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Content words in Hebrew child-directed speech

L. Adi-Bensaid[a,b,*], A. Ben-David[c,d], G. Tubul-Lavy[a,e]

[a] Department of Communication Sciences and Disorders, Ono Academic College, Israel
[b] Speech and Hearing Center, Sheba Medical Center, Tel Hashomer, Ramat Gan, Israel
[c] Department of Communication Disorders, Hadassah Academic College, Israel
[d] Department of Communication Disorders, Tel-Aviv University, Israel
[e] Department of Special Education, Achva Academic College, Israel

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ABSTRACT

The goal of the study was to examine whether the 'noun-bias' phenomenon, which exists in the lexicon of Hebrew-speaking children, also exists in Hebrew child-directed speech (CDS) as well as in Hebrew adult-directed speech (ADS). In addition, we aimed to describe the use of the different classes of content words in the speech of Hebrew-speaking parents to their children at different ages compared to the speech of parents to adults (ADS). Thirty infants (age range 8:5–33 months) were divided into three stages according to age: pre-lexical, single-word, and early grammar. The ADS corpus included 18 Hebrew-speaking parents of children at the same three stages of language development as in the CDS corpus. The CDS corpus was collected from parent–child dyads during naturalistic activities at home: mealtime, bathing, and play. The ADS corpus was collected from parent–experimenter interactions including the parent watching a video and then being interviewed by the experimenter. 200 utterances of each sample were transcribed, coded for types and tokens and analyzed quantitatively and qualitatively. Results show that in CDS, when speaking to infants of all ages, parents' use of types and tokens of verbs and nouns was similar and significantly higher than their use of adjectives or adverbs. In ADS, however, verbs were the main lexical category used by Hebrew-speaking parents in both types and tokens. It seems that both the properties of the input language (e.g. the pro-drop parameter) and the interactional styles of the caregivers are important factors that may influence the high presence of verbs in Hebrew-speaking parents' ADS and CDS. The negative correlation between the widespread use of verbs in the speech of parents to their infants and the 'noun-bias' phenomenon in the Hebrew-child lexicon will be discussed in detail.

1. Introduction

1.1. Child directed speech

Recent studies have shown the importance of input in the process of language development. Child-directed speech (CDS) is an important component in the child's input. CDS refers to speech addressed to children and has unique characteristics which differ significantly from adult-directed speech (ADS). These unique characteristics occur in all language components

* Corresponding author.
E-mail address: limorbensaid@gmail.com (L. Adi-Bensaid).

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(e.g. phonology, syntax, lexicon) and are designed to draw the infant's attention to adult speech, to facilitate language acquisition, and to help infants interpret emotional signals from others (Cooper, Abraham, Berman, & Staska, 1997; Owens, 2008; Snow, 1972).

CDS includes several unique features: *prosodic properties* – adults use higher pitch with wider, smoother and simpler pitch contours (Fernald, 1989; Fernald & Kuhl, 1987; Fernald & Mazzie, 1991; Fernald & Simon, 1984) when speaking to infants than when speaking to adults, as well as slower rhythm and tempo and longer pauses (Albin & Echols, 1996; van de Weijer, 2002); *phonological properties* – phonological simplification, preference of CVC, CVCV word structures (Ferguson, 1964); and mono- and bi-syllabic words in CDS (Cutler & Carter, 1987; Segal, Nir-Sagiv, Kishon-Rabin, & Ravid, 2008); *syntactic properties* – shorter and less complex sentences are most common (Sherrod, Friedman, Crawley, Drake, & Devieux, 1977); and regarding *lexical properties* – more concrete references, which relate to here and now, and more restricted vocabulary are used by parents when speaking to their children (Berko-Gleason & Bernstein-Ratner, 2013; Owens, 2008).

1.2. Content words in CDS and the relation to acquisition

Word class categorization is best characterized as a continuum and divided into three major classes: (1) open class (2) closed class, and (3) between class (Berman, 2001). The open-class items, which include content words, carry the semantic information of the utterances and are considered open class since new words can easily be added to the category. Open-class items include nouns (e.g. story, doll), verbs (e.g. go, drink, think), adjectives (e.g. color, size), and adverbs (e.g. carefully, interestingly). Closed-class items, which include function words, occur between content words in the utterances and are thus important for syntactic structure. Function words are more stable over a long period of time, and they occur far more frequently than content words (Morgan, Shi, & Allopenna, 1996; Shi, 1996, 2005; Shi, Morgan, & Allopenna, 1998). They include paradigms such as articles, demonstratives and personal pronouns (e.g. the, this, I), as well as more open-ended lexical classes such as prepositions (e.g. inside, to, from), coordinating and subordinating conjunctions (e.g. and, but, that), negators (e.g. no), quantifiers (e.g. numbers, all, many), question words (e.g. why, what, who), etc. Between-class items lie between fully grammatical and fully contentive lexical elements. These words include discourse markers such as also, just, even, great, etc.

The distinction between the two main categories, open class and closed class, also exists in language acquisition: in many languages, function words are deleted from children's early productions, while content words are usually preserved. This may indicate that the distinction between content and function words exists, on some level, even in infants. Yet it seems that these two categories can also be derived by infants using perceptual analysis of the acoustic, phonetic and phonological cues within the input. For example, in English, function words contain reduced vowels compared to content words (Cutler & Carter, 1987) and are described as unstressed (Gleitman & Wanner, 1982). In Hebrew, functional closed-class items consist mainly of monosyllabic words (almost 80%, and 60% of all tokens and types in the closed class of the data), while semantically complex open-class items consist mainly of bi- and tri-syllabic words (about 87% of all tokens and types) (Segal et al., 2008). Similar findings are reported for English (Cutler & Carter, 1987), as well as Turkish (Shi et al., 1998). These findings suggest that prosodic cues such as word length and stress patterns help young children to differentiate between word classes (open-class or content words versus closed-class or functional words), as well as to differentiate between different subclasses, such as verbs versus nouns (e.g. Kelly & Bock, 1988; Shi, Werker, & Morgan, 1999). Kelly and Bock (1988), for example, reported that in a representative sample of bi-syllabic English words (3000 nouns and 1000 verbs) most strong-weak words (90%) were nouns and most weak-strong words (85%) were verbs. In addition, Segal et al. (2008) reported that the iambic stress pattern was found to be more frequent in verbs (91%, 92.7% of all tokens and types, respectively), than in nouns (56%, 61.6% of all tokens and types, respectively). It seems then, that this type of prosodic diversity may influence both the learning of grammatical category assignment (Kelly & Bock, 1988) as well as the development of segmentation strategies during language development (Nazzi, Dilley, Jusczyk, Shattuck-Hufnagel, & Jusczyk, 2005). Even in their first years of life, infants show significant achievements in this task: by the age of 9 months, they are able to distinguish between content and function words (Shi, Werker & Morgan, 1999). By age 1;1, they begin to make finer distinctions among the content words according to their meaning; first among nouns (e.g. objects) and then among adjectives and verbs (e.g. properties and events, respectively) (Waxman & Lidz, 2006). The present study will focus on the open-class category, i.e. the use of content words in CDS.

