Light Verbs and the Flexible Use of Words as Noun and Verb in Early Language Learning.

David Barner, Department of Communication Sciences and Disorders, McGill University, Montréal

Submitted September, 2001

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements of the degree of Master of Science.

Acknowledgements

I would like to thank Professors Yuriko Oshima-Takane and Martha Crago for their supervision and extensive comments on drafts of this manuscript. I would also like to thank Mayada Elsabbagh, Mai-Gee Hum, Joanne Hager, Erin Beetham, and Anouk Ernst for their assistance in coding of data, Yuhko Kayama and Alyssa Ono for their assistance in reliability coding, and A. M. Sonia Guerriero, Chung Yin Lee and Wing Yan Chan for their help in updating transcripts to CHAT format required for the calculation of MLU. Thank you also to Professor Fred Genesse, who provided valuable feedback on later versions of this thesis.

Special thanks to my friend and colleague Alan Bale for his intellectual and moral support, and to my wife, Julie Burelle, for her limitless endurance of my student lifestyle.

Finally, I would like to acknowledge the financial support I received from the Government of Québec, in the form of an FCAR fellowship, which was essential to my successfully completing this thesis.

Contribution of Authors

The two manuscripts contained in this thesis were co-authored with Dr. Yuriko Oshima-Takane. Dr. Oshima-Takane acted as co-supervisor with Dr. Martha Crago during the creation of the manuscripts, providing assistance in the choice of methodologies, statistical analysis of data, and editing of manuscripts. I provided the primary source of theoretical and empirical arguments for each manuscript, and determined which aspects of data were most suitable for testing the proposed hypotheses. I also played a primary role in establishing coding schemes for light verbs and complex predicates, performing the coding of data, and calculating mean length of utterance (MLU) for subjects. Finally, I drafted both manuscripts in their entirety. Paper 1 was co-authored with Anouk Ernst, who contributed extensively to data coding under my supervision. Paper 2 was co-authored with Mai-Gee Hum and Erin Beetham, who each worked as undergraduate thesis students under the co-supervision of Dr. Oshima-Takane and myself. Both students contributed greatly to the coding of data and to the evolution of coding methods used in this study.

Two previous studies carried out with Dr. Oshima-Takane overlapped in minor ways with the studies presented below. First, Oshima-Takane, Barner, Elsabbagh, and Guerriero (1999; in press) each analyzed data for three of the children that are studied in this thesis: Sarah and Eve (Brown, 1973), and Naomi (Sachs, 1983). Second, both studies examined aspects of how children acquire deverbal nouns, which constitute a subset of the words studied in this thesis. However, these two points do not impact upon the originality of the present thesis, nor its importance as a unique contribution to knowledge. In both papers presented below, data for six additional children were considered in

combination with those for Sarah, Eve, and Naomi. Also, analyses extended well beyond data for deverbal nouns, and considered all words that could be used flexibly as noun and verb without phonological change. Finally, the actual methods of analysis used in this thesis differed importantly from those used by Oshima-Takane, Barner, Elsabbagh, & Guerriero (1999; 2001), and involved detailed statistical analyses of how target words were used in various noun-verb proportions, how words were used in complex predicate constructions, how nouns as a class were used to denote various semantic categories, and how children produced light verbs in early acquisition.

Abstract

The present thesis investigated two questions: (1) is there a correspondence between lexico-semantic categories like *object* and syntactic categories like *noun* in acquisition, and (2) can the late emergence of action nouns be explained by their use in longer, "complex predicate" constructions (CP), such as *Have a hug*?

Paper 1 examined the use of words that can appear as noun or verb, in the speech of nine English-speaking children (aged 1;3 - 2;6) and their caregivers. Children showed a strong polarization in their productions, using a majority of object words consistently as nouns and non-object words consistently as verbs. However, children also showed some flexibility, and used fewer non-object words as nouns than object words as verbs.

Paper 2 investigated words used by caregivers in CPs to those that were not in the speech of nine English-speaking children (aged 1;3 to 4;6). On average, words used in CPs by caregivers emerged later in child speech that non-CP words. Also, at early stages children had not mastered the use of verbs required for CPs. It was concluded that words used in CPs (i.e. action nouns), may emerge late due to their use in these expressions, and not due to a problem understanding the semantics of action words.

Résumé

Deux questions sont examinées dans cette thèse: (1) y a-t-il une correspondance entre les catégories lexico-sémantiques comme celle d'«objet physique» et les catégories syntaxiques comme celle des «noms» dans les premières phases de l'acquisition du langage, et (2) est-il possible d'expliquer une apparition tardive des noms exprimant des actions par leur usage dans des prédicats complexes (PC), plus longs, tels que «Have a hug»? Les deux articles constituant la présente thèse sont le fruit de ces questionnements.

L' article 1 porte sur la production de mots peuvant être utilisés comme des noms ou comme des verbes, chez des enfants anglophones (âgés de 15 à 30 mois) et leurs gardiens. Les résultats de nos recherches indiquent que les enfants font preuve d'une grande polarisation dans leur production de mots. De façon constante et cohérente, ils utilisent comme des noms la majorité des mots désignant des objets et emploient comme des verbes la majorité des mots dénotant des actions. Cela dit, les enfants ont aussi fait montre d'une certaine flexibilité, utilisant cependant avec beaucoup plus de difficulté comme des noms des mots dénotant des actions que comme des verbes des mots désignant des objets.

L'article 2 porte sur l'usage de certains mots employés dans des PC par les gardiens mais absents du langage de leurs neuf enfants anglophones (agés de 15 mois à 4 ans et demi). Le fait que les gardiens utilisent ou non certains mots dans des PC affecte-t-il l'usage que font les enfants de ces mots? Il semble qu'en moyenne, les mots-cibles employés par les gardiens dans des PC émergent plus tard dans le discours des enfants que ceux qui ne le sont pas. Nous avons également remarqué que dans les premières phases de l'acquisition du langage, les enfants étudiés n'avaient pas maîtrisé l'usage des

verbes requis pour la production de PC. Nous en avons conclu que les mots utilisés dans des PC (i.e. des noms exprimant des actions) pourraient apparaître plus tard dans le discours des enfants parce qu'ils sont employés dans ces expressions, et non parce que les enfants éprouvent des difficultés à comprendre la signification de ces noms.

Table of Contents

Chapter 1: General Introduction

The present thesis examined with the acquisition of nouns and verbs by children learning English, and how both lexical semantics and the use of words in particular syntactic constructions affect their order of acquisition. More specifically, the thesis investigated the acquisition of words that can be used as either nouns or verbs in English without phonological change (e.g., *hug, push*), and whether existing proposals concerning syntax-to-semantics mappings can account for children's early production of these words. As an alternative to some previous accounts, the thesis examined whether the late emergence of certain words, such as action nouns, might be due in part to their common use in longer syntactic constructions, rendering them less accessible to production for children. The Introduction provides a context for this investigation, and is organized as follows: the first section reviews important literature on the nature of syntax-semantics correspondences in language acquisition, with discussions of how syntax acquisition might require strong interaction with semantics, and of how factors related to lexical semantics might result in a noun bias in child vocabulary. The section concludes with a brief review of studies on words that are used as both noun and verb, and then discusses the possibility that action nouns may emerge late in child speech due to their common use in complex predicate constructions by caregivers (see Oshima-Takane, Barner, Elsabbagh & Guerriero, 2001). The second section provides an overview of the studies described in this thesis, and of how they address the role of complex predicate constructions in the acquisition of action nouns.

1. Syntax-semantics correspondences in early language acquisition

Over the past 40 years, a large body of literature has emerged concerning the interaction of syntax and semantics in acquisition. The present section concerns itself primarily with the question of how vocabulary acquisition might be facilitated by mappings between syntactic and semantic representations. In the acquisition literature this question has be broken apart into several sub-questions, of which the following two will be addressed here: (1) to what extent do children appeal to semantic representations in fixing grammatical features such as +/-noun and +/-verb, and (2) do words marked with lexico-semantic features such as *+/-physical object* emerge early in child language compared to words with features deemed more abstract (e.g., *name*, *colour*)? Below, each of these questions is reviewed briefly, with an interest in how they might shed light on the acquisition of words used flexibly as noun and verb, in particular when such flexibility results in lexical items that violate correspondences between syntax and semantics proposed in recent literature.

1.1 Bootstrapping nouns and verbs

Common to theories of how children acquire language is the assumption that the child's interaction with primary linguistic data takes place at a highly abstract level, involving the parsing of input into such entities as nouns, verbs, adjectives, etc. A problematic consequence of this assumption is that the child must be ascribed the ability to identify patterns in the speech stream as corresponding to the proposed abstract units (Fodor, 1966). Thus, for example, the child acquiring English must discover that the phonological unit /si/ corresponds to a particular lexical root that is marked[1] as +verb,

[1] "Marking" in this context refers to the specification of lexical roots for features such as +/-Noun.

while /kæt/ corresponds to a different root that is marked as +noun. However, since such features are not given universal phonological expression across languages, the child is faced with the problem of using other qualities of language to uncover which words are nouns and which are verbs. For the researcher studying acquisition, the problem is to determine which information the child in fact uses to acquire grammatical markings.

To resolve this problem, several researchers have proposed that the child makes use of *semantic bootstrapping* (Pinker, 1984), whereby extra-linguistic information is used to bootstrap into grammar. According to Macnamara (1972, 1982), children exploit knowledge of worldly objects and events to decode the reference of expressions in adult language. The resulting semantic representations are comprised, in part, of *object* words, *action* words, and *attribute* words that form the cores of the categories noun, verb, and adjective, respectively. With time, these initial semantic categories are transformed on the basis of distributional analysis, allowing items that behave like object words yet do not refer to objects (e.g., *romance*) to join what has become the noun category. In this way, "[t]he child climbs to grammar on a semantic ladder and then kicks the ladder away" (Macnamara, 1982, p. 134). Proposals by Schlesinger (1971) and Braine (1992) are similar to Macnamara's, differing mildly in their descriptions of the initial semantic representations and processes of distributional analysis, or *assimilation*.

