanings. For example, word-final phonology is critical for establishing nominal gender, and attention to it will improve performance on both plurals and possessives. Moreover, reading and spelling are acquired early on by Israeli grade-schoolers, due to the transparency of the vocalized orthographic version used in literacy instruction, and early reliance on morphological cues: Hebrew-speaking first-graders read accurately by the spring (Share & Levin, 1999), and spell function letters with 90% accuracy by the summer (Gillis & Ravid, 2006; Ravid, 2005). Thus, orthographic representations are already in place by the end of first grade, and these support and reinforce the relationship between morphological forms and semantics in lexical items – entrenching lexical representations and enabling efficient general- izations of morphological structures.

Plurals versus possessives across first grade

Another finding is the difference between the start-off points and amount of improvement in the two constructions. Two related aspects of plurals versus possessives can be invoked here – morphological complexity and patterns of distribution.

   Suffix complexity. Since plurals and possessives share stem changes (see below) we will focus in this section on the differences in SUFFIX complexity. Plural suffixation takes into consideration grammatical noun gender and its phonological marking on the singular stem as a cue to plural suffix, as in masculine *pil/pil-im* 'elephant/s' vs. feminine *pila/pil-ot* 'elephant,Fem./s'.

The challenge to young learners arises when the plural suffix is in clash with stem gender and/or phonology – as shown by the fact that performance on regular suffixes such as *mita/mit-ot* 'bed/s' was better than on irregular suffixes such as *mila/mil-im* 'word/s' by about 4 percent. First-graders' errors on plural suffixation (at both time-points) are not random and reveal their robust command of Hebrew gender. There are almost no suffix errors in inanimate nouns with regular suffixes such as *ec/ecim* 'tree/s' or feminine *matana/matanot* 'present/s'. A few errors occur in animate nouns, such as pluralizing masculine *xatul* 'cat' as feminine *xatulot*, given young children's propensity to regards cats as female; or sometimes pluralizing *axot* 'sister' as *axim* 'brothers' and *isha* 'woman' as *anashim* 'men' (Ravid, 1995; Ravid & Schiff, 2009). Beyond these scarce examples, all suffix errors reflect children's sensitivity to inherent gender and its phonological marking. For example, all errors on feminine *shana* 'year' and *nemala* 'ant' consisted of matching the ubiquitous singular -*a* with the feminine plural suffix to yield erroneous *shanot* and *nemalot* respectively. Likewise, 29 out of a total of 39 errors on masculine *nahar* 'river' involved using the masculine suffix -*im*, compatible with stem gender and phonology.

Even more interesting were cases where stem phonology clashed with stem gender as in feminine *ir* 'city' and *kaf* 'spoon' ending with a consonant, a masculine feature. In such cases, the only way to determine noun gender is to consider adjective or verb agreement with the noun, as in *ir gdola* 'city,Fem. big,Fem.=big city'. Children's errors reflected their attempts to reconcile the gender/phonology clash. Consider, for example, *ir* 'city', where the correct plural form *arim* requires stem change and a masculine suffix. Erroneous responses on *ir* contained an almost equal number of 21 *irot* with feminine suffix, following inherent gender, and 22 *irim* with masculine suffix, following stem phonology. Most telling were the 3 erroneous cases of *draxot* instead of correct *draxim* 'ways'. These errors highlight children's correct construal of *dérex* 'way' as a feminine noun despite not only its masculine phonology, but also the fact that it pertains to the highly frequent masculine morphological pattern *CéCeC*.