Many researchers have shown a link between CDS and language acquisition (Hart & Risley, 1995; Schwartz & Terrell, 1983; Weizman & Snow, 2001). More specifically, a positive correlation has been found between frequency and word acquisition: the greater the frequency with which a word is produced in CDS, the earlier it will be learned (Goodman, Dale, & Li, 2008). Moreover, several studies have suggested that frequency affects which categories of words children learn. In some languages, such as Korean and Chinese, CDS contains verbs more frequently than does English CDS and this is reflected in children's early vocabularies by a higher proportion of verbs and action words than nouns and object labels (Camaioni & Longobardi, 2001; Choi & Gopnik, 1995; Gopnik & Choi, 1990; Tardif, Shatz, & Naigles, 1997; Tardif, 1996; Tardif, Gelman, & Xu, 1999). Tardif et al. (1997) reported that English-speaking child caregivers tend to emphasize nouns by placing them in utterance-final position, asking questions about objects and having fewer morphological markings on nouns. As a result, American children use a larger proportion of nouns in their early vocabulary than Korean- and Mandarin-speaking children (Fenson et al., 1994; Gentner, 1982).

These studies provide evidence that CDS plays a crucial role in language acquisition in general and specifically in the use of content words by children. In other words, in the languages examined, there is a positive correlation between the use of nouns and verbs in the parents' CDS and the noun-bias or verb-bias in the speech of children acquiring these languages (see also Sandhofer, Smith, & Luo, 2000). Yet Camaioni and Longobardi (2001) and Caselli et al. (1995) show the opposite for Italian: while Italian-speaking parents use verbs more frequently than nouns when talking to their infants, a noun-bias is reported in Italian early child lexicon.

In Hebrew, a noun-bias phenomenon was reported by Dromi (1987) in her case study of early lexical development in the one-word period of production. The child's verbal productions were collected for a period of 32 weeks between the ages of 10(12) and 17(23) [months (days)]. The distribution of the child's words in the various categories of reference (i.e. object word, action word, modifier, social word, indeterminant word) indicated that the majority of words (59%) were object words. The four other categories were far less frequent: indeterminant words constituted 16% of the total lexicon, action words 14%, social words 7%, and modifiers only 4%. Dromi summarized her findings and claimed that "in Hebrew, as in other languages (e.g., English, Japanese, German, Kaluli and Turkish, as discussed by Gentner), nouns in adult speech constitute the largest category of words learned by the child, with the acquisition of verbs lagging behind" (Dromi, 1987, p. 157). As far as we know, Dromi's study is the only study in Hebrew which examined the distribution of lexical categories in child acquisition.

The study by Maital, Dromi, Sagi and Bornstein (2000) also reported on the noun-bias phenomenon in Hebrew-speaking children. They constructed the HCDI, a Hebrew adaptation of the MCDI – MacArthur Communicative Development Inventory. The HCDI was then administered to Israeli mothers of 253 infants aged 1;6–2;0. The findings revealed that nouns were the largest category in the infant's lexicon (50–60% of all words used) when lexical levels ranged from 50 to 500 words. The proportion of nouns peaked at a mean of 58.9 in children with 101–200 word vocabularies.

Later, a cross-linguistic study of early vocabulary in young children in seven different languages, of which Hebrew was one, was conducted (Bornstein et al., 2004). The Hebrew corpus included 37 infants whose mothers completed the Early Language Inventory when they were approximately 20 months old (20.49). Mothers independently reported that their infants used more nouns than verbs in all seven languages, including Hebrew. The authors concluded that the findings indicate a noun-bias in early vocabularies of children learning to speak Spanish, Dutch, French, Italian, Korean and American-English, as well as Hebrew.

Thus, since a noun-bias phenomenon has been reported in Hebrew-speaking children (Bornstein et al., 2004; Dromi, 1987; Maital et al., 2000), the purpose of this study is to determine if input contributes to the noun-bias phenomenon. We will do that by examining the use of the different classes of content words in the CDS of parents to Hebrew-speaking infants in order to determine whether or not there is a positive correlation between the noun-bias phenomenon in acquisition and CDS in Hebrew. If a positive correlation does exist, then, similar to findings in English, the occurrence of nouns in CDS by Hebrew-speaking parents will be more frequent than that of verbs. However, if a reverse correlation is found, then, like in Italian, verbs in the CDS of Hebrew-speaking parents will be more frequent than nouns.

The second goal of the study is to compare the findings from the CDS to Hebrew ADS in order to discover whether the noun-bias or verb-bias that characterizes Hebrew CDS is unique to the input the children receive from their parents or whether it is a characteristic of the Hebrew language.

While the CDS corpus is mainly collected in naturalistic situations of parent–child dyads, ADS data is collected through various methods: telephone conversations between pairs of volunteer speakers on suggested topics (Bell, Brenier, Gregory, Girand & Jurafsky, 2009), a semi-structured short interview by the adult experimenter with each mother (Kondaurova & Bergeson, 2011), casual conversation with the mothers either on general topics (Phillips, 1973), or specifically about their child (Hoff-Ginsberg, 1991; Liu, Tsa, & Kuhl, 2009). Fernald (1989), for example, used the same research tool, i.e. a picture book, both for CDS and ADS. In this study, each mother was asked to "tell the story" both to her infant and to an adult listener.

The different method of collecting the ADS corpus used in each study depends mainly on the research question and the linguistic features examined (e.g. prosodic, grammatical, etc.). To the best of our knowledge, there are no previous studies on Hebrew that describe the distribution of lexical categories in the spoken language.

A third aim of the study is to examine the distribution of words, both types and tokens, within the sub-groups of each lexical category. This analysis will allow us to assess whether there is a dominant sub-category in parental speech within each lexical class (e.g. a preference to use a certain type of nouns or verbs).

2. Methods

2.1. Participants

2.1.1. Experimental group

Participants were 30 Hebrew-speaking parents of children at the early stages of language development who were divided into three groups: (a) 10 children in the pre-lexical stage, who were in the intentional phase (age range: 8:5–18 months, average: 12 months) (GC1); (b) 10 children in the single-word stage, with at least 10 words, but before the combination stage (age range: 12–24 months, average: 19 months) (GC2); and (c) 10 children in the early grammar stage, who had combinations of words (age range: 23–33 months, average: 27 months) (GC3). All the children were in good health with typical development and normal hearing. Children with known impairments were excluded. The age range of the parents

was 25–39 (average 31.56 years). They were all native Hebrew-speakers with academic education and medium-high socioeconomic status. Background information about the participating children and parents was collected using a demographic questionnaire filled out by the parents, who also signed a form giving informed consent to participate in the study.

2.1.2. Control group

A control group of parents speaking to adults (ADS) was recruited. The parents in the ADS group were not the same individuals who participated in the CDS interactions. This was intended to ensure that the distribution of the lexical categories reflected in the ADS corpus represents the use of lexical categories by Hebrew-speaking parents generally, and is not a preference of the specific parents who participated in the study.