In a somewhat similar vein, Grimshaw (1981) and Pinker (1984) proposed that the child uses semantic flags like *object, action* and *attribute* to assign words to the innate categories *noun*, *verb*, *adjective*, etc. Using this initial classification of words, the child is then able to infer syntactic rules particular to the grammar being acquired, which can

subsequently be used to classify additional words without further appeal to semantics (e.g., permitting the classification of verbs that do not refer to actions).

In the present study, Paper 1 investigated evidence relevant to semantic bootstrapping through an analysis of words that can be used as either noun or verb. Such words provide an interesting window through which the relationship between semantic and syntactic categories can be assessed. For example, evidence that children use action-denoting words such as *kick* and *push* exclusively as verbs, while using object-denoting words like *hammer* and *shovel* only as nouns could be taken to support semantic bootstrapping. Likewise, evidence that children use action and object words flexibly as noun and verb, or action words as nouns and object words as verbs, would fail to provide support for the hypothesis. To date, no study has provided a comprehensive analysis of how children use such words in the early months of acquisition.

1.2 The noun bias in early acquisition

A generous body of literature has also discussed how category-specific semantics might facilitate the acquisition of members from one grammatical class over another. For example, Gentner (1982) found that across a variety of languages, children's early vocabulary is constituted by a disproportionate number of nouns relative to verbs (see also Goldin-Meadow, Seligman, & Gelman, 1976; Bates, Dale, & Thal, 1995). To account for this, she suggested that the referents of nouns (e.g., physical objects) might be more easily discerned than those of verbs (e.g., actions). In response to this suggestion, a number of objections have been raised (see Gentner & Boroditsky, 2001, for a review). Studies of children acquiring languages such as Mandarin, Korean, Japanese, Hungarian and Italian have suggested that language-specific factors such as word order, presence or

absence of pro-drop, and morphological variability may delay the production of nouns relative to verbs in these languages (Choi & Gopnik, 1995; Gopnik & Choi, 1995; Nabors-Olah, 2001; Tardif, 1996; Yamashita, 1999). However, an equally important number of studies has provided conflicting evidence with regard to these same languages, suggesting that despite the numerous language-specific factors favoring verb acquisition, children still show a noun bias (Au, Dapretto & Song, 1994; Tardif, Gelman, & Xu, 1999; Tardif, Shatz, & Naigles, 1997).

Other objections have questioned whether proper names should be included in counts of nouns versus verbs (e.g., Bloom, Tinker, & Margulis, 1993; Nelson, Hampson & Shaw, 1993), whether children might use object nouns to stand for abstract concepts, and if the child noun bias might not reflect a parallel bias in adult speech (see Gentner & Boroditsky, 2001). However, it is rarely questioned whether the first 50 to 100 instances of words can be definitively classified as either noun or verb. As argued in several recent studies (Barner & Bale, 2001; Harley & Noyer, 1999; Marantz, 1997), the status of the lexical distinction between nouns and verbs is not clear for even adults, especially given facts concerning nominalization (i.e. the conversion of verb roots to nouns). Instead, words may become members of one class or another only upon projection to syntax. Short of evidence that children use the words in somewhat advanced morphological and syntactic contexts, no clear indication of how they represent early words as noun or verb is available. However, it is precisely the absence of such words (e.g., verbs, determiners, and corresponding constructions) that constitutes the main evidence for the noun bias.

Meaningful evidence concerning the noun bias may only be accessible at later stages of acquisition, when rich morpho-syntactic evidence becomes available. If

differences persist at later stages, they can be subjected to more fine-grained analyses based on abstract qualities of child speech, to determine whether cognitive factors are indeed the best explanation for patterns of use. Under this assumption, Paper 1 examined children's production of words that are used as both noun and verb, to determine whether children produced object words more readily than action words, and if correspondences existed between the categories *noun* and *verb*, and *object* and *action*, respectively.

1.3 Existing evidence concerning the flexible use of words as noun and verb

A handful of studies have provided preliminary evidence concerning the acquisition of words that can be used as either noun or verb. For the purposes of the present thesis, the primary interest in examining these words is to determine whether lexical semantic features such as *+physical object* align themselves with morphological features like +noun in early acquisition. More specifically, do children have difficulty expressing object words as verbs (e.g., *to shovel*), or action words as nouns (e.g., *give a hug*)?

In his analysis of one of Brown's (1973) corpora, Sarah, Macnamara (1982) determined that Sarah's parents used words such as *comb*, *soap* and *slide* flexibly as noun and verb, with no sign of increase or decrease in flexibility over time. In addition, Macnamara claimed that, whereas parental speech included at least 25 different words used as both noun and verb (including various action nouns), there was no case of similar flexibility in Sarah's speech until the age of 2 1/2 years old, at which time her flexibility remained limited. Macnamara's evidence suggested that children are exposed to flexible use of words from early in acquisition, but that they nonetheless do not mirror this behaviour. Instead, children use words to denote either objects or actions, but not both.

In an investigation of the acquisition of nouns and verbs, Nelson, Hampson and Shaw (1993) provided evidence that supported Macnamara's conclusion about input, but questioned his conclusions about children's use of nouns and verbs. Using the Early Language Inventory (Bates, Bretherton, Shore, & Snyder, 1984), Nelson et al. found that by 1;8 years of age, 14 of the 45 children studied used action-denoting nouns, while 12 used nouns referring to non-actional events. For 12 children aged 1;1 to 1;8, it was found that seven of 95 non-object words studied could be used as either noun or verb, and that all of these were used as nouns by some children and five (*bite, drink, help, kiss,* and *walk*) were used by six or more children as nouns. It was concluded that little evidence existed for mapping between semantics and syntax, and that other factors such as pragmatics and distributional analysis might play more central roles.

Finally, a study by Oshima-Takane et al. (2001) analyzed the use of deverbal nouns in the spontaneous speech of three English-speaking children and their caregivers. According to their study, one child used words like *cut* and *swing* flexibly as noun and verb to refer to both actions and physical things, from the earliest stages of acquisition. Also interesting was the finding that some object words emerged first as verbs (all three children used *drink* and *ride* exclusively as verbs in Brown's Stage I), suggesting that simple mappings from semantics to syntax might not exist (e.g., *object* $\rightarrow$ *noun*). Perhaps most interesting was the finding that the children used object words flexibly as noun and verb earlier than non-object words. This was intriguing since non-object nouns were available in the input for all three children, in some cases equalling or out-numbering the number of object word tokens. Thus, the results indicated that association with a physical

object not only predicts early use of target words as a noun but also predicts their early flexible use as noun and verb.

Oshima-Takane et al. (2001) offered two interpretations for these results. Based on the observation that artifact kind objects (e.g., hammers) are associated with characteristic functions (e.g., hammering), Oshima-Takane et al. proposed that knowledge of this relation accelerates the flexible acquisition of artifact nouns and their corresponding verbs. Specifically, if the child acquires an artifact kind term, its phonological form is copied to the root that denotes the object's function. Likewise, if the function is acquired first, its phonological form is copied to the relevant artifact kind root.

Oshima-Takane et al. (2001) also proposed that the emergence of non-object words might be delayed by their use in complex predicate (CP) constructions by caregivers. In certain CP constructions (see 1a), an action-denoting noun, such as *hug*, combines with a light verb like *give* to form a predicate (see Cattell, 1984), whose semantics often correspond to an equivalent verb expression (1b):

(1) a. Give the dog a hug!

b. Hug the dog!

As shown in (1), CP constructions are typically two or more morphemes longer than their counterpart verb constructions. Consequently, children might be delayed in using action nouns due to a problem with producing CPs, the constructions in which the words ordinarily appear. In support of this, Oshima-Takane et al. (2001) provided evidence that while the caregivers used non-object deverbal nouns more than half the time in CP constructions, and some such words exclusively in CPs, object words appeared in CPs not even half as often. Meanwhile, the children did not use CP

constructions until later stages of development, at which point mean length of utterance (MLU; see Brown, 1973) values were higher. Thus, the frequent use of non-object words in CP constructions might account for their late emergence in child speech relative to object words, rather than as a result of their referential qualities.

Several questions remain to be answered. For example, since Oshima-Takane et al. (2001) examined only deverbal nouns and their verb counterparts, a large number of non-object words that are not commonly used in CPs were not considered. Evidence that these words (e.g., *name, colour*) are used from early stages of acquisition would lend support to the CP delay hypothesis, while a failure to find a difference between them and words such as those studied by Oshima-Takane et al. would suggest that use in CPs does not play an important role in delaying one word class compared to another.

Under the CP delay hypothesis, it is predicted that children will not use CP constructions at early stages of acquisition (Brown's Early Stage I and Late Stage I), despite their presence in caregiver speech. Consequently, it is predicted that words used canonically in these constructions will also not appear until later stages (i.e. Brown's Stage II). For example, it is predicted that action-denoting words, such as *bite,* will be used exclusively as verbs in early stages of acquisition and only later on as nouns, when production of CP constructions becomes possible. Other words that do not denote physical objects and yet are not used in CP constructions (e.g., *colour, name*) should emerge as both noun and verb from the earliest stages of acquisition. Support for these predictions will be taken as evidence that action-denoting words emerge late in part as a result of production limitations and not due to their referential qualities.

2. Overview of the studies

Paper 1 investigated the use of words that can be used flexibly as noun and verb, including not only deverbal nouns and their corresponding verbs (*a hug / to hug*), but also denominal verbs and their respective noun counterparts (*to saddle / a saddle*). Based on transcriptions of spontaneous speech recordings of 9 children aged approximately 1;2 to 2;6 years, the children's use of noun and verb forms of target words was compared to use by their caregivers. Results indicated that the children used fewer words flexibly as noun and verb relative to the caregivers, and that they showed a stronger tendency to use object words as nouns and actions words as verbs. However, the children used more object words as verbs than non-object words as nouns. Also, a preliminary examination of non-object nouns suggested that the children were more likely to produce nouns not used in CP constructions.

To assess the role of CPs in the late emergence of non-object nouns in child speech, Study 2 compared words used in CPs by the caregivers to words that were not. CP and non-CP words were examined at early and late stages in the speech of 9 children aged approximately 1;2 to 4;5 years, to assess whether a difference existed in their frequency over time. Also, the acquisition of semantically "light" verbs (e.g., *give, take*) was examined, and it was determined at what point the children began producing the verbs with nominal complements. Results indicated that words used in CPs underwent a significantly greater increase in frequency over time compared to words not used in CPs. Words used 80% or more of the time in CPs by the caregivers were almost never used by the children early on, and became more frequent later on, when the children produced longer constructions. It was also found that light verbs were seldom used with content-

bearing nominal complements until later in acquisition. Thus, the results from Study 2 suggest that words used commonly in CP constructions by the caregivers were used by the children only later in acquisition, when they began using light verbs with content-bearing nominal complements. It was concluded that production limitations delaying the use of CPs play a central role in delaying the use of action-denoting words as nouns.