Forming possessive nouns requires even more complex morphological machinery. Possessive nouns are marked not only for their own gender and number, but also incorporate ten different suffixes indicating number, gender and person of the possessor – e.g. *pil/pil-ex* 'elephant / your,Fem. elephant', *pil/pil-o* 'elephant / his elephant', *pil/pil-am* 'elephant / their elephant'. The form of the possessive suffix may, moreover, change with stem number. For example, compare the forms of the first person singular suffix on a singular stem *pil-i* 'my elephant' and on a plural stem, *pil-ay* 'my elephants'. In addition, the same suffix may take allomorphic forms on different stems, e.g. *av-iv* 'his father' vs. *im-o* 'his mother'. The enormous

variety of children's erroneous responses on possessive nouns reflects their ongoing struggle in learning the different suffixes, their forms and their allomorphs, and attempts to assign them to stems. One set of erroneous responses reveals children's actual difficulty with the very morphological task of creating an inflected possessive noun. First, every single item on the possessive task elicited the non-bound stem – e.g. responding with *ná'al* 'shoe' to *ha-ná'al shela* 'her shoe' instead of incorporating the third person singular feminine pronoun into the correct inflected form *na'ala*. Each such error occurred several times. In contrast, only 8 out of the 24 plural items resulted in the free singular stem, and each error occurred just once. Moreover, almost every item elicited possessive responses, i.e. repeating the possessive pronoun in the task item or producing an inappropriate one, e.g. *shelánu* 'our' for *ha-mora shlaxem* 'your teacher', where the correct response should have been *moratxem*. Finally, every item on the task elicited a syntactic response including the same or a different pronoun than in the task item, e.g. *ha-báyit sheli* 'my house' in response to *ha-báyit shelo* 'his house', where the correct response should have been the bound form *beyto*. In addition to the numerous non-morphological responses, children produced possessive nouns with incorrect possessive inflections, mostly changing the target person, as in *armonex* 'your,Fem. palace' for the required *armoni* 'my palace', or *susénu* 'our horse' for *susxem* 'your,Pl. horse'. There were also several gender errors, as in *kafxa* 'your,Masc. spoon' for correct *kapex* 'your,Fem. spoon', or *calaxtam* 'their,Masc. plate' for *calaxtan* 'their,Fem. plate'.

In this context, and as predicted, first person possessives were found to be relatively easier than the second and third person suffixes. They had the highest scores of all possessives at both time-points and showed vigorous growth between them. Moreover, every single item elicited erroneous responses with first person singular, either as a possessive pronoun *sheli* or as an inflected form, e.g. *sakiti* 'my bag' for correct *sakitex* 'your,Fem. bag'. This finding is in line with cross-linguistic evidence for the early emergence of children's first person pronouns and inflections (Berman, 1985; Chiat, 1986; de Villiers & de Villiers, 1985; Schieffelin, 1985). It is also supported by previous studies on optional bound morphology in Hebrew (Levin *et al.*, 2001; Kaplan, 2008). The relative prominence of first person inflections may be attributed to children's early interest in their own possessions or to the frequent occurrence of the speaker role in conversation (Clark, 1996).

To sum up this analysis, most possessive items (including first person) elicited a long list of suffixation errors – free stems, free possessive pronouns, syntactic phrases expressing possession, and several different inflection errors. Taken together, this array of suffixation errors demonstrates that children need to be familiar with all of the different aspects of number–gender–person combinations to succeed in inflecting possessive nouns.

In that sense, plural inflection places a lighter demand on children's evolving morphological abilities than possession suffixes. Our results indicate that while plural inflection is in general at a high level by the end of first grade, learning the more complex possessive inflection makes considerable progress in first grade – but still has a long way to go in reaching adult-like performance (Lavie, 2006; Kaplan, 2008).

Distributional patterns. Morphological complexity is related to the distributional issues presented in the 'Introduction'. The plural inflection is not only simpler, it is also obligatory with general application in all appropriate contexts, and therefore noun plurals occur across the board, and their number increases with age in both child-directed input and children's output regardless of register. Possessive incorporation is optional, since noun possessives are usually expressed syntactically in everyday language, and certainly in input to children and in their own output, as evidenced in the many syntactic errors described above. The bound morphological option is rarer, typical of higher register, specifically written, formal or narrative language (Ravid & Berman, 2009). Thus children are exposed to noun plurals earlier and in larger quantities than to noun possessives, and they are also obliged to compose plural forms morphologically from early on, whereas the major possessive expression remains syntactic. The dramatic increase in correct possessives across first grade would then correspond to the exposure to written language (Berman & Ravid, 2008), characterized by rich and diverse optional bound morphology.