The ADS corpus included 18 Hebrew-speaking parents of children at the same three stages of language development as in the CDS corpus (a) 6 children in the pre-lexical stage (age range: 8–12 months, average: 9:5 months) (GA1), (b) 6 children in the single-word stage (age range: 18–20 months, average: 19 months) (GA2), and (c) 6 children in the early grammar stage (age range: 20–27 months, average: 23 months) (GA3). The age range of the parents was 24–39 (average 32.66 years). All the children in the control group were in good health with typical development and normal hearing. Children with known impairments were excluded. The parents were all native Hebrew-speakers with academic education and medium-high socioeconomic status. As to the experimental group, the parents of the control group filled out a demographic questionnaire including background information about their child and themselves, and gave informed consent to participate in the study.

2.2. Procedure

CDS corpus: Speech samples were collected from 30 parent–child dyads during activities at home. Each session lasted about 45 minutes and included four different contexts: meal time, bathing, spontaneous play with toys, and dressing or diapering (age-dependent). The four sessions were videotaped.

ADS corpus: The ADS corpus was collected from 18 parent–experimenter interactions. As mentioned in the introduction, there are various methods used for collecting ADS data. Since we aimed to discover whether the noun- or verb-bias that characterizes Hebrew CDS is similar to that in the ADS corpus, ADS characteristics were examined through speech samples that relate to mother–child dyads. In other words, the ADS corpus was more associated with children than with adults in general (Fernald, 1989; Liu, Tsa & Kuhl, 2009). Thus, to enable comparison between the CDS and the ADS corpus in terms of topics of conversation, each parent watched a video taken from the CDS corpus that included a mother–child dyad during meal-time, bathing, and eating. Then, a twenty-minute parent–experimenter (adult to adult) conversation was conducted. The parents were asked about the video and about their own children's daily routine. A similar method is reported in Liu, Tsa, and Kuhl's (2009) study, using interviews in semi-structured situations: Initially, mother–child interactions were audio-recorded during spontaneous play and picture naming. Then, during ADS recordings, mothers talked with the experimenter about their child's interest in the same set of pre-selected toys and pictures while their own child was playing with an adult in the adjacent room (see also Kondaurova & Bergeson, 2011, for a similar method).

To achieve balance among all the interactions, both within the CDS and between CDS and ADS, 50 utterances from each different context were used for the present study. In other words, two hundred utterances from each sample (i.e. 30 CDS and 18 ADS) were transcribed and analyzed both quantitatively and qualitatively (see also Camaioni & Longobardi, 2001 for the same procedure).

Parental speech was coded according to four lexical categories: nouns, verbs, adjectives, and adverbs. Each category was classified into sub-groups: *Nouns* consisted of five sub-categories: (a) concrete (e.g. 'train'), (b) abstract (e.g. 'fun'), (c) personal name (e.g. 'daddy'), (d) animal sounds (e.g. 'meow'), and (e) onomatopoeic words (e.g. 'hop'). *Verbs* consisted of two sub-categories: (a) stative verbs, which describe a state or situation (i.e. thought or opinion, possession, sense, emotion) and (b) active verbs, which are used to indicate an action, process or sensation as opposed to state. *Adjectives* consisted of two sub-categories: (a) size (e.g. 'big'), and (b) color (e.g. 'red'). *Adverbs* consisted of three sub-categories: (a) time (e.g. 'yesterday'), (b) place (e.g. 'here'), and (c) manner (e.g. 'carefully').

The number of types (i.e. of different words) and tokens (i.e. number of occurrences of each word within the sample) of each lexical category and sub-category were calculated. Inter-rater reliability both of the transcription and the analysis was examined in 6 samples. The correlation as measured by Kappa was high: 0.95.

3. Results

The analysis presented here is based on results from 30 monolingual Hebrew-speaking parents talking to their infants (CDS) and 18 monolingual Hebrew-speaking parents talking to adults (ADS). The CDS corpus includes a total of 3257 types and 9574 tokens from 30 parent–child dyads, while the ADS corpus includes 3998 types and 7960 tokens from 18 parent–experimenter interactions. We first describe the general results of the use of the four lexical categories (nouns, verbs, adjectives, and adverbs) in CDS and ADS. Next we describe the distribution of the sub-categories within each lexical class. Although both the CDS and the ADS corpus consist of three age groups, comparison between the age groups and age effect are reported in another paper (Adi-Bensaid, Tubul-Lavy, & Ben-David, in preparation).

3.1. General results

Tables 1 and 2 present the means and standard deviation of the use of the four lexical categories (verbs, nouns, adverbs, and adjectives), by child's age in both CDS and ADS.

A repeated measures ANOVA revealed significant differences in all word classes (types and tokens) in the three age groups in CDS (GC1 types: $F(3,36) = 25.37$ $p < .0001$, tokens: $F(3,36) = 23.8$ $p < .0001$; GC2 types: $F(3,36) = 37.66$ $p < .0001$, tokens: $F(3,36) = 33.82$ $p < .0001$; GC3 types: $F(3,36) = 43.21$ $p < .0001$, tokens: $F(3,36) = 24.01$ $p < .0001$) and in ADS (GA1 types: $F(3,20) = 21.26$ $p < .0001$, tokens: $F(3,20) = 17.33$ $p < .0001$; GA2 types: $F(3,20) = 46.66$ $p < .0001$, tokens: $F(3,20) = 40.65$ $p < .0001$; GA3 types: $F(3,20) = 28.58$ $p < .0001$, tokens: $F(3,20) = 23.39$ $p < .0001$).

In CDS: A Bonferroni post hoc test revealed no significant difference between the use of verbs and nouns ($p > .05$), nor any significant difference between the use of adverbs and adjectives ($p > .05$). However, the differences between verbs and nouns compared to adverbs and adjectives were statistically significant ($p < .0001$). In other words: the use of verbs and nouns was the largest while the use of adverbs and adjectives was the smallest for both types and tokens in the three age groups (GC1, GC2, GC3).

In ADS: A small difference was found between types and tokens: A Bonferroni post hoc test revealed significant differences between verbs compared to all other categories ($p \leq .05$) and between adjectives and all other categories ($p < .01$). However, no significant difference was found between nouns and adverbs ($p > .05$). In other words, the use of verbs was more frequent than the use of all other categories, and the use of nouns and adverbs was more frequent than adjectives. These findings were reported for tokens in all three age groups (GA1, GA2, GA3) and for types in group GA1. The findings for types in GA2 and GA3 were similar except that no significant difference was found between verbs and nouns ($p < .05$), which were statistically more frequent than adverbs and adjectives ($p < .01$).

Table 1
Mean and SD of the use of the four lexical categories in CDS by child's age.