Chapter 2: Paper 1

Lexical Semantics and the Acquisition of Zero-Derivation Noun-Verb Pairs.

David Barner, Yuriko Oshima-Takane and Anouk Ernst

McGill University

Abstract

Correspondences between syntactic and semantic categories (e.g., *object* → *noun*; *action* → *verb*) have been posited in various studies of language acquisition (Grimshaw, 1981; Macnamara, 1982; Pinker, 1984; also see Gentner, 1982). Few studies (Nelson, Hampson, & Shaw, 1993; Oshima-Takane, Barner, Elsabbagh, & Guerriero, 2001) have examined words that do not conform to proposed correspondences. The present study examined the use of words that can appear as either noun or verb, in the spontaneous speech of nine English-speaking children (aged 1;3 - 2;6) and their caregivers. Results indicated that the children used a majority of object words consistently as nouns, and a majority of non-object words consistently as verbs. This polarization was greater for the children than for the caregivers. However, the children did use some object and non-object words flexibly, although the flexible use of non-object words was much less common, owing to their infrequent use of non-object nouns. It is suggested that non-object nouns may emerge late in the acquisition of English due to the syntactic constructions in which they are used, and not their referential properties.

Introduction

Investigators of language and its acquisition have long debated to what extent categories in syntactic and semantic domains correspond. Since Chomsky's early remarks on the autonomy of syntax (Chomsky, 1957), the notion that syntax is independent from semantics has been investigated on many fronts, including early proposals in generative semantics (e.g., Dowty, 1979), and more recently in cognitive grammar (Langacker, 1987, 1991), construction grammar (Goldberg, 1995, 1998), and distributed morphology (Halle & Marantz, 1993; Marantz, 1997). Psycholinguists have examined how children might exploit semantics to acquire syntax (Braine, 1992; Gordon, 1985; Grimshaw, 1981; Macnamara, 1972, 1982; Pinker, 1984; Schlesinger, 1971), and in turn how syntax might encode cues pertaining to the meanings of words (Bloom, 1994; Gleitman & Gleitman, 1997; Landau & Gleitman, 1985; Naigles, 1996; Soja, 1992; Waxman & Hall, 1993). Also, the semantics of word classes has been investigated as a possible source of the noun bias in English (Gentner, 1982). In most cases, attention has been given either to studying possible correspondences between lexical categories and semantic categories (e.g., *noun* → *object*), or to how use in specific verb frames might indicate semantic features of lexical items. The present paper is concerned with the relationship between syntax and semantics at the level of lexical categories like noun and verb.

Over the course of linguistic and psycholinguistic debates, some relatively uncontroversial facts have emerged. Most evident is that the old grammar school axiom, "A noun is a person, place or thing", does not hold up to any serious degree of scrutiny. In fact, it is a genuine challenge to find a semantic content that can be expressed using an adjective or verb, but not by a noun. As noted by Maratsos (1982), words denoting

emotions can be found as verbs (e.g., *like, hate, enjoy*), adjectives (e.g., *fond, sad, glad*), or as nouns (e.g., *joy, hatred, fondness*). More interesting, however, are cases where morphological roots are realised in more than one syntactic category. For example, many roots in English can appear in either noun or verb positions, which is explained by some as resulting from the conversion of morphological roots from one category to another, generating deverbal nouns from verbal roots, and denominal verbs from noun roots (see Chomsky, 1970; Kiparsky, 1997; Lieber, 1980; Marchand, 1969). Examples of deverbal nouns are abundant, and include *destruction* and *growth*, while denominal verbs include such words as *shelve* and *saddle* (see Clark & Clark, 1979, for an extensive list). In the case of deverbal nouns, meanings are often indistinguishable from those of verb counterparts, since both forms denote the same action or event (e.g., *to hug / a hug*).

Such flexibility provides somewhat strong evidence that, at least for adults, simple correspondences between syntax and semantics may not exist. In fact, evidence from nominalization has led some researchers to conclude that the distinction between grammatical categories is perhaps not meaningful at the lexical level, and that roots may be unspecified with regard to grammatical category (Barner & Bale, 2001; Harley & Noyer, 1999; Marantz, 1997). Rather than being stored as such in the lexicon, roots may become nouns and verbs in the syntax, and thus be creatively generated on line.

However, despite such flexibility, reasons remain to think that the child acquiring language might nonetheless make use of syntax-semantics mappings. First, although the grammar school teacher may have been wrong about what defines a noun, it does seem to be the case that concepts for people, places, and things are universally encoded by nouns (grammar school just got things backwards). *London, the hammer*, and *the girl next door*

are each noun phrases, whose contents seem elusive to other syntactic expressions. For instance, although the verb phrase *to hammer* can be used to describe striking a hammer to nail, it cannot name the instrument of hammering itself. Likewise, although *shovel, fork,* and *table* can all appear as either noun or verb, only noun forms can be used to refer to physical objects. Thus, it is possible that children could begin acquisition by marking all words used to refer to physical objects as nouns. A second reason to think that children might use syntax-semantics mappings would be evidence that their vocabularies show correlations between lexical and semantic categories. Children, unlike adults, might be constrained to link actions to verbs and attributes to adjectives, etc. (Grimshaw, 1981; Macnamara, 1982; Pinker, 1984).

To examine this possibility, a number of studies have examined words that can appear as either noun or verb (Macnamara, 1982; Nelson, Hampson, & Shaw, 1993; Oshima-Takane, Barner, Elsabbagh, & Guerriero, 2001). In English, processes of generating denominal verbs and deverbal nouns occur without a phonological change, resulting in a large number of homophonous noun-verb pairs with related meanings. Such words are sometimes called *zero-derivation* or *conversion* words (Allen, 1979; Lieber, 1980; Marchand, 1969; Myers, 1984). Some common examples from adult speech include *comment, discipline, experiment, balance, attempt, concern, dispute, attack,* and *disguise*.

Macnamara (1982) examined noun-verb pairs in the speech of Brown's (1973) Sarah, and found that, although maternal speech exhibited flexible use of some words to denote both physical objects and actions, Sarah's speech did not. Instead, Macnamara's analysis of Sarah's first 10 recording sessions indicated that she used object words as nouns and action words as verbs. Macnamara concluded that children follow a rule that individual

words encode at most one semantic category (e.g., object or action), and that children use these mappings to bootstrap into syntax (i.e. object word → noun; action word → verb).

Nelson et al. (1993) questioned this discontinuity between child and adult syntax-semantics mappings, in their study of children learning English. In their study, Nelson et al. found that mothers of 12 children aged 1;1 to 1;8 used many nouns that did not refer to physical objects (e.g., *help, kiss*), a good proportion of which were used as both noun and verb. Each word used flexibly by mothers was also produced by at least one child. Five action words (*bite, drink, help, kiss,* and *walk*) were used as nouns by half of the children at least once. In addition, in an analysis of 45 children aged 1;8, Nelson et al. found that roughly a third of children used action nouns, while many used nouns referring to non-actional events. Thus, their study failed to find evidence that children exhibit a correlation between actions and verbs.

Similarly, Oshima-Takane et al. (2001) analysed the use of deverbal nouns and their verb counterparts in the spontaneous speech of three English-speaking children and their caregivers. According to the study, the children were delayed in their use of action nouns, despite their frequent use in caregiver speech. Oshima-Takane et al. also found evidence that some object words (e.g., *ride, drink*) were used exclusively as verbs by all three children during early stages. Also, the children used object words (e.g., *swing*) flexibly as noun and verb earlier than non-object words (e.g., *kick*), despite the flexible use of both kinds of words by the caregivers. Thus, the study found support for neither Macnamara's (1982) proposed syntax-semantics mappings, nor for Nelson et al.' (1993) contention that action words pose no problem to children.

Left uncertain by the study was whether denominal verbs and their nominal counterparts (e.g., *hammer, plug, colour, paint*) showed the same pattern of production as deverbal nouns and their counterpart verbs (since they only examined the latter). Also, since their study examined the speech of only three children, conclusions were based on a relatively small sample of words, including only 4 object word types.

The present study examined the full spectrum of homophonous noun-verb pairs in the spontaneous speech of 9 children and their caregivers. Also, an additional analysis determined the proportion of noun types used by the children and caregivers to denote objects, as compared to substances and all other concepts (e.g., events, emotions, etc.). For each analysis, results were interpreted with an interest in how caregiver speech differed from child speech in the relation of semantics to lexical and syntactic categories.

Noun-verb pairs in early acquisition

To examine whether children are constrained in their mapping of lexical contents such as *object* and *action* to grammatical categories like *noun* and *verb*, we investigated the use of noun-verb pairs that denoted objects (e.g., *hammer*), and non-objects (e.g., *hug*), in the speech of young children and their caregivers. Of interest were the following questions: (1) do young children produce words flexibly as noun and verb, (2) is this ability different for words denoting objects, as opposed to those do not, and (3) do children differ from adults in their use of noun-verb pairs?

Evidence that children use object words like *hammer* as nouns only, and action words like *hug* only as verbs would support to the hypothesis that the semantic categories object and action constitute the cores of the grammatical categories noun and verb, respectively.

Method

Participants

A total of 643 transcripts for 9 children were obtained from CHILDES (Child Language Data Exchange System; MacWhinney, 2000). They included transcripts of Anne, Aran, Becky, Dominic, Nicole, and Ruth (Theakston, Lieven, Pine, & Rowland, 1999), Eve and Sarah (Brown, 1973), and Naomi (Sachs, 1983). The transcripts were assigned to Brown's (1973) stages based on mean length of utterance (MLU). Those classified as Early and Late Stage I were selected for analysis. For these stages, ages ranged from 1;2.29 to 2;5.26. See Appendix A for a breakdown of ages, MLU values, etc.