Stem changes across development

Beyond the differences between the two constructions in terms of suffix complexity and distribution, our analyses highlighted a shared area of difficulty in the developmental trajectories we found – that is, stem changes under linear morphological operations.

Performance on non-changing plural stems such as *ner/ner-ot* 'candle/s' was better than on changing stems such as *tof/tup-im* 'drum/s' by about 20%. An interesting finding in this category showed that the high results in plural formation to a large extent derive from the non-changing stems with both regular and irregular suffixes, which do not change between the two time-points. The locus of change in noun plurals is in changing stems, which increase from 75% in October to over 81% in June. This growth includes both changing stems with regular suffixes, e.g. masculine *dli/dlay-im* 'bucket/s', as well as those with irregular suffixes, e.g. masculine *lev/levav-ot* 'heart/s' with the feminine plural suffix.

Error analysis illustrates how morphological and morphophonological factors impact on learning about Hebrew stem changes. For example, the lack of root and pattern structure in monosyllabic nouns, which may seem

simpler than bisyllabic nouns from a non-Semitic point of view, is an obstacle to learning. Many participants found it especially challenging to perform single-vowel changes in monosyllabic items such as *xec* 'arrow' (correct plural *xic-im*), *ir* 'city' (correct plural *ar-im*), leaving the stem unchanged. They also found it difficult to exchange stop for spirant, e.g. responding to *kaf* 'spoon' with plural *kaf-im* or *kaf-ot* for correct *kap-ot*. The combination of vowel change and stop/spirant alternation was especially daunting in *tof/tupim* 'drum/s', where most erroneous responses did not make any stem change, yielding *tof-im*, or else either failed to change the vowel (*top-im*) or the consonant type (*tuf-im*). However, making 'heavy' stem changes in the highly frequent noun pattern *CéCeC* was not at all demanding for first graders, so that the items *dérex/draxim* 'way/s', *mélex/mlaxim* 'king/s', and *éven/avanim* 'stone/s' had almost no stem errors – in line with previous finding of the early acquisition of *CéCeC* and its morphophonological changes (Ravid, 1995). However, the two items with nominal pattern *CiCCa*, which requires similar structural changes as *CéCeC*, entailed dozens of errors – virtually all errors on *giv'a* 'hill' and *ricpa* 'floor' left the stem intact instead of changing it into the required *CCaC-ot* format. This may be due to the low frequency of *CiCCa* nouns in child-directed input and child speech, since non-animate feminine patterns, *CiCCa* included, denote mostly abstract entities (Ravid, 2006).

An additional set of errors points at how morphological and orthographic knowledge begin to interface in first grade (Ravid, 2005). One of the most salient markers of Hebrew feminine nouns is the final *-t*, which deletes before the plural suffix as in *axot/axayot* 'sister/s'. About 10 erroneous responses failed to perform this change (giving *axotot* or *axotim*), most probably since final *-t* deletion is more frequently associated with penultimate structures and following vowels *e* and *a*, e.g. *rakévet rakav-ot* 'train/s' or *mikláxat/miklax-ot* 'shower/s'. Note that *-t* is homophonous, and the orthographic variation marking feminine gender is spelled with T ת. In first grade, this orthographic knowledge is not yet firmly entrenched (Gillis & Ravid, 2006): seven of the errors on *máxat* 'needle' deleted the final *t*, a stem consonant spelled with Ṭ ט, to yield plural *máxot* instead of correct *mexatim*.