	Pre-verbal $N = 10$		Single word $N = 10$		Early grammar $N = 10$		Total $N = 30$	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
Verbs	46.2* (12.3)	163.1* (61.72)	36.1* (9.8)	116.3* (36.17)	45.8* (11.5)	143.9* (60.66)	42.7* (11.8)	141.1* (55.8)
Nouns	43.5* (14.4)	138.1* (57.17)	32.6* (10.8)	108* (45.77)	43.5* (10.5)	112.2* (34.2)	39.9* (12.7)	119.4* (47)
Adverbs	16.6 (6.62)	40.2 (16)	11.4 (3.63)	26.2 (9.18)	17.4 (5.54)	47.1 (21.6)	15.1 (5.9)	37.8 (18.1)
Adjectives	15.2 (6.34)	31.8 (14.74)	6.1 (3.41)	10.6 (6.33)	11.3 (4.11)	19.9 (11.34)	10.9 (5.9)	20.8 (14.06)

* $p < .0001$.

Table 2
Mean and SD of the use of the four lexical categories in ADS by child's age.

	Pre-verbal $N = 6$		Single word $N = 6$		Early grammar $N = 6$		Total $N = 18$	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
Verbs	84.83** (19.3)	180** (56.5)	87.83* (15.4)	215.67** (38)	83.17* (12.7)	182.2** (35.8)	85.2** (15.2)	192.6** (45)
Nouns	59* (16.4)	105.2* (38.56)	73* (11.24)	147.5* (36)	70.5* (15.8)	123* (34.5)	67.5* (15.1)	125.2* (38.6)
Adverbs	60* (15.1)	97* (32.12)	52.2 (10.6)	110.8* (31.13)	47.33 (15.1)	99.3* (43.8)	53.16* (14)	102.4* (34.5)
Adjectives	16.2 (7.1)	21.83 (8.8)	15.7 (5.2)	22.7 (10.6)	16.7 (8.8)	21.5 (11.8)	16.16 (6.7)	22 (9.8)

* $p \leq .01$.
** $p \leq .05$.

Table 3
Mean and SD of the five sub-lexical categories within the noun class in CDS by child's age.

	Pre-verbal $N = 10$		Single word $N = 10$		Early grammar $N = 10$		Total $N = 30$	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
Concrete	25** (10.9)	65.1** (30.8)	19** (8.1)	59.7** (39.03)	26.3** (8.9)	65.9** (32.8)	20** (1.64)	53.82** (5.33)
Abstract	8.4* (5.1)	19.4 (14.07)	4.7* (3.9)	9.5 (8.4)	7.9* (2.7)	15.8 (5.8)	6.7* (0.64)	13.95 (1.55)
Personal	4.7* (1.7)	33* (19.2)	3.5* (1.8)	23.2* (16.35)	7.9* (2.8)	26.7* (13.3)	4.6* (0.44)	23.42* (2.6)
Animal	1.2 (1.03)	2.9 (2.8)	1.7 (1.6)	4.9 (4.9)	0.2 (0.6)	0.5 (1.6)	0.85 (0.2)	2.3 (0.56)
Onomatopoeic	4.2 (1.9)	17.7 (14.1)	3.7 (2.0)	10.7 (6.9)	1.2 (1.1)	3.3 (3.5)	2.6 (0.32)	8.6 (1.6)

* $p < .05$.
** $p < .001$.

Table 4
Mean and SD of the five sub-lexical categories within the noun class in ADS by child's age.

	Pre-verbal $N=6$		Single word $N=6$		Early grammar $N=6$		Total $N=18$	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
Concrete	34.66** (6.0)	64** (22.9)	43.66** (5.5)	96.5** (19.7)	38.66** (5.9)	67.33** (17.06)	39** (1.57)	75.94** (5.67)
Abstract	21.33* (10.7)	29.66* (12.9)	24.5* (6.4)	36.16* (9.5)	28* (14.05)	44.66* (23.15)	24.6* (2.5)	36.83* (3.9)
Personal	3 (0.6)	11.5 (8.6)	4.5 (1.3)	14.3 (8.3)	3.66 (1.8)	10.8 (6.9)	3.72 (0.34)	12.22 (1.8)
Animal sounds	0 (0)	0 (0)	0.33 (0.8)	0.5 (1.2)	0.16 (0.4)	0.16 (0.4)	0.16 (0.12)	0.22 (0.17)
Onomatopoeic	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

* $p < .05$.
** $p < .01$.

3.2. Analysis within each lexical category

Next, the within word class distribution was examined. Tables 3 and 4 show the means and standard deviation of types and tokens for the five sub-categories of the *noun class* in CDS and ADS, respectively.

A repeated measures ANOVA revealed significant differences among the five sub-categories of the noun class (types and tokens) in the three age groups in both CDS (GC1 types: $F(4,45) = 29.3$ $p < .0001$, tokens: $F(4,45) = 16.02$ $p < .0001$; GC2 types: $F(4,45) = 27.13$ $p < .0001$, tokens: $F(4,45) = 14.02$ $p < .0001$; GC3 types: $F(4,45) = 56.77$ $p < .0001$, tokens: $F(4,45) = 26.86$ $p < .0001$) and in ADS (GA1 types: $F(4,25) = 47.43$ $p < .0001$, tokens: $F(4,25) = 28.28$ $p < .0001$; GA2 types: $F(4,25) = 146.68$ $p < .0001$, tokens: $F(4,25) = 88.25$ $p < .0001$; GA3 types: $F(4,25) = 41.21$ $p < .0001$, tokens: $F(4,25) = 31.01$ $p < .0001$).

In CDS: A Bonferroni post hoc test revealed that the use of *concrete noun* types was significantly higher than the use of all other sub-categories ($p < 0.001$). There was no significant difference between the use of *personal names* and *abstract words* ($p > 0.05$). However, the use of these two sub-categories was significantly higher than the use of *onomatopoeic* and *animal sounds* ($p < 0.05$). Moreover, there was no significant difference between *onomatopoeic words* and *animal sounds* ($p > 0.05$). Similar, though slightly different findings were found for tokens: A Bonferroni post hoc test revealed that *concrete noun* tokens were significantly more frequent than the other sub-categories ($p < 0.01$). However, in contrast to the findings for types, the second most frequent sub-category for tokens was *personal names* ($p < 0.05$), followed by *abstract nouns*. There was no significant difference between *abstract words, animal sounds* and *onomatopoeic words* ($p > 0.05$).

In ADS: The differences among the five sub-groups were similar in both types and tokens: a Bonferroni post hoc test revealed that *concrete nouns* were significantly higher than all other sub-categories ($p < 0.01$). Also, the use of *abstract nouns* was significantly higher than the use of *personal names*, *onomatopoeic words* and *animal sounds* ($p < 0.05$). However, there was no significant difference between *personal names*, *onomatopoeic words* and *animal sounds* ($p > 0.05$). In fact *onomatopoeic words* and *animal sounds* were hardly used by parents while talking to adults.

Regarding the sub-categories of *verbs*, Table 5 presents the means and standard deviation of types and tokens for the two sub-categories within the *verb class* in CDS and ADS in the three age groups.