Materials & Coding

Words with homophonous noun and verb forms (e.g., *bite, name*) that were used at least once as both noun and verb in the database were selected for study, and are presented in Appendix B.

Using CLAN (MacWhinney, 2000), all caregiver and child utterances containing target words were coded to indicate (1) whether or not the word was used to refer to a physical object, (2) whether it was used as noun, verb, or undecided, (3) whether it was used repetitively or non-repetitively (i.e. back-to-back), and (4) whether children's uses of words were spontaneous, imitative, or prompted by a caregiver (Oshima-Takane, Barner, Bellamy, Butt, Boudewijnse, & Weinlick, 1999).

Target words were classified as noun or verb on the basis of syntactic context and use with bound morphemes (e.g., determiners, verbal inflections, etc.). One-morpheme utterances were coded as undecided, except when clearly used as part of a speech act (e.g., Look!). A random sample of 10% of each child's transcripts (a total of 65 files) was

coded independently by a research assistant to test reliability. Agreement between the original and reliability codes averaged 91.1%, with a range of 85.8% – 96.3%.

Analysis

Analyses were performed on all words used during Early and Late Stage I. For each child, target words were assigned to one of three semantic classes: OB (words whose noun forms were used to refer to discrete physical objects), SB (words whose noun forms were used to refer to substances), and OT (whose noun forms were used to refer to actions, events, abstract entities, etc). Classification was based on how words were used by the particular child and his or her caregivers.

For each word, frequency of use as noun and verb was determined for individual children and their caregivers using the CLAN program (MacWhinney, 2000). Noun and verb frequencies were then used to determine a noun-verb proportion for each word (nouns / nouns + verbs). Within each semantic class (e.g., OB), words were again classified according to their noun-verb proportion, for each child and caregivers. In total, three proportion classes were created for each semantic class: 0-14% (consistent as verb), 15-84% (flexible), and 85-100% (consistent as noun). To assure that proportion values provided a valid reflection of how the children used words, only words with a frequency of 5 tokens or more through Brown's Early Stage V were considered for analysis.

Using this scheme, two main analyses were performed. First, the percentage of words within each semantic class used at each noun-verb proportion was determined. For example, the number of OB words used consistently as a noun (85-100%) was found for all children and caregivers. This allowed a general comparison of caregiver and child use of noun-verb pairs. In the second analysis, words used as both noun and verb by the

caregivers (5-95% noun proportion[2]) were found in child speech and assigned to one of the three noun-verb proportion classes. This allowed a closer investigation of how the children responded to the presence of both noun and verb tokens of a given lexical item.

Results

Table 2 presents the proportion with which the target words types were used consistently as verbs, flexibly, or consistently as nouns, according to their classification as OB, SB, or OT. Results are given for both the children and the caregivers.

Table 2

Mean proportion of OB, SB, and OT types used by caregivers and children as noun and verb

		Caregivers			Children		
		V[1]	F[2]	N[3]	V	F	N
OB	*Mean*	0.13	0.35	0.52	0.17	0.11	0.73
	SD	0.09	0.16	0.11	0.23	0.16	0.27
OT	*Mean*	0.69	0.17	0.14	0.80	0.07	0.13
	SD	0.13	0.11	0.04	0.11	0.03	0.10
SB	*Mean*	0.10	0.19	0.71	0.15	0.04	0.82
	SD	0.20	0.26	0.29	0.23	0.11	0.21

[1] Proportion of words used consistently as verbs.

[2] Proportion of words used flexibly as noun and verb.

[3] Proportion of words used consistently as nouns.

[2] Note that this differs from the criterion for flexibility, where words must be used with a noun-verb proportion of15-85%.

Three results are of interest. First, the children used a significant majority of OB words consistently as nouns (73% on average), $t(8) = 2.730$, $p < .05$ (all t-tests reported here are two-tailed). This proportion of OB words was significantly greater than that of caregivers, who used 52%, paired $t(8) = 2.322$, $p < .05$. Second, the children used a significant majority of OT words consistently as verbs (80%), $t(8) = 7.470$, $p < .05$, also more polarized than caregivers, who used significantly fewer OT words as verbs (69%) than children, paired $t(8) = 2.536$, $p < .05$. Third, these differences were partly due to the caregivers' more flexible use of both OB and OT words relative to the children. While the caregivers used an average of 35% of target OB words flexibly, the children used a significantly lower percentage of target OB words flexibly (11%) than the caregivers, paired $t(8) = 3.799$, $p < .05$. Likewise, the caregivers used a mean percentage of 17% of OT words flexibly, significantly greater than the children's mean percentage of 7%, paired $t(8) = -2.450$, $p < .05$.

Despite the children's strong tendency to use OB words consistently as nouns and OT words consistently as verbs, a number of exceptions were found. For example, the following OT words were used consistently as nouns by the children (where the number of children to use the word is indicated in parentheses, when exceeding one): *bang, colour, dream, end, jump, knock, mess* (2), *name* (3), *rain* (2), *smack, smoke, sneeze* (2), *stop, top* (7), and *wave*. Interestingly, two of these words (*jump* and *mess*) were used when they appeared in caregiver speech combined with a light verb, such as *give, have,* or *take* to form a composite or "complex" predicate, such as *John took a jump* (see Cattell, 1984).

Also, the children used several OT words flexibly: *bite, colour, crash, cuddle, cut, fall, rain, rock, walk, wash,* and *wee* (2). Interestingly, these words were used more often by the caregivers in complex predicate constructions (six words) than were words used consistently as nouns (three words), indicating that use of nouns in such constructions might lead children to opt for verb uses instead (see Oshima-Takane et al., 2001).

To summarize, the children used most OB words as nouns and most OT words as verbs, and were more polarized in their use than caregivers in each case. Also, the children used a number of OT words flexibly but others consistently as nouns. A review of these words suggested that additional factors, such as use in longer, complex predicate constructions by the caregivers, might contribute to the difference between the caregivers and children.

Words used flexibly in caregiver speech

Table 3 provides a summary of the children's use of word types that appeared as both noun and verb in caregiver speech. Data are organized according to semantic category (OB, OT, SB), and by the proportion of words in each class that were used consistently as nouns, as verbs, or flexibly as both.

Table 3

Mean proportions of word types appearing consistently as noun, verb, or flexibly as both, for words used as both noun and verb in caregiver speech

		V[1]	F[2]	N[3]	n[4]
OB	*Mean*	.16	.20	.64	3.3
	SD	.22	.29	.39	2.5
OT	*Mean*	.74	.15	.13	7.0
	SD	.22	.10	.18	4.7
SB	*Mean*	.50	.10	.40	0.8
	SD	.50	.22	.55	0.8

[1] Proportion of words used consistently as verbs.

[2] Proportion of words used flexibly as noun and verb.

[3] Proportion of words used consistently as nouns.

[4] Number of word types.

Several results stand out. First, the children used a significant majority of OT words consistently as verbs (74% of the time on average), $t(7) = 2.890$, $p < .05$[3]. However, the use of OB words consistently as nouns did not represent a significant majority of OB word use, $t(8) = 1.823$, $p > .05$. Thus, when used as both noun and verb by the caregivers, OT words were more polarized in the speech of the children than OB words.

Table 4 shows frequencies for words used flexibly (15-85%) by both the children and the caregivers. Of 22 words, 11 were OB, including *dress, drink* (2), *shop* (3), *step, crayon, cover, slide* and *swing*. Ten were OT words, including *bang, bite, crash, cuddle,*

[3] Reported degrees of freedom reflect the number of children having data for the given variable. Thus, when df = 7, only eight children had data available.

cut, *rain*, *walk*, *wash*, *wee* (2), and one was an SB (*poo*). Thus, by Brown's stage I, the children used OB and OT words flexibly when given a flexible model.

Table 4

Words used flexibly by both caregivers and children (noun-verb)

	Caregivers	Child		Caregivers	Child
Aran			Ruth		
Drink	20/4[1]	8/1	*Wee*	43/4	1/4
Bang	11/19	17/7	Sarah		
Bite	1/4	1/3	*Cut*	2/5	3/1
Becky			*Rain*	2/16	1/5
Shop	12/6	1/2	*Slide*	5/3	1/2
Step	5/1	4/1	*Swing*	9/1	12/3
Crayon	40/9	9/4	Anne		
Dominic			*Cover*	15/9	7/7
Crash	2/24	1/4	*Drink*	17/3	2/5
Nicole			*Shop*	29/10	2/6
Dress	22/26	6/1	*Cuddle*	4/8	3/4
Shop	31/8	2/1	*Wee*	13/3	4/3
Poo	1/4	1/1			
Walk	8/16	1/1			
Wash	7/21	1/1			

[1] Values in the numerator indicate frequency of noun use; values in the denominator indicate frequency of verb use.

To summarize, an analysis of words that can be used as either noun or verb revealed several main results. First, the children used a significant majority of OB words consistently as nouns and OT words consistently as verbs. In each case, the children's use of OB and OT words was more polarized than that of the caregivers, meaning that they used fewer OB words consistently as verbs and OT words consistently as nouns, and that they showed less flexibility than the caregivers overall. One factor that may have contributed to this difference was the use of some OT words in longer, complex predicate constructions by the caregivers, which may have delayed their production by the children.

When only words used as both noun and verb by the caregivers were considered, it was found that the children again used a significant majority of OT words consistently as verbs, but that OB words were used in a less polarized fashion.

Nouns in the speech of children and caregivers

To establish whether the low frequency of OT nouns in child speech was specific to words that could also be used as verbs, an analysis of noun use in general was performed for 6 of the 9 children (and caregivers), for whom detailed morphological data were available (Anne, Aran, Becky, Dominic, Nicole, and Ruth). All common noun types used by the children and caregivers during Stage I were assigned to one of three categories: object nouns (OB), substance nouns (SB), and all other common nouns (OT). Examples from each category are as follows:

OB Nouns: *axe, bag, bed, carton, dog, elephant, giant, kettle, lamp, mask, napkin*, etc.

SB Nouns: *ash, butter, cream, dough, glue, jam, oil, paint, vinegar, water, yoghurt*, etc.

OT Nouns: *burn, chance, dance, fall, harm, idea, joke, laugh, name, shame, throw*, etc.