While noun plurals improved only in the changing stems, ALL possessive categories with both changing and non-changing stems improved in first grade, most of them doubling their score within the eight months between October and June. This general difference in rate of development is probably due to the large margin for improvement in knowledge of this optional construction. But there was yet another difference between plurals and possessives. In optional possessives, too, performance was better on non-changing stems (e.g. *mexonit* 'car' / *mexonit-a* 'her car') than on changing stems (e.g. *tmuna* 'picture' / *tmunat-a* 'her picture'), but the

overall difference between the two stem types was only 7 percent. This small difference between changing and non-changing stems requires an explanation. We believe that this is due to the fact that possessive stem changes are somewhat less complex than plural changes. The main area of difference is the higher transparency of feminine stems in possessive nouns. This is achieved in two ways. One is the preservation of the final *-t* on feminine stems which would delete in plurals but not in possessives. Compare, for example, plural *xanut/xanuy-ot* 'shop/s', *axot/axay-ot* 'sister/ s', and *mapit/mapiy-ot* 'napkin/s' with their respective possessive forms *xanut/xanut-i* 'shop / my shop', *axot/axot-a* 'sister / her sister', and *mapit/ mapit-am* 'napkin / their napkin'. Moreover, *-a* final stems require *t* insertion in possessive forms (e.g. *mora/morat-xem* 'teacher,Fem. / your,Pl. teacher'. The result is clear and consistent representation of stem gender by *t*, which makes one type of possessive stem easier to process. This observation is supported by the distribution of errors on possessive nouns: stem errors are fewer because feminine items ending with *-t* (such as *mexonit* 'car' or *caláxat* 'plate') and *-a* (*mora* 'teacher,Fem.', *tmuna* 'picture') mostly preserve the stem or add *t* to it. Children's sensitivity to feminine *t* is reflected in errors where feminine *t* is inappropriately inserted where not required, an error which never occurs in plurals: for example, in masculine stems such as *armonati* for *armoni* 'my palace', or *pitxa* for *píxa* 'your,Masc. mouth'; and in feminine *ná'al* to yield *na'alato* for *na'alo* 'his shoe'. Stem errors mostly occurred in masculine possessive items, e.g. *kafex* for *kapex* 'your,Fem. spoon', *péxa* for *píxa* 'your,Masc. mouth', or *klavi* for *kalbi* 'my dog'.

Frequency issues. As noted above, task items were concrete nouns familiar to first-graders. In the absence of word frequency lists for current Hebrew, we could not formally assess the impact of word frequency on success in plural or possessive formation. Nevertheless, the analysis of error distri- bution indicated that the issue of frequency is quite complex and involves several aspects of word knowledge. First, pattern frequency was clearly involved in correctly marking plural items, as demonstrated above by the comparison of items in frequent *CéCeC* versus rare *CiCCa*. Pattern consistency was also important, as shown by the virtual absence of *-im* errors in *iparon* 'pencil', since all items of masculine pattern *CiCaCon* consistently take the feminine suffix *-ot* (Ravid, 1995). Moreover, frequency measures should address not only the singular stem (lemma) but also the inflected word forms. Plural-dominant nouns, where the plural form occurs at least as frequently as the singular, entailed fewer errors, as was the case with irregular *beyca/beycim* 'egg/s' and stem-changing and irregularly suffixed *arye/arayot* 'lion/s' and *éven/avanim* 'stone/s'. On the other hand, nouns which occur more frequently in their singular form entailed many errors, such as pluralizing irregular *shana* 'year' as *shanot* (for correct

shanim) or stem-changing and irregularly suffixed *isha* 'woman' as *ishot* (instead of correct *nashim*). In possessive nouns, items with the highly frequent first person suffix had higher scores than those with second and third person suffixes. In this respect, future studies of plurals and possessives should delve deeper and more extensively into noun gender, which did not constitute a variable in this study.

Conclusion

This study contributes to our knowledge about later language development by showing that inflectional learning is vigorously under way in Hebrew-speaking six–seven-year-old first-graders, and that acquisition of noun plurals is much further along the way than the acquisition of possessive incorporation. While plural marking is one of the first inflections to emerge in toddlers, the main challenge in mastering plural marking is morpho-phonological: children aged six–seven years have learned much of the irregular plural suffixation, but still have to gain command of the various types of stem changes in plural nouns. Possessive marking, a high-register, optional construction typical of formal, mostly written Hebrew, gains much ground during the relatively short period during which first-graders learn to read and write Hebrew and turn to the written modality as their main source of linguistic input. The fact that success on the two inflectional tasks was correlated at the end (but not at the beginning) of first grade testifies to the impact of the crucial shift from spoken language to the 'language of literacy' on children's construal of Hebrew morphology.