A *t*-test with repeated measures revealed that active verbs were significantly higher than stative verbs in both types and tokens in all age groups in CDS (GC1 types: $t(9) = -11.87$ $p < 0.0001$, tokens: $t(9) = -6.23$ $p < 0.0001$; GC2 types: $t(9) = -11.11$ $p < 0.0001$, tokens: $t(9) = -6.97$ $p < 0.0001$; GC3 types: $t(9) = -8.57$ $p < 0.0001$, tokens: $t(9) = -5.32$ $p < 0.0001$), as well as in ADS (GA1 types: $t(5) = -7.57$ $p = 0.0003$, tokens: $t(5) = -7.4$ $p = 0.0003$; GA2 types: $t(5) = -11.07$ $p < 0.0001$, tokens: $t(5) = -8.28$ $p = 0.0002$; GA3 types: $t(5) = -32.25$ $p < 0.0001$, tokens: $t(5) = -9.77$ $p < 0.0001$).

Table 6 shows the means and standard deviation of types and tokens for the three sub-categories within the *adverb class* in CDS and ADS in the three age groups.

A repeated measure ANOVA revealed significant differences among the three sub-categories (types and tokens) in the three age groups in both CDS (GC1 types: $F(2,27) = 10.42$ $p < .0001$, tokens: $F(2,27) = 8.43$ $p = 0.01$; GC2 types: $F(2,27) = 7.7$ $p = 0.002$, tokens: $F(2,27) = 3.97$ $p = 0.03$; GC3 types: $F(2,27) = 10.71$ $p = 0.0003$, tokens: $F(2,27) = 5.45$ $p = 0.01$) and in ADS (GA1

Table 5
Mean and SD of types and tokens of the two lexical categories within the verb class both in CDS and ADS by child's age.

	Pre-verbal		Single word		Early grammar		Total	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
CDS								
Active	33.2* (8.8)	102.3* (44.03)	27.8* (7.3)	81.3* (30.42)	34.5* (10.2)	100.6* (47.9)	31.83* (9.07)	94.73* (41.17)
Stative	7.8 (2.8)	28 (12.6)	4.5 (2.2)	12.5 (6.5)	6.3 (2.4)	18 (7.2)	6.2 (2.8)	19.5 (11)
ADS								
Active	60.33* (15)	124.33* (38.06)	61.16* (10.26)	137.66* (22.6)	57.16* (5.7)	119* (20.6)	59.55* (2.47)	127* (6.5)
Stative	12.5 (2.8)	27.16 (3.8)	12.66 (3.2)	47.83 (18.8)	12 (4)	36.33 (17.8)	12.4 (0.75)	37.11 (4.1)

* $p \leq .0001$.

Table 6
Mean and SD of types and tokens of the three lexical categories within the adverb class in both CDS and ADS by child's age.

	Pre-verbal		Single word		Early grammar		Total	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
CDS								
Place	8.8** (4.5)	18.8** (8.5)	5.6** (2.8)	12.7** (7)	8.8** (3.5)	19.8** (9.1)	7.73** (3.8)	17.1** (8.6)
Time	3.9 (1.4)	12.5 (5.2)	2.5 (1.5)	6.6 (3.3)	4.1 (1.9)	16 (7.4)	3.5 (1.7)	11.7 (6.6)
Manner	3 (2.4)	6.2 (6.4)	2.8 (1.1)	6.4 (6)	3.3 (2.9)	8.1 (7.5)	3.03 (2.2)	6.9 (6.5)
ADS								
Place	21 (10.6)	29.33 (14.5)	11 (4.4)	20.1 (8.7)	12.3 (2.9)	23.5 (12)	14.77 (1.86)	24.33 (2.8)
Time	27.16* (8.6)	43.83* (16.5)	21* (6.1)	31.66* (9)	19.5* (8.9)	33* (22)	22.55* (1.95)	36.16* (3.65)
Manner	9 (2.9)	16.33 (3.6)	10 (3.2)	23.83 (8.1)	8.5 (2.94)	20.5 (7.1)	9.16 (0.68)	20.22 (1.63)

* $p < .05$.
** $p < .01$.

types: $F(2,15) = 7.88$ $p = 0.04$, tokens: $F(2,15) = 6.85$ $p < 0.05$; GA2 types: $F(2,15) = 9.85$ $p = 0.001$, tokens: $F(2,15) = 2.79$ $p < 0.05$; GA3 types: $F(2,15) = 5.72$ $p = 0.01$, tokens: $F(2,15) = 1.11$ $p < 0.05$).

However, a Bonferroni post hoc test revealed an interesting finding: while in CDS, *place* was used significantly more than *manner* and *time* in all age groups in both types and tokens ($p < 0.01$), in ADS, the sub-lexical category *time* was used significantly more than *place* and *manner* in all age groups in both types and tokens ($p < 0.05$). No significant differences were found between *manner* and *time* in CDS, and *place* and *manner* in ADS ($p > 0.05$).

The use of *adjectives* was less frequent than that of the other lexical categories. A t-test with repeated measures revealed no significant differences in the use of the sub-categories *color* and *size* in either types or tokens in CDS and ADS in all age groups ($p > 0.05$).

4. Discussion

The main purpose of the present study was to examine the correlation between the noun-bias phenomenon in acquisition and the use of content words in Hebrew CDS. A second aim of the study was to examine the distribution of words, both types and tokens, within the sub-groups of the lexical categories.

4.1. Content words in Hebrew CDS: general results

Since noun-bias is reported in Hebrew acquisition (Bornstein et al., 2004; Dromi, 1987; Maital et al., 2000), we expected to find more nouns in parents' CDS than all other lexical categories. However, this was not the case: In CDS, there was no significant difference between the use of nouns and verbs. The use of nouns and verbs was more frequent than the use of adverbs and adjectives. These findings were consistent for both types and tokens in the three age groups. In ADS, however, verbs were the main lexical category used by Hebrew-speaking parents to most age groups in both types and tokens. Only in groups GA2 and GA3 was there no significant difference in the use of types between verbs and nouns. Once again, the use of these two categories was highest in comparison to the use of adverbs and adjectives.

We assume that the high proportion of verbs is similar to that of nouns in Hebrew CDS and the fact that verbs are the main category of content words in Hebrew ADS stems from Hebrew syntax. Hebrew is a partially null-subject language. Thus, subject omission is permitted in some environments (Shlonsky, 2009). Berman (1980) examined Modern Hebrew as an instance of an (S)VO language, in that, like Russian (but unlike English or French), it has a wide range of sentence types lacking an overt grammatical subject. These include, for example, the semantically and structurally related classes of existential and possessive sentences (e.g. impersonal sentences with 3pl. verbs which may function in place of agentless passives – 'SHOTIM hamon mic ba arec'. Drink + PL lots of juice in the country. 'People/They drink lots of juice in Israel'). Thus, Hebrew, while basically an SVO language, makes wide use of verb initial constructions. Indeed, Tardif et al. (1997) explained that pro-drop languages may emphasize verbs more than non-pro-drop languages because fewer noun phrases and common nouns are required for communication. Overall, then, null-subject languages should have a higher proportion of verbs and have verbs appearing in sentence-initial positions more frequently than non-null subject languages. Thus, since Hebrew is a pro-drop language, it is not surprising to find a high proportion of verbs in CDS as well as in ADS.