For each category, the number of types used by the children and caregivers was calculated, for Early and Late Stage I. In addition, the number of tokens corresponding to

these types was also calculated. For the caregivers and children, the proportion of nouns used in each semantic category was determined. For example, to calculate the proportion of OB noun types used, the frequency of such types was divided by the total number of noun types used by the child overall (i.e. OB / OB + SB + OT). This allowed a comparison of how frequently the children used OB nouns versus others, and of how their noun use differed from that of the caregivers.

Table 6 provides a breakdown of how the children and caregivers used OB, SB and OT noun types.

Table 6

Mean proportions of OB, OT, and SB noun types in caregiver and child speech

	Caregivers			Child		
	OB	OT	SB	OB	OT	SB
Mean	.55	.40	.05	.67	.27	.06
SD	.03	.04	.08	.02	.03	.01

The children used an average of 244.3 (SD = 66.1) noun types during Early and Late Stage I, while caregivers used 601.7 (SD = 190.6) noun types on average. A significant majority of nouns used by children were OB nouns, $t(5) = 18.525$, $p < .05$, as was also the case for the caregivers, $t(5) = 5.267$, $p < .05$. Also, the children used significantly more OB nouns than the caregivers (67% compared to 55%), paired $t(5) = -6.636$, $p < .05$. Corresponding to this difference, it was found that the caregivers used significantly more OT noun types, using 40% of nouns in this way, compared to 27% by the children, paired $t(5) = 6.388$, $p < .05$.

Similar results emerged in the analysis of tokens. Table 7 presents data concerning the use of OB, OT and SB tokens by the children and caregivers.

Table 7

Mean proportions of OB, OT and SB noun tokens in caregiver and child speech

	Caregivers			Child		
	OB	OT	SB	OB	OT	SB
Mean	.64	.31	.05	.76	.17	.07
SD	.04	.04	.01	.05	.04	.04

The children used an average of 1536 (SD = 471) noun tokens during Early and Late Stage I, while caregivers used 4425 (SD = 1892) noun tokens on average. Similar to what was found for types, a majority of nouns used by both the children and caregivers were OB nouns. Specifically, OB words made up 76% of child noun tokens, which represented a significant majority of noun use, $t(5) = 11.109$, $p < .05$. Likewise, OB words comprised a mean of 64% of caregiver noun tokens, representing a significant majority of their noun use, $t(5) = 8.953$, $p < 0.05$.

The children exhibited a stronger bias than adults, using a smaller proportion of OT tokens, paired $t(5) = 5.489$, $p < .05$, and a greater proportion of OB tokens, paired $t(5) = -5.585$, $p < .05$, compared to the caregivers. Thus, for the use of both types and tokens, the children used a significantly greater proportion of OB nouns, relative to both their own use of other nouns and to the use of OB nouns in the speech of the caregivers.

The analysis of tokens also revealed an interesting difference between the children and caregivers with respect to the mean number of words used as nouns versus verbs. Whereas for the type analysis both the caregivers and children averaged more

nouns than verbs (601.7 versus 482 and 244.3 versus 125 respectively), the token analysis showed that the caregivers but not the children used more tokens as verbs than as nouns. Whereas the caregivers used 4425 noun tokens on average and 7525 verb tokens, the children showed an opposite pattern using nearly twice as many noun tokens (1536) as verb tokens (833) on average.

Overall, results concerning the use of ordinary nouns indicated that the children used a majority of nouns to denote objects, and that this tendency was stronger than in the speech of the caregivers. Also interesting was that only the children used more nouns than verbs in terms of both types and tokens, providing evidence of a noun bias through Brown's Late Stage I.

Discussion

The present study performed two main sets of analyses concerning syntax-semantics correspondences in early stages of acquisition. Both sets of analyses revealed a strong correspondence between the syntactic category noun and words denoting physical objects, for both caregiver and child speech. For instance, results indicated that both the caregivers and children used a significant majority of OT words consistently as verbs, and a significant majority of OB words consistently as nouns. The study also indicated that these tendencies were considerably stronger for the children (i.e. the children used a greater proportion of types consistently as either noun or verb). The analysis of noun types in general showed similar differences between the caregivers and children, this time concerning the proportion of noun types used to denote objects relative to substances and other concepts. Again, child speech showed a much closer correspondence between the

syntactic category noun and the semantic category object than caregiver speech, though a strong correspondence was also found in caregiver speech.

Each of these results seems to indicate a semantic bias on the part of the children, relating the word categories OB and OT to the syntactic categories noun and verb respectively. Despite linguistic intuitions that nouns can be used to denote virtually any semantic category of natural language and that semantic categories span across lexical categories more often than not, data from spontaneous speech productions indicate that the children may be somewhat more constrained in their mappings from semantics to syntax. At a somewhat crude level of analysis, data seem to concur with the previous observations of Macnamara (1982), who suggested that for children, a strong correspondence exists between the syntactic categories noun and verb and the semantic categories object and action, respectively.

However, several pieces of evidence indicate that things are not so simple. Many exceptions existed, where it was found that the children used both OB and OT words flexibly as noun and verb. Also, for both ordinary nouns and words that could be used flexibly, the children used a reasonably large number of types with a pattern opposite to that predicted by a grammar based on mappings such as *object* → *noun* and *action* → *verb*. For example, the analysis of noun types indicated that around 30% of nouns used by the children did not denote physical objects. The analysis of words that can be used flexibly found that the children used 13% of OB words consistently as verbs, and 15% of OT words consistently as nouns. Thus, results provided additional support to Nelson et al.'s (1993) observation that young children do produce many non-object nouns early in

acquisition. Equally important, data also indicated that the children used a good number of object words as verbs from early on.

Analyses also revealed interesting differences between OB and OT words. When words were used as both nouns and verbs by the caregivers, the children tended to show greater flexibility with OB than with OT words. Correspondingly, a greater proportion of OT words were used consistently as verbs, compared to the use of OB words consistently as nouns. Thus, the children used conspicuously few OT words as nouns. Further analyses revealed that a small number of OT words that were used as nouns by children appeared in longer, complex predicate constructions in caregiver speech. Interestingly, OT words used flexibly by children were those that appeared most often in complex predicate constructions in the input, indicating that caregivers' use of the words in the longer constructions may have resulted in children using their verb forms more frequently.

Such results are largely consistent with those reported by Oshima-Takane et al. (2001), who also found a difference between the noun-verb flexibility of words for objects versus those for actions and events only. While the children were presented with models of flexibility for each category of word, only object words were produced flexibly at early stages of acquisition. In their study, Oshima-Takane et al. (2001), suggested that the difference between adult and child productions could stem from lexical mapping rules involving artifact kind words.

Specifically, Oshima-Takane et al. (2001), suggested that, by associating physical objects with specific functions (e.g., hammers and hammering), children may build knowledge structures that later form the basis for lexical items. For example, a lexical

entry for a word like *hammer* might consist not only in a semantic specification of the object (e.g., detailing its physical constitution), but might also specify aspects of its mode of creation and function, as is proposed in such Aristotelian-inspired models as Moravcsik (1975, 1998), Prasada (1999), and Pustejovsky (1995). By learning such information before the onset of speech production, the child might then be equipped to quickly map sound to meaning, and generalize the root sound across categories to both noun and verb meanings (in the absence of an existing, precluding synonym). Accordingly, words for artifact kind objects might quickly attain flexibility due to the link between the objects and their intended functions.

Oshima-Takane et al. (2001) also suggest that use of certain action-denoting nouns in longer, complex predicate constructions by caregivers may delay their emergence in child language. Specifically, they suggest that since action nouns are used frequently in complex predicate constructions, and that such constructions are typically two or more morphemes longer than corresponding verb uses, children may prefer verb over noun uses until later stages of acquisition, when mean length of utterance (MLU) plays a less significant role. As discussed by Cattell (1984), action-denoting nouns like *kiss* can be used in conjunction with a light verb such as *give, have,* and *take* to form a complex predicate, as in (5) – (6):

(5) a. John kissed his Mom. (5 morphemes)

b. John gave his Mom a kiss. (7 morphemes)

(6) a. Clara walked the dog. (5 morphemes)

b. Clara took the dog for a walk. (8 morphemes)

Although the difference of 2 morphemes between (a) and (b) examples may be insignificant to adult speakers of English, children who average 2-3 morphemes per utterance may show a strong preference for the shorter (a) examples. Thus, nominal forms of action-denoting words may emerge later in child language due to this constraint imposed by MLU, and may not result directly from a semantic or cognitive constraint. Providing preliminary support for this, the present study revealed that OT words used as nouns by children were more likely to also be used as verbs when appearing in complex predicates in caregiver speech. This result could be taken to indicate that children prefer verb forms to noun forms, when the latter are used by caregivers in longer complex predicate constructions.

Following studies by Choi and Gopnik (1995), Gopnik and Choi (1995), Tardif (1996), and Tardif, Shatz, and Naigles (1997), this suggests that language-specific properties of caregiver speech may play an important role in determining the order with which children begin to produce members of syntactic categories like noun and verb. While in English caregivers' use of complex predicates may delay the emergence of deverbal nouns in child language, factors such as canonical word order, noun ellipsis, and morphological variation may differentially affect the emergence of such words in other languages such as Japanese, Korean, Chinese, and Hungarian (see also Bloom, Tinker, & Margulis, 1993; Choi, 2000; Nabors-Olah, 2001; Tardif, Gelman, & Xu, 1999; Yamashita, 1999; see Gentner & Boroditsky, 2001, for discussion).

In conclusion, the present study provided evidence that early child language shows a crude correspondence between the syntactic categories noun and verb and the semantic categories OB and OT. However, exceptions to this correspondence revealed

interesting differences between OB and OT words, including the observation that the latter were used in a more polarized fashion and appeared infrequently as nouns. It is suggested that this relative paucity of OT nouns may result from language-specific factors relating to the length of constructions within which OT words are commonly used. In English, children acquiring language may use action words more as verbs than as nouns due to both frequency differences in caregiver speech and due to the greater production resources required of complex predicate constructions, where action nouns are often found. Future studies will investigate the acquisition of complex predicate constructions in relation to the emergence of action nouns, to establish the relation between the two.

References

Allen, M. (1979). *Morphological investigations.* Unpublished doctoral dissertation, University of Connecticut.