REFERENCES

Berman, R. A. (1981). Regularity vs. anomaly: The acquisition of inflectional morphology. *Journal of Child Language* **8**, 265–82.

Berman, R. A. (1985). *Acquisition of Hebrew*. In D. I. Slobin (ed.), *The crosslinguistic study of language acquisition*, 255–371. Hillsdale, NJ: Erlbaum.

Berman, R. A. (1997). Preliterate knowledge of language. In C. Pontecorvo (ed.), *Writing development: An interdisciplinary view*, 61–76. Amsterdam: John Benjamins.

Berman, R. A. (2008). The psycholinguistics of developing text construction. *Journal of Child Language* **35**, 735–71.

Berman, R. A. & Ravid, D. (2008). Becoming a literate language user: Oral and written text construction across adolescence. In D. R. Olson & N. Torrance (eds), *Cambridge handbook of literacy*, 92–111. Cambridge: Cambridge University Press.

Bickel, B. & Nichols, J. (2007). Inflectional morphology. In T. Shopen (ed.), *Language typology and syntactic description, Volume III Grammatical categories and the lexicon, 2nd edn*, 169–240. Cambridge: Cambridge University Press.

Brown, R. (1973). *A first language: The early stages*. Cambridge, MA: Harvard University Press.

Bybee, J. L. (1985). *Morphology: A study of the relation between meaning and form*. Amsterdam: John Benjamins.

Cahana-Amitay, D. & Ravid, D. (2000). Optional bound morphology in the development of text production. In S. C. Howell, S. A. Fish & T. Keith-Lucas (eds), *Proceedings of the*

24th Annual Boston University Conference on Language Development, Vol. I, 176–84. Somerville, MA: Cascadilla Press.

Chiat, S. (1986). Personal pronoun systems. In P. Fletcher & M. Garman (eds), *Language acquisition II*, 339–55. Cambridge: Cambridge University Press.

Chomsky, N. (1995). *The Minimalist Program*. Cambridge: MIT Press.

Clark, H. H. (1996). *Using language*. Cambridge: Cambridge University Press.

Croft, W. (1990). *Typology and universals*. Cambridge: Cambridge University Press.

Dabrowska, E. & Szczerbinski, M. (2006). Polish children's productivity with case marking: The role of regularity, type frequency, and phonological diversity. *Journal of Child Language* **33**, 559–97.

De Houwer, A. & Gillis, S. (1998). Dutch child language: An overview. In S. Gillis & A. De Houwer (eds), *The acquisition of Dutch*, 1–90. Amsterdam: John Benjamins.

de Villiers, J. G. & de Villiers, P. A. (1985). The acquisition of English. In D. I. Slobin (ed.), *The crosslinguistic study of language acquisition*, 27–140. Hillsdale, NJ: Erlbaum.

Gillis, S. & Ravid, D. (2006). Typological effects on spelling development: A crosslinguistic study of Hebrew and Dutch. *Journal of Child Language* **33**, 621–59.

Kaplan, D. (2008). Relationship between later language knowledge and reading abilities. Unpublished doctoral dissertation, Tel Aviv University [in Hebrew].

Laaha, S., Ravid, D., Korecky-Kröll, K., Laaha, G. & Dressler, W. U. (2006). Early noun plurals in German: Regularity, productivity, or default? *Journal of Child Language* **33**(2), 271–302.

Langacker, R. W. (1991). Concept, image, and symbol: The cognitive basis of grammar. Berlin: Mouton de Gruyter.

Lavie, N. (2006). The development of noun plurals. Unpublished MA thesis, Department of Communications Disorders, Tel Aviv University [in Hebrew].