Further, Ravid (2010) described the types of verbs in the CDS of a Hebrew-speaking mother to her child (age 1;6) and the early lexicon of verbs of that child. She found that more than half of the mother's verbs (tokens) have modality, i.e. verbs that do not relate to tense or aspect but express command, intention, warning, duty, permission, etc. These verbs may include: infinitive – 'to go', imperative – 'take'! and future – 'eat!' (=you will eat). These verb forms can appear without subjects or objects (i.e. without nouns), and consequently they are more likely to appear in salient sentence-initial position. Indeed, data from our study reveals similar findings: the parents' CDS included many utterances with verbs only, without nouns. In other words, the fact that Hebrew permits a pro-drop structure may explain the high proportion of verbs in comparison to the other lexical categories.

As mentioned, there is a strong positive correlation between CDS and child language development. Mandarin-speaking caregivers emphasized verbs over nouns when speaking to their children and the children used more verbs and action words in their early speech (Tardif et al., 1997). In contrast, English-speaking caregivers emphasized nouns over verbs and indeed, English-speaking children used more nouns in their early spontaneous speech. Unlike English and Mandarin, there is no positive correlation between CDS and child language development in Hebrew. In other words, although there is frequent use of verbs in Hebrew CDS and ADS, a noun-bias has been reported for the Hebrew child lexicon (Bornstein et al., 2004; Dromi, 1987; Maital et al., 2000). There are several possible explanations for this mismatch. The first suggests that there are other factors that influence the child's early productions and perhaps have more influence than CDS. Gentner (1982) explained the noun advantage in children's early productions by adopting the 'Natural Partition Hypothesis'. She suggested that nouns are more dominant in children's speech because object categories are conceptually and perceptually simpler than the relational concepts of verbs, prepositions, and adjectives. Nouns represent concrete objects and entities, they relate to here and now, and they are usually more tangible and higher in imagery, thus are acquired by children earlier than verbs. On the other hand, verb acquisition depends mainly on two capabilities: (i) a conceptual understanding of the events that the verbs describe and (ii) recognition of the way in which the particular language expresses these events. Kim, McGreogor, and Thompson (2000) report that Korean- and English-learning children acquired significantly more nouns than verbs at the 50-word mark and throughout the data collection period, even though the input available to these two groups of children was different: Korean-speaking caregivers tended to emphasize verbs whereas English-speaking caregivers tended to emphasize nouns in their talk to the children. The authors suggest that the child comes to the task of early word learning with some predisposition toward, or capacity for, noun-to-object mapping. This may also explain the difference between verb use in CDS compared to ADS in our study. While the use of verbs in ADS was significantly higher than the use of nouns, as well as of adverbs and adjectives, no significant difference was found between nouns and verbs in CDS. Thus, Hebrew-speaking parents show a preference for nouns when talking to their children (CDS) more than when talking to adults (ADS). In other words, although a verb-bias does exist in Hebrew ADS, Hebrew-speaking parents use more nouns when talking to their children than when talking to adults, a finding which may support Gentner's hypothesis.

The second explanation relates to the typological characteristics of the language, which may influence the morpho-syntactic information of certain parts of speech, and may affect the children's preference to acquire nouns before verbs or vice versa. For instance, since Hebrew is a partial null-subject language with SVO word order, it involves nouns appearing at the edges of the utterances. Based on language typology, the utterance final position was often occupied by nouns in the Hebrew samples. Since the end unit is typically lengthened and bounded by silence, it may be phonologically more salient than the preceding units, and thus easier to extract (Kim et al., 2000).

As for morphological information, similar to Italian, Hebrew has a rich morphology system. The result is that Hebrew children not only hear input rich in verbs, but this input also contains greater variability (different morphological inflections) of verbs relative to nouns, a fact that makes the process of verb acquisition more complex than that of nouns, which are less inflected. This may explain why Hebrew-speaking children produce more nouns than verbs at early stages.

The third possible explanation for the mismatch between the verb-bias in CDS and ADS and the noun-bias in children's early productions is methodological: our research method included spontaneous situations (meal time, bathing, spontaneous play with toys, and dressing or diapering). It is possible that these situations encouraged parents' use of verbs. Similar findings were reported by Tardif et al. (1999), who found an association between the method used to elicit productions from children and the frequency of use of nouns versus verbs. When looking at a picture book with their children, mothers speaking both English (which has more nouns in CDS) and Mandarin (which has more verbs in CDS) used more noun types than verb types; while when given toys to play with, the mothers in both cultures used more verb types than noun types (see also Gopnik, Choi, & Baumberger, 1996).

It seems that both the properties of the input language (e.g. the pro-drop parameter) and the interactional styles of the caregivers are important factors that may influence the high presence of verbs over any other category in Hebrew-speaking parents' ADS and similar to that of nouns in parents' CDS, even though a noun-bias does exist in Hebrew-speaking children's acquisition.

In comparison to verb and noun use, the relatively low frequency of adjectives and adverbs in parents' CDS and ADS is also reported by Sandhofer et al. (2000) for English and Mandarin. Since verbs were more dominant than nouns in Hebrew-speaking parents' ADS, it is not surprising to find significantly more adverbs than adjectives. The adverb complements the verb (e.g. 'come quickly!', 'sit quietly'), while the adjective complements the noun (e.g. 'a nice boy', 'a beautiful doll'). In addition, the adjective sub-groups, color and size, were not frequently used by the parents either to their children or to adults.

4.2. Lexical categories – Comparison within sub-groups

The second goal was to describe the parents' use of the sub-groups of each lexical category. *Noun class*: A comparison of the sub-categories revealed that concrete nouns were the largest group of nouns used by parents in ADS and CDS, in both types and tokens. The fact that the sub-category of concrete nouns is the largest group of nouns in CDS is not surprising and is consistent with the description of the composition of nouns in CDS in the literature (Berko-Gleason & Bernstein-Ratner, 2013; Owens, 2008). It is also the most dominant sub-category in ADS, a finding which was expected, considering how the

ADS data was collected (recall that the ADS corpus was collected during parent–experimenter conversations after viewing a video from the CDS corpus. This was designed to ensure that parallel topics arose in both CDS and ADS).

Onomatopoeic words and animal sounds were the least used sub-groups in both types and tokens. Parents of all age groups frequently used the words: 'peekaboo', 'am' (for food), 'bye-bye', as well as 'hav' (dog sound) and 'miao' (cat sound). In fact, these two sub-groups were found only in CDS. This is not surprising since animal sounds and onomatopoeic words are frequently used by parents when talking to their children at the early stages of language acquisition but not when talking to adults.

Differences between CDS and ADS in types and tokens were found in abstract nouns and personal names: while there was no a significant difference between the number of types of personal names and abstract words in CDS, in tokens, the number of personal names was significantly higher than of abstract words. In ADS, the number of abstract nouns was significantly higher than personal names in both types and tokens. We assume that the differences between types and tokens for these two sub-categories lies in the fact that parents do not often use abstract nouns while talking to their children (compared to when talking with adults). However, they used personal names (e.g. mommy, daddy, the child's name) relatively more frequently during interactions, which may explain the high use of tokens of this sub-group compared to abstract nouns.