Barner, D., & Bale, A. (2001, April). *Going strapless: Early acquisition and the bootstrapping hypotheses.* Poster session presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Bloom, L., Tinker, E., & Margulis, C. (1993). The words children learn: Evidence against a noun bias in early vocabularies. *Cognitive Development, 8,* 431-450.

Bloom, P. (1994). Syntax-semantics mappings as an explanation for some transitions in language development. In Y. Levy (Ed.), *Other children, other languages: Issues in the theory of language acquisition* (pp. 41-75). Hillsdale, NJ: Erlbaum.

Braine, M. D. S. (1992). What sort of structure is needed to "bootstrap" into syntax? *Cognition, 45,* 77-100.

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

Cattell, R. (1984). *Composite predicates in English.* New York, NY: Academic Press.

Choi, S. (2000). Caregiver input in English and Korean: Use of nouns and verbs in book-reading and toy-play contexts. *Journal of Child Language, 27,* 69-96.

Choi, S., & Gopnik, A. (1995). Early acquisition of verbs in Korean: A cross linguistic study. *Journal of Child Language, 22,* 497-529.

Chomsky, N. (1957). *Syntactic structures.* The Hague: Mouton.

Chomsky, N. (1970). Remarks on nominalization. In R. Jacobs & P. Rosenbaum (Eds.), *Readings in English transformational grammar* (pp. 184-221). Waltham, MA: Blaisdell.

Clark, E. V. & Clark, H. H. (1979). When nouns surface as verbs. *Language, 55,* 767-811.

Dowty, D. R. (1979). *Word meaning and Montague grammar: The semantics of verbs and times in generative semantics and in Montague's PTQ.* Boston, MA: D. Reidel Publishing Company.

Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. A. Kuczaj II (Ed.), *Language development, 2: Language, thought, and culture* (pp. 301-334). Hillsdale, NJ: Lawrence Erlbaum.

Gentner, D., & Boroditsky, L. (2001). Individuation, relativity, and word learning. In M. Bowerman & S. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 215-256). England: Cambridge University Press.

Gleitman, L., & Gleitman, H. (1997). What is language made out of? *Lingua, 100,* 29-55.

Goldberg, A. (1998). Patterns of experience in patterns of language. In M. Tomasello (Ed.) *The new psychology of language* (pp. 203-219). Hillsdale, NJ: Lawrence Erlbaum.

Goldberg, A., (1995). *Constructions: A construction grammar approach to argument structure.* Chicago, IL: University of Chicago Press.

Gopnik, A., & Choi, S. (1995). Names, relational words, and cognitive development in English and Korean-speakers: Nouns are not always learned before verbs. In M.

Tomasello & W. Merriman (Eds.), *Relations between linguistic and cognitive development* (pp. 63-80). Hillsdale, NJ: Lawrence Erlbaum.

Gordon, P. (1985). Evaluating the semantic categories hypothesis: The case of the count-mass distinction. *Cognition, 20*, 209-242.

Grimshaw, J. (1981). Form, function, and the language acquisition device. In C. L. Baker & J. McCarthy (Eds.), *The logical problem of language acquisition* (pp. 165-182). Cambridge, MA: MIT Press.

Halle, K., & Marantz, A. (1993). Distributed morphology and the pieces of inflection. In S. J. Keyser & K. Hale (Eds.), *The view from building 20* (pp. 111-176). Cambridge, MA: MIT Press.

Harley, H., & Noyer, R. (1999). Licensing in the non-lexicalist lexicon: Nominalization, roots and the encyclopedia. *MIT Working Papers in Linguistics, 32*, 119-137.

Kiparsky, P. (1997). Remarks on denominal verbs. In A. Alsina, J. Bresnan, & P. Sells (Eds.), *Complex predicates* (pp. 473-499). Stanford, CA: CSLI Publications.

Landau, B., & Gleitman, L. R. (1985). *Language and experience: Evidence from the blind child.* Cambridge, MA: Harvard University Press.

Langacker, R. (1987). *Foundations of cognitive grammar 1.* Stanford, CA: Stanford University Press.

Langacker, R. (1991). *Foundations of cognitive grammar 2.* Stanford, CA: Stanford University Press.

Lieber, R. (1980). Morphological conversion within a restrictive theory of the lexicon. In M. Moortgat, H. V. D. Hulst, & T. Hoekstra (Eds.), *The scope of lexical rules* (pp. 161-200). Holland: Foris Publications.

Macnamara, J. (1972). Cognitive basis of language learning in infants. *Psychological Review, 79,* 1-13.

Macnamara, J. (1982). *Names for things. A study of human learning.* Cambridge, MA: MIT Press.

MacWhinney, B. (2000). *The CHILDES project: Tools for analyzing talk. Third Edition.* Mahwah, NJ: Lawrence Erlbaum.

Marantz, A. (1997). No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. *University of Pennsylvania Working Papers in Linguistics, 4,* 201-225.

Maratsos, M. P. (1982). The child's construction of grammatical categories. In H. E. Wanner & L. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 240-266). Cambridge, MA: The University Press.

Marchand, H. (1969). *The categories and types of present-day English word-formation: A synchronic-diachronic approach. Second edition.* Munchen: Beck.

Moravcsik, J. (1975). Aitia as a generative factor in Aristotle's philosophy. *Dialogue, 14,* 622-636.

Moravcsik, J. (1998). *Meaning, creativity, and the partial inscrutability of the human mind.* Stanford, CA: CSLI Publications.

Myers, S. (1984). Zero-derivation and inflection. *MIT Working Papers in Linguistics, 7,* 53-69.

Nabors-Olah, L. (2001, April). *Noun and verb production of young speakers of English and Hungarian.* Poster session presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Naigles, L. (1996). The use of multiple frames in verb learning via syntactic bootstrapping. *Cognition, 58,* 221-251.

Nelson, K., Hampson, J., & Shaw, L. K. (1993). Nouns in early lexicons: Evidence, explanations and implications. *Journal of Child Language, 20,* 61-84.

Oshima-Takane, Y., Barner, D., Bellamy, S., Butt, R., Boudewijnse, G. J., & Weinlick, A. (1999). *Coding gestalt and non-gestalt words as nouns or verbs.* Unpublished manuscript, McGill University, Montréal.

Oshima-Takane, Y., Barner, D., Elsabbagh, M., & Guerriero, S. M. (1999, August). *The learning of deverbal nouns.* Poster session presented at the VIIIth Congress of the International Association for the Study of Child Language, San Sebastian, Basque Country.

Oshima-Takane, Y., Barner, D., Elsabbagh, M., & Guerriero, S. (2001). Learning of deverbal nouns. *Proceedings for the VIIIth Congress of the International Association for the Study of Child Language,* San Sebastian, Basque Country.

Pinker, S. (1984). *Language learnability and language development.* Cambridge, MA: Harvard University Press.

Prasada, S. (1999). Names for things and stuff: An Aristotelian perspective. In R. Jackendoff, K. Wynn, & P. Bloom (Eds.), *Language, logic, and conceptual representation: Essays in honour of John Macnamara* (pp. 119-146). Cambridge, MA: MIT Press.

Pustejovsky, J. (1995). *The generative lexicon.* Cambridge, MA: MIT Press.

Sachs, J. (1983). Talking about the there and then: The emergence of displaced reference in parent-child discourse. In K. E. Nelson (Ed.), *Children's language, 4.* Hillsdale, NJ: Erlbaum.

Schlesinger, I. (1971). Production of utterances and language acquisition. In D. Slobin (Ed.), *The ontogenesis of grammar* (pp. 63-101). New York, NY: Academic Press.

Soja, N. N. (1992). Inferences about the meanings of nouns: The relationship between perception and syntax. *Cognitive Development, 7,* 29-45.

Tardif, T. (1996). Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabularies. *Developmental Psychology, 32,* 492-504.

Tardif, T., Gelman, S., & Xu, F. (1999). Putting the "noun bias" in context: A comparison of English and Mandarin. *Child Development, 70,* 620-635.

Tardif, T., Shatz, M., Naigles, L. (1997). Caregiver speech and children's use of nouns before verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language, 24,* 535-565.

Theakston, A. L., Lieven, E. V. M., Pine, J. M. & Rowland, C. F. (1999). The role of performance limitations in the acquisition of 'mixed' argument structure at stage 1. In M. Perkins & S. Howard (Eds.) *New directions in language development and disorders* (pp. 127-152). New York, NY: Plenum.

Waxman, S. R., & Hall, D. G. (1993). The development of a linkage between count nouns and object categories: Evidence from fifteen- to twenty-one-month-old infants. *Child Development, 64,* 1224-1241.

Wynn, K. (1990). Children's understanding of counting. *Cognition, 36,* 155-193.

Yamashita, Y. (1999). The acquisition of nouns and verbs in young Japanese children: Why do verbal nouns emerge early? In A. Greenhill, H. Littlefield, & Cheryl Tano (Eds.), *Proceedings of the 23rd Annual Boston University Conference on Language Development* (pp. 741-752). Somerville, MA: Cascadilla.

Appendix A

Transcript classification and ages of children at Periods I-III.