Levin, I., Ravid, D. & Rapaport, S. (2001). Morphology and spelling among Hebrew-speaking children: From kindergarten to first grade. *Journal of Child Language* **28**, 741–69.

Levy, Y. (1980). The acquisition of gender. Unpublished doctoral dissertation, Hebrew University of Jerusalem [in Hebrew].

Lieven, E. (2005). Language development: An overview. In K. Brown (General Editor), *The encyclopedia of language and linguistics, 2nd edn, Volume 6*, 376–91. Oxford: Elsevier.

Lyons, J. (1968). *Introduction to theoretical linguistics*. New York: Cambridge University Press.

Meir, I. (2006). Morphological levels and diachronic change in Modern Hebrew plural formation. *Studies in Language* **30**, 777–806.

Narasimhan, B. (2005). Splitting the notion of 'agent': Case-marking in early child Hindi. *Journal of Child Language* **32** (4), 787–803.

Ravid, D. (1995). *Language change in child and adult Hebrew: A psycholinguistic perspective*. New York: Oxford University Press.

Ravid, D. (2005). Hebrew orthography and literacy. In R. M. Joshi & P. G. Aaron (eds), *Handbook of orthography and literacy*, 339–63. Mahwah, NJ: Erlbaum.

Ravid, D. (2006). Word-level morphology: A psycholinguistic perspective on linear formation in Hebrew nominals. *Morphology* **16**, 127–48.

Ravid, D. & Berman, R. (2009). Developing linguistic register in different text types. *Pragmatics & Cognition* **17**(1), 108–145.

Ravid, D. & Berman, R. (2010). Developing noun phrase complexity at school-age: A text-embedded cross-linguistic analysis. *First Language* **30** (1), 3–26.

Ravid, D., Dressler, W. U., Nir-Sagiv, B., Korecky-Kröll, K., Souman, A., Rehfeldt, K., Laaha, S., Bertl, J., Basbøll, H. & Gillis, S. (2008). Core morphology in child directed speech: Crosslinguistic corpus analyses of noun plurals. In Heike Behrens (ed.), *TILAR Series No 6. Trends in Corpus Research*, 25–60. Amsterdam: Benjamins.

Ravid, D. & Levie, R. (2010). Hebrew adjectives in later language text production. *First Language* **30** (1), 27–55.

Ravid, D. & Schiff, R. (2009). Morpho-phonological categories of noun plurals in Hebrew: A developmental study. *Linguistics* **47** (1), 45–63.

Ravid, D. & Shlesinger, Y. (2001). Vowel reduction in Modern Hebrew: Traces of the past and current variation. *Folia Linguistica* **35**(3–4), 371–97.

Schieffelin, B. B. (1985). The acquisition of Kaluli. In D. I. Slobin (ed.), *The crosslinguistic study of language acquisition*, 525–94. Hillsdale, NJ: Erlbaum.

Schwarzwald, O. R. (2006). Three related analyses in Modern Hebrew morphology. In G. Goldenberg (ed.), *Ancient Egyptian, Neo-Semitic, methods in linguistics in memory of H. J. Polotsky*. Jerusalem: The National Academy of Sciences.

Share, D. L. & Levin, I. (1999). Learning to read and write in Hebrew. In M. Harris & G. Hatano (eds), *A cross-cultural perspective on learning to read*, 89–111. Cambridge: Cambridge University Press.

Slobin, D. I. (ed.) (1985). *The crosslinguistic study of language acquisition*. Hillsdale, NJ: Erlbaum.

Slobin, D. I. (2001). Form–function relations: How do children find out what they are? In M. Bowerman & S. C. Levinson (eds), *Language acquisition and conceptual development*, 406–449. Cambridge: Cambridge University Press.

Tubul, M. (2003). The distribution of plural morphemes in Biblical and Mishnaic Hebrew. Unpublished doctoral dissertation, Bar-Ilan University [in Hebrew].

Tomasello, M. (2003). *Constructing a language: A usage-based theory of language acquisition*. Cambridge, MA: Harvard University Press.