Verb class: Active verbs are significantly more frequent than stative verbs in both CDS and ADS. Active verbs frequently used by most of the parents include: 'to come', 'we're finished', 'to put', 'to say', while the most frequent stative verbs were 'want' and 'look'. The fact that active verbs are used more frequently than stative verbs in CDS and that action verbs are the largest sub-category within active verbs is well known from other studies (Berko-Gleason & Bernstein-Ratner, 2013; Owens, 2008). Nelson (1973) and Gopnik and Meltzoff (1993) claimed that children are interested in dynamic changes, motion and causality, concepts that are usually conveyed by verbs, action verbs in particular. Messer (1978) examined the interaction between mothers and their infants in a joint play situation involving toys and objects. The mothers' speech relating to a toy coincided with the manipulation of that toy, and reference was associated with actions which were likely to involve joint attention to a toy. The mothers used action verbs to attract the children's attention and increase their interest in the object.

Adverb class: The largest sub-group used by parents in ADS was 'time' (some common words used by parents were 'now', 'usually', 'today') while 'place' was the largest sub-group in CDS (the most common word used by all parents was 'here'). The sub-group 'place' represents concrete things (e.g. 'going to kindergarten', 'let's play outside') while the sub-group 'time' represents an abstract concept (e.g. 'we will go tomorrow', 'grandpa came to visit yesterday'). We therefore assume that the use of place is more common in parents' speech to their children than the use of time.

In the *adjective class*: The use of words of color and size was very rare. Once again, we see that parents tend to use fewer classes that are less concrete for young children. Tare, Shatz and Gilbertson (2008) found evidence that maternal input of color, number and time words is available to children at ages that correspond to the stage when children show evidence of understanding these lexical categories.

To summarize, in this study we aimed to examine whether there is a positive correlation between the noun-bias phenomenon in acquisition and CDS in Hebrew and to compare the results with ADS. In CDS, there was no significant difference between the use of nouns and verbs. In fact, the use of nouns and verbs was most frequent, while the use of adverbs and adjectives was least frequent. These findings were consistent for both types and tokens in the three age groups. In ADS, however, verbs were the main lexical category used by Hebrew-speaking parents to most of the age groups in both types and tokens. In other words, although noun-bias is reported in Hebrew children's acquisition, Hebrew-speaking parents use more verbs when talking to their children, as to adults. Being a partial pro-drop language may explain the fact that Hebrew emphasizes verbs both in CDS and ADS. In fact, at early stages of language acquisition, children are exposed to verbs to a large extent. Since verbs connect the arguments of the utterances, they are an essential component of the sentence (Golinkoff & Hirsh-Pasek, 2008). Thus, we assume that such a major use of verbs gives the child important linguistic information and affects early vocabulary learning. However, since the morphology of verbs in general is richer than that of nouns, and in Hebrew in particular (compared to English, for example), a noun-bias pattern still exists in Hebrew-speaking children's lexicon. Moreover, nouns are more dominant in children's speech because object categories are conceptually and perceptually simpler than the relational concepts of verbs, prepositions, and adjectives (Gertner, 1982). These factors simplify the acquisition task and consequently favor the acquisition of nouns earlier and more easily than verbs in Hebrew-speaking children. It should also be noted that while the use of verbs is dominant in ADS, the use of nouns and verbs is similar in CDS, indicating the adjustments parents make to their children's linguistic needs in early acquisition.

Since the aim of this study was to examine the use of content words in Hebrew CDS and ADS, we concentrated only on parental speech and compared the findings to those related to acquisition reported in other studies in Hebrew-speaking children (Bornstein et al., 2004; Dromi, 1987; Maital et al., 2000). In future research it will be interesting to examine the correlation in the use of content words between CDS and the speech of the children whose mothers participated in the study.

Also, it will be interesting to examine the use of content words by parents to children with a-typical development. Such studies may include analyzing the speech of hearing parents to their hearing-impaired infants, parents to children with Autistic Spectrum Disorder, parents to language-delayed children, etc. In recent years, intervention programs have been family-centered, thus they assign a central role to parents in the intervention process. The finding of the current study and future studies on children with a-typical language development may contribute to improving parental guidance and help in directing parental input according to their children's linguistic abilities.