Child	Age range for Early and Late Stage I (Y;M.D)	# of Sessions	Total duration (hours:minutes)
Anne	1;10.7 – 1;11.20	12	6:04
Aran	1;11.12 – 2;0.9	8	8:00
Becky	2:0.7 – 2;2.30	18	9:00
Dom.	1;10.25 – 2;2.9	21	10:20
Eve	1;6.0 – 1;7.0	4	4:15
Naomi	1;2.29 – 1;10.14	13	N/A
Nicole	2;0.25 – 2;5.26	30	15:00
Ruth	1;11.15 – 2;4.29	32	16:00
Sarah	2;3.5 – 2;7.28	23	13:20

Appendix B

Words used flexibly as noun and verb at least once, by a caregiver or child

(Physical) Object	bottle	dress	lock	shop
(n = 24)	button	drink	phone	shovel
	brush	drum	pin	slide
	comb	fish	plug	step
	cover	hammer	pump	swing
	crayon	iron	ride	tape
Substance	butter	paint	peel	snow
(n = 9)	dust	poo	smoke	water
	glue			
Other	bang	help	rest	stop
(n = 75)	bite	hug	rock	stroke
	blow	joke	rub	suck
	burn	jump	run	sulk
	call	knock	scratch	surprise
	climb	kiss	scream	swim
	colour	kick	shower	swop
	cough	laugh	shot	talk
	crash	load	sleep	taste
	cry	look	smack	think
	cuddle	love	smell	try
	cut	mess	smile	throw
	dance	name	sneeze	tickle
	drive	pat	sniff	top
	drop	peek	snooze	walk
	end	peep	spank	wash
	fall	pull	squeak	wave
	fight	push	squeeze	wee
		rain	stack	wipe

Chapter 3: Paper 2

Complex Predicate Constructions and the Late Emergence of Action-denoting Words as Nouns

David Barner, Yuriko Oshima-Takane, Mai Gee Hum and Erin Beettam

McGill University

Abstract

Recent studies (Oshima-Takane, Barner, Elsabbagh, & Guerriero, 1999, 2001) have suggested that children use few abstract and action-denoting nouns early in acquisition. While action words can be used as verbs in short constructions (e.g., *John hugged Mary*), use of the same words as nouns requires longer, *complex predicate* (CP) constructions (e.g., *John gave Mary a hug*), a factor that could delay their use relative to verb forms. The present study compared the use of CP and non-CP words in the spontaneous speech of nine English-speaking children (aged 1;3 to 4;6) and their caregivers. On average, nouns used by the caregivers in CPs emerged later in child speech than those that were not. Further analysis revealed that the children used few light verbs (e.g., *give, take*) with content-bearing noun complements (e.g.,. *cat, hug*) early on. Since CPs combine a light verb with an action noun, it is suggested that the children's failure to use action nouns may result from a general inability to use light verbs with noun complements (action-denoting or not), rather than from a problem understanding the semantics of action words.

Introduction

It has long been assumed in studies of language acquisition that identifying the members of grammatical categories is essential to discovering abstract particularities of a grammar. Consequently, it has also been assumed that a satisfactory account of language acquisition requires some explanation of how children come to classify words into grammatical categories such as noun, verb, adjective, etc. (although see Barner & Bale, 2001; Marantz, 1997). Following this, several researchers have hypothesized that children use extra-linguistic evidence to either construct grammatical categories (Braine, 1987; Macnamara, 1982; Schlesinger, 1971) or to identify words as members of innate categories (Grimshaw, 1981; Pinker, 1984). This general idea, that children use semantic notions to build or identify members of grammatical categories in language input, has been called the *semantic bootstrapping hypothesis* (Pinker, 1984).

On a related note, other researchers have suggested that the order in which category members emerge may depend on their lexico-semantic specification. For example, it has been argued that across a number of languages, children produce a preponderance of nouns relative to verbs in the early stages of acquisition (Gentner, 1982), and that this noun bias may result from the greater accessibility of noun referents (e.g. physical objects) compared to verb referents (e.g., actions) to the child's cognitive system (Gentner, 1982; see also Goldin-Meadow, Seligman, & Gelman, 1976; Bates, Dale, & Thal, 1995). While evidence from languages such as Korean, Chinese, Hungarian, and Japanese has placed the universality of the noun-bias in question (Bloom, Tinker, & Margulis, 1993; Choi, 2000; Choi & Gopnik, 1995; Nabors-Olah, 2001; Tardif,

1996; Tardif, Gelman, & Xu, 1999; Tardif, Shatz, & Naigles, 1997; Yamashita, 1999), such studies have yet to conclusively refute the thesis (Gentner & Boroditsky, 2001).

In the context of such debates, a somewhat neglected question has been how children acquire words that do not respect proposed mappings between semantic and grammatical categories, such as abstract and action-denoting nouns (e.g., *bite, kick, name*). Several preliminary investigations of these words have provided mixed evidence concerning the correspondence between semantics and syntax in early child language (Macnamara, 1982; Nelson, Hampson, & Shaw 1993; Oshima-Takane, Barner, Elsabbagh, & Guerriero, 1999, 2001; Yamashita, 1999). Abstract and action-denoting nouns, it has been claimed, may pose a serious problem to proposals such as semantic bootstrapping, since the hypothesis predicts that these words should be misclassified as verbs early in acquisition (Nelson, et al.; Oshima-Takane, et al., 2001). Likewise, any hypothesis that posits strong links between semantics and grammatical categories may require refinement, should children be found to resemble adults in their use and understanding of non-canonical category members such as action-denoting nouns.

In a recent study, Nelson et al. (1993) provided preliminary evidence that very young children (aged 1;1 to 1;8) used a number of action and event denoting nouns in spontaneous speech (e.g., *bite, drink, help, kiss,* and *walk*). It was suggested that such use may arise when caregiver speech contains highly frequent idiomatic use of target action nouns. According to their analysis, several action-denoting nouns were used by mothers in what were called "lexical phrases", such as *take a bath* and *have a bite.* For example, 75% of the time *bath* occurred in the phrases *take/ing (a) bath* or *give/ing/gave X a bath.*

Likewise, *noise* occurred 46% of the time in the expression *make/s/ing a noise*, and *picture* was used 46% of the time in the phrase *taking a picture*.

Below, it is argued that such phrases, commonly termed *light verb constructions*, or *complex predicates* (Cattell, 1984; Pinker, 1989) are indeed important to explaining patterns of noun use in early child language acquisition, though perhaps not in the way suggested by Nelson et al. (1993). Rather than facilitating their acquisition, the canonical use of action nouns in complex predicate constructions may prevent children from using them early in acquisition. This possibility is discussed by Oshima-Takane et al. (2001).

Oshima-Takane et al. (2001) analyzed the use of deverbal nouns (i.e. nouns derived from verb roots) in the spontaneous speech of three English-speaking children and their caregivers. The acquisition of object words (e.g., *drink, ride, swing*) was compared to that of non-object words (e.g., *kiss, walk, hug*). Despite the equal availability of both kinds of word as nouns in caregiver speech, only object words were used productively by the children early in acquisition as nouns. Non-object words were used productively as nouns two linguistic stages later (Brown, 1973) by all three kids, despite sometimes occurring more frequently in caregiver speech.

Oshima-Takane et al. (2001) suggested two factors that may delay the production of non-object nouns. First, in the absence of precluding forms, phonological values for words denoting objects and related functions could be copied from one to the other to fill lexical gaps (e.g., *a hammer* $\rightarrow$ *to hammer*), with language specific derivational

morphology being added when necessary[4]. This process might operate for object words only, explaining the earlier emergence of flexible use, relative to non-object words.

Second, Oshima-Takane et al. (2001), proposed that non-object words emerge later as nouns because they are often used in complex predicate (CP) constructions when used as nouns. In examples 1-2 below, the (b) sentences involve the pairing of a light verb, such as *do, get, give, have,* or *take*, with an action-denoting nominal to form a CP.

(1) a. Walk the dog!

b. Give the dog a walk!

(2) a. John looked at the church.

b. John took a look at the church.

In each case, the nominal provides crucial information pertaining to event structure, a role normally played by the verb (see Cattell, 1984). Contrast such uses of these verbs with their non-light senses, where the nominal complements no longer denote events, but physical objects:

(4) a. *Bone the dog.

b. Give the dog a bone!

(5) a. *John pamphletted at the church.

b. John took a pamphlet at the church.

Although these sentences involve the same verbs, the nominal no longer plays a role in specifying the event structure of the expression, leaving the verbs to express their

[4] This is not a theory of derivation, but rather describes a process of language acquisition, whereby meanings are attributed phonetic values. Thus, questions related to diachronic patterns of word use (i.e. historical linguistics), or the logical relations of concepts are not of importance (e.g., the fact that understanding the notion of *swinging* is logically anterior to understanding what it is to be a *swing*).

default lexical senses, in this case involving transfer of possession (*give, take*). Crucial to the current discussion is that, as shown in examples 1-2, light verb constructions comprising CPs are typically two or more morphemes longer than counterpart verb constructions. For example, while sentence (1a) can be attributed a morpheme count of only 3, sentence (1b) comprises 5 morphemes. This is interesting since it has long been noted that the mean length of children's utterances (MLU) increases steadily during early acquisition (e.g., Brown, 1973). As a result, constructions requiring many morphemes should emerge later than those requiring only two or three. So, utterances such as that in (1a) should emerge earlier in child language than utterances such as that in (1b). Action-denoting nouns could emerge later than object-denoting nouns due in part to production limitations related to MLU.

To support this hypothesis, Oshima-Takane et al. (2001) noted that both caregivers and children used fewer object words in CPs than non-object words, and that object words emerged earlier, on average. However, children's use of words in CPs did not begin until later stages of acquisition. Thus, the common use of non-object words in CPs could in part explain their late emergence compared to object words.

However, several questions remain to be answered. First, since Oshima-Takane et al. (2001) studied deverbal nouns only, the study did not permit a complete test of their hypothesis, since few deverbal nouns denoting non-objects are used outside of CP constructions. In contrast, other nouns such as *name, colour,* and *rain* are seldom if ever used in CPs. Evidence that these words are used early on while words used in CPs are not would support the hypothesis that non-object nouns emerge late for reasons other than their referential properties. Second, Oshima-Takane et al.'s conclusions were based on

results for only three children, and thus were not conclusive. Finally, although a fair body of research has discussed the acquisition of light verbs, little work has been done on how the acquisition of these verbs relates to their use in CP constructions, and how the acquisition of such constructions relates to the use of action nouns.

For example, a number of studies have examined what have been called general-all-purpose (GAP) or pathbreaking verbs (Bloom, Lifter, & Hafitz, 1980; Clark, 1978, 1993; Goldberg, 1995, 1998; Ninio, 1999; Thordardottir & Weismer, 2001; Uziel-Karl, 2000). However, rarely have researchers distinguished between the use of these words in general and their use as constituents in CPs. While CP instances of verbs such as *have, take, get, do* and *give* qualify as instances of GAP or pathbreaking verbs, not all GAP verbs are constituents of CPs. In particular, any instance of a GAP verb that is uttered without an event-denoting nominal as complement does not qualify as a CP (e.g., *Mommy do that*). As a consequence, while studies such as Clark (1978) provide important insight into the emergence and frequency of light verbs *qua* lexical items, little information concerning the use of such words in full CP constructions is available. Instead, many uses of GAP verbs appear to lack nominal complements (see Clark, 1978, for examples). Also, no detailed analyses discuss the point at which complements are used, and whether children use event-denoting complements any later than other possible complements.