References

Adi-Bensaid, L., Tubul-Lavy, G., & Ben-David, A. (2015). *Content words in Hebrew child-directed speech at different stages of language development*. (in press).
Albin, D. D., & Echols, C. H. (1996). Stressed and word-final syllables in infant-directed speech. *Infant Behavior and Development: 19.*, (4), 401–418.
Bell, A., Brenier, J. M., Gregory, M., Girand, C., & Jurafsy, D. (2009). Predictability effects on durations of content and function words in conversational English. *Journal of Memory and Language: 60.*, 92–111.
Berko-Gleason, J. B., & Bernstein-Ratner, N. (2013). *The development of language* (8th ed.). Boston: Pearson.
Berman, R. A. (1980). Child language as evidence for grammatical description: Preschoolers' construal of transitivity in the verb system of Hebrew. *Linguistics: 18.*, (7–8), 677–701.
Berman, R. A. (2001). New perspectives in lexical categorization. In *Paper presented at the conference on lexical and morphological processing in spoken and written language* Bar Ilan University.
Bornstein, M. H., Cote, L. R., Maital, S., Painter, K., Park, S. Y., Pascual, L., et al. (2004). Cross-linguistic analysis of vocabulary in young children: Spanish, Dutch, French, Hebrew, Italian, Korean, and American English. *Child Development: 75.*, 1115–1139.
Camaioni, L., & Longobardi, E. (2001). Noun versus verb emphasis in Italian mother-to-child speech. *Journal of Child Language: 28.*, (03), 773–785.
Caselli, M. C., Bates, E., Casadio, P., Fenson, J., Fenson, L., Sanderl, L., et al. (1995). A cross-linguistic study of early lexical development. *Cognitive Development: 10.*, (2), 159–200.
Choi, S., & Gopnik, A. (1995). Early acquisition of verbs in Korean: A cross-linguistic study. *Journal of Child Language: 22.*, (03), 497–529.
Cooper, R. P., Abraham, J., Berman, S., & Staska, M. (1997). The development of infants' preference for motherese. *Infant Behavior and Development: 20.*, (4), 477–488.
Cutler, A., & Carter, D. M. (1987). The predominance of strong initial syllables in the English vocabulary. *Computer Speech and Language: 2.*, 133–142.
Dromi, E. (1987). *Early lexical development*. London: Cambridge University Press.
Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., & Pethick, S. J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development: 59.*, (5 (Serial No. 242)), 1–185.
Ferguson, C. A. (1964). Baby talk in six languages. *American Anthropologist: 66.*, (6 (Part 2)), 103–114.
Fernald, A. (1989). Intonation and communicative intent in mothers' speech to infants: Is the melody the message? *Child Development: 60.*, (6), 1497–1510.
Fernald, A., & Kuhl, P. K. (1987). Acoustic determinants of infant preference for motherese speech. *Infant Behavior and Development: 10.*, 279–280.
Fernald, A., & Mazzie, C. (1991). Prosody and focus in speech to infants and adults. *Developmental Psychology: 27.*, 209–221.
Fernald, A., & Simon, T. (1984). Expanded intonation contours in mothers' speech to newborns. *Developmental Psychology: 20.*, 104–113.
Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. A. Kuczay (Series Ed.) &, *Language development (language, thought and culture) : Vol. 2.* (Vol. 2) (pp. 301–334). Hillsdale, NJ: Erlbaum.
Gleitman, L. R., & Wanner, E. (1982). Language acquisition: The state of the state of the art. In E. Wanner, & L. R. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 3–48). Cambridge: Cambridge University Press.
Golinkoff, R. M., & Hirsh-Pasek, K. (2008). How toddlers begin to learn verbs. *Trends in Cognitive Sciences: 12.*, (10), 397–403.
Goodman, J. C., Dale, S. P., & Li, P. (2008). Does frequency count? Parental input and the acquisition of vocabulary. *Journal of Child Language: 35.*, (3), 515–531.
Gopnik, A., & Choi, S. (1990). Do linguistic differences lead to cognitive differences? A cross-linguistic study of semantic and cognitive development. *First Language: 10.*, (30), 199–215.
Gopnik, A., Choi, S., & Baumberger, T. (1996). Cross-linguistic differences in early semantic and cognitive development. *Cognitive Development: 11.*, (2), 197–225.
Gopnik, A., & Meltzoff, A. N. (1993). Imitation, cultural learning and the origins of "theory of mind". *Behavioral and Brain Sciences: 16.*, (03), 521–523.
Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Paul H. Brookes Publishing.
Hoff-Ginsberg, E. (1991). Mother-child conversation in different social classes and communicative settings. *Child Development: 62.*, (4), 782–796.
Kelly, M. H., & Bock, J. K. (1988). Stress in time. *Journal of Experimental Psychology: Human Perception & Performance: 14.*, 389–403.
Kim, M., McGregor, K. K., & Thompson, C. K. (2000). Early lexical development in English- and Korean-speaking children: Language-general and language-specific patterns. *Journal of Child Language: 27.*, (2), 225–254.
Kondaurova, M. V., & Bergeson, T. R. (2011). The effects of age and infant hearing status on maternal use of prosodic cues for clause boundaries in speech. *Journal of Speech Language and Hearing research: 54.*, 740–754.
Liu, H. M., Tsa, F. M., & Kuhl, P. K. (2009). Age-related changes in acoustic modifications of Mandarin maternal speech to preverbal infants and five-year-old children: A longitudinal study. *Journal of Child Language: 36.*, 909–922.
Maital, S. L., Dromi, E., Sagi, A., & Bornstein, M. H. (2000). The Hebrew Communicative Development Inventory: Language specific properties and cross-linguistic generalizations. *Journal of Child Language: 27.*, 43–67.
Messer, D. J. (1978). The integration of mothers' referential speech with joint play. *Child Development: 49.*, (3), 781–787.
Morgan, J. L., Shi, R., & Allopenna, P. (1996). Perceptual bases of rudimentary grammatical categories: Toward a broader conceptualization of bootstrapping. In J. L. Morgan, & K. Demuth (Eds.), *Signal to syntax: Bootstrapping from speech to grammar in early acquisition* (pp. 263–283). Mahwah, NJ: Erlbaum.
Nazzi, T., Dilley, L. C., Jusczyk, A. M., Shattuck-Hufnagel, S., & Jusczyk, P. W. (2005). English-learning infants' segmentation of verbs from fluent speech. *Language and Speech: 48.*, 279–298.
Nelson, K. (1973). Structure and strategy in learning to talk. *Monographs of the Society for Research in Child Development: 38.*, (1–2 (Serial No. 149)), 1–135. http://dx.doi.org/10.2307/1165788
Owens, R. E. (2008). *Language development: An introduction* (7th ed.). Boston: Pearson.
Phillips, J. R. (1973). Syntax and vocabulary of mothers' speech to young children: Age and sex comparisons. *Child Development: 44.*, 182–185.
Ravid, D. (2010). The appearance of the verb category in Hebrew-speaking infants: A new psycholinguistic perspective. *Literacy and Language: 3.* (in Hebrew).
Sandhofer, C. M., Smith, L. B., & Luo, J. (2000). Counting nouns and verbs in the input: Differential frequencies, different kinds of learning? *Journal of Child Language: 27.*, (03), 561–585.
Schwartz, R. G., & Terrell, B. Y. (1983). The role of input frequency in lexical acquisition. *Journal of Child Language: 10.*, (01), 57–64.
Segal, O., Nir-Sagiv, B., Kishon-Rabin, L., & Ravid, D. (2008). Prosodic patterns in Hebrew child-directed speech. *Journal of Child Language: 36.*, 629–656.
Sherrod, K. B., Friedman, S., Crawley, S., Drake, D., & Devieux, J. (1977). Maternal language to prelinguistic infants: Syntactic aspects. *Child Development: 48.*, (4), 1662–1665.
Shi, R. (1996). Perceptual correlates of content words and function words in early language input (Ph.D. dissertation, Brown University, 1995). In *Dissertation Abstracts International, 56, 3108A*.
Shi, R. (2005). Early syntactic categories in infants' language. In H. Cohen, & C. Lefebvre (Eds.), *Handbook of categorization in cognitive science* (pp. 481–495). New York: Elsevier.
Shi, R., Morgan, J. L., & Allopenna, P. (1998). Phonological and acoustic bases for earliest grammatical category assignment: A cross-linguistic perspective. *Journal of Child Language: 25.*, (01), 169–201.
Shi, R., Werker, J. F., & Morgan, J. L. (1999). Newborn infants' sensitivity to perceptual cues to lexical and grammatical words. *Cognition: 72.*, (2). B11-B21.
Shlonsky, U. (2009). Hebrew as a partial null-subject language. *Studia Linguistica: 63.*, (1), 133–157.
Snow, C. E. (1972). Mothers' speech to children learning language. *Child Development: 43.*, (2), 549–565. http://dx.doi.org/10.2307/1127555
Tardif, T. (1996). Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabulary. *Developmental Psychology: 32.*, (3), 492–504.

Tardif, T., Gelman, S. A., & Xu, F. (1999). Putting the "noun bias" in context: A comparison of English and Mandarin. *Child Development: 70.*, (3), 620–635.
Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns versus verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language: 24.*, (3), 535–565.
Tare, M., Shatz, M., & Gilbertson, L. (2008). Maternal uses of non-object terms in child-directed speech: Color, number and time. *First language: 28.*, (1), 87–100.
van de Weijer, J. (2002). *How much does an infant hear in a day? Paper presented at the GALA 2001 Conference on Language Acquisition, Lisboa.*
Waxman, S. R., & Lidz, J. (2006). Early word learning. In D. Kuhn, & R. Siegler (Series Eds.) &, *Handbook of child psychology : Vol. 2.* (Vol. 2) (6th ed., Vol. 2, pp. 299–335). Hoboken, NJ: Wiley.
Weizman, Z. O., & Snow, C. E. (2001). Lexical output as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology: 37.*, (2), 265–279.