The present study investigated the acquisition of light verbs and their eventual use in CP constructions. This analysis accompanied a comparison of nouns that were used in CPs in caregiver speech and those that were not, to determine whether use in these longer constructions affected the emergence of abstract and action-denoting nouns. Following Oshima-Takane et al. (2001), it was predicted that children would not use CP

constructions in abundance at early stages of language acquisition (Brown's Early Stage I and Late Stage I), despite the availability of these constructions in language input. Consequently, it was also predicted that words used canonically in these constructions would not appear until later in acquisition (i.e. Brown's Stage II or later).

Study 1. Children's production of nouns in complex predicates

To examine whether use in CP constructions might contribute to the late emergence of abstract and action-denoting nouns in child speech, Study 1 performed a comparison of children's use of words that appeared in CPs in caregiver speech versus those that did not. This analysis focussed on noun forms of words that could be used as either noun or verb. These words constitute the vast majority of words used in CPs in child-directed speech, given that CP constructions almost invariably can be translated into a corresponding verb expression. In addition, the appearance of target words in multiple grammatical categories permits a distinction between the acquisition of lexical concepts, and the expression of these concepts using nouns versus verbs. In addition to this comparison CP and non-CP words, a detailed analysis of words used canonically in CPs was performed, to evaluate whether the absence of an alternative model of use for a given noun would further decrease the likelihood of its production by children.

Method

Participants

Data for 9 children, including 643 transcripts of spontaneous speech were obtained from the Child Language Data Exchange System (MacWhinney, 2000). Children included: Anne, Aran, Becky, Dominic, Nicole, and Ruth (Theakston, Lieven, Pine, & Rowland, 1999), Eve and Sarah (Brown, 1973), and Naomi (Sachs, 1983).

For each transcript, an MLU value was determined (Brown, 1973). On the basis of MLU, transcripts were assigned to Brown's Linguistic Stages (see Brown, 1973; de Villiers & de Villiers, 1973; Barner, Guerriero, & Oshima-Takane, 1999). These stages were then grouped into four developmental periods, as shown in Table 1:

Table 1

MLU Stages and Periods

Period	MLU	Brown's Stage
I	1.01 – 1.99	Early I, Late I
II	2.00 – 2.99	II, III
III	3.00 – 3.99	Early IV, Late IV – Early V
IV	4.00 +	Late V, Post V

See Appendix A for transcript classifications and ages during recording sessions.

Materials & Coding

Words selected for coding were those that could be used as both noun and verb without overt derivational morphology (i.e. *zero-derivation* words). Appendix B lists words meeting this definition that appeared in transcripts used for the study. Words were organized according to whether or not their noun forms denoted physical objects, resulting in two categories: object words (OB), and non-object words (OT). Words used in CPs by at least one caregiver were classified as "Used in CP".

Using the CLAN program (MacWhinney, 2000), the child and caregiver utterances that contained target words were coded to indicate (1) whether or not the target word denoted a physical object, (2) whether it was used as noun, verb, or undecided, (3) whether the word was used as part of a CP construction, (4) whether it was used

repetitively or non-repetitively (i.e. back-to-back), and (5) for child speech, whether the utterance in which the target word appeared was spontaneous, imitative, or prompted by a caregiver (Oshima-Takane, Barner, Bellamy, Butt, Boudewijnse, & Weinlick, 1999).

Target words were classified as noun or verb on the basis of syntactic context and appearance with bound morphemes (e.g., determiners, verbal inflections, etc.). One-morpheme utterances were coded as undecided, except when used as part of a speech act (e.g., Look!). A random sample of 10% of the transcripts was coded independently for each child by a trained research assistant, to test coding reliability (65 files in all). The percentages of agreement between original codes and reliability codes averaged 91.1%, with a range of 85.8% – 96.3%.

Analysis

For each child, target words that appeared in CP constructions in the speech caregivers were classified as "CP words". In turn, CP words that were used 80% or more of the time in CPs in caregiver speech were classified as "canonical CP words". Those words not classified as CP fell under one of two categories of non-CP words: OB words (used to denote objects), and OT words (not used to denote objects).

The first analysis assessed whether a difference existed between CP and non-CP words, in terms of the number of types and tokens used by children at Periods I and III. To control for frequency fluctuations due to differences in the number of utterances, each child's type and token frequencies for each word category were divided by the number of utterances produced at each Period (I or III). Using these scores, a comparison was performed between CP words and each of the two classes of non-CP words (OB and OT).

The second analysis examined canonical CP words. which were of particular interest since caregiver speech offered little alternative for how to use them. In order to express the content of canonical CP words, the child would be required either to produce a CP construction or to utter the word in a qualitatively different way from caregivers. In contrast, words used flexibly by caregivers both in CPs and in other contexts can be produced by children in an adult fashion, without necessarily involving a CP.

For the children, only spontaneous and non-repetitive uses of target words were analyzed. Also, to ensure that the children's failure to produce words at Period I did not simply reflect their absence in caregiver speech, all analyses included only words that were used by individual caregivers in Period I and one other Period (e.g, II or III), and that were used five times or more by a given child's caregivers.

Results and Discussion

At Period I, children averaged 4752.9 utterances (SD = 2466.8), and caregivers averaged 8418.2 (SD = 5408.0). At Period III, children averaged 8451.7 utterances (SD = 4746.8), and caregivers averaged 12550.0 (SD = 7504.5). Since total utterance frequencies varied greatly between children and between Periods, the frequencies of target word types and tokens were divided by utterance frequencies. Figure 1 shows mean type/utterance frequencies of CP and non-CP words at Periods I and III.

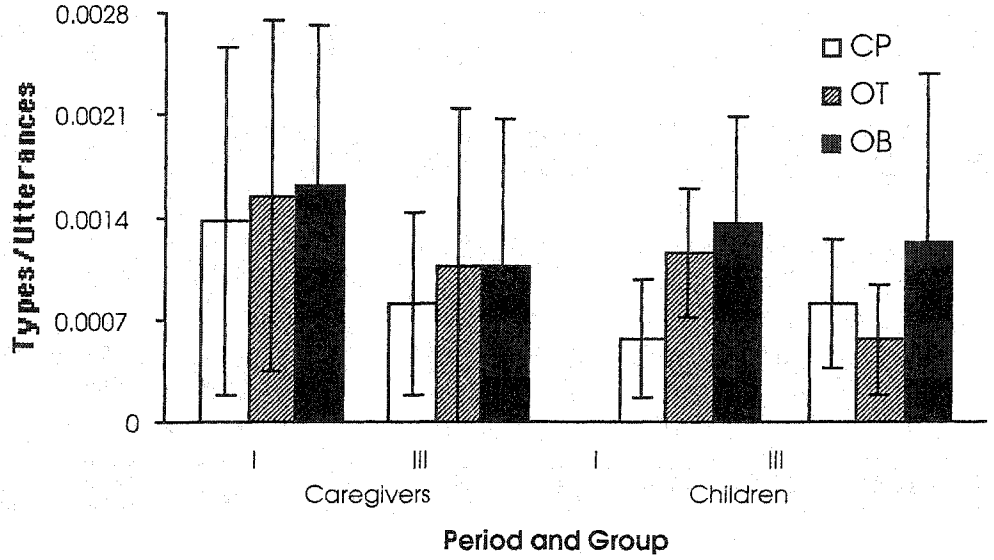

Figure 1. Mean type/utterance ratios for CP, OT, and OB words in the speech of caregivers (n = 9) and children (n = 9) at Periods I and III.

The children's use of CP words appeared to increase more in frequency over time, from 5.6^{-04} (i.e. 0.00056) to 8.1^{-04}, compared to OT words, which actually decreased relative to utterance frequency (from 1.1^{-03} to 5.6^{-04}). To assess this, a 2(Period) × 2(Word Category) ANOVA with two repeated factors was performed on mean type/utterance ratios for CP and OT words at Periods I and III, and revealed a significant Period × Word Category interaction, $F(1, 8) = 11.61$, $p < .05$, with no main effect for either Period, $F(1, 8) = 0.92$, $p > .05$, or Word Category, $F(1, 8) = 0.66$, $p > .05$. Post-hoc pairwise comparisons using the studentized range statisitic, Tukey's *honestly significant difference* test (TukeyHSD), failed to locate significant differences between the mean type/utterance ratios of CP and OT words at Period I, $Q(1, 8) = 4.80$, $p > .05$, and Period III $Q(1, 8) = 2.01$, $p > .05$.

The significant interaction effect found for CP and OT words in the children's speech did not reflect caregiver speech. The caregivers' use of CP types decreased over time relative to utterance frequency (from 1.4^{-03} to 8.12^{-04}), as did their use of OT words (from 1.5^{-03} to 1.1^{-03}). A 2(Period) × 2(Word Category) ANOVA with two repeated factors was performed on the caregivers' mean type/utterance ratios for CP and OT words at Periods I and III, and revealed no significant Period × Word Category interaction $F(1, 8) = 0.10$, $p > .05$, nor main effect for Period, $F(1, 8) = 1.84$, $p > .05$, or Word Category, $F(1, 8) = 0.38$, $p > .05$.

The children's use of OB types/utterances decreased over time (from 1.4^{-03} to 1.2^{-03}), but was greater than their use of CP words at both Periods I and III. To confirm this, a 2(Period) × 2(Word Category) ANOVA with repeated factors was performed on mean type/utterance ratios for CP and OB words. This revealed a significant main effect for Word Category, $F(1, 8) = 12.65$, $p < .05$, but no interaction for Time × Word Category, $F(1, 8) = 0.93$, $p > .05$, nor main effect for Time, $F(1, 8) = 0.03$, $p > .05$. Post-hoc pairwise comparisons (TukeyHSD), did not find significant differences between the mean type/utterance ratios of CP and OB words at Period I, $Q(1, 8) = 4.68$, $p > .05$, and Period III $Q(1, 8) = 2.43$, $p > .05$.

For the caregivers, the use of OB types/utterances appeared to decrease over time (from 1.6^{-03} to 1.0^{-03}), though not to the extent of CP types/utterances. A 2(Period) × 2(Word Category) ANOVA with repeated factors was performed on mean type/utterance ratios for CP and OB words, and revealed no main effect for Word Category $F(1, 8) = 0.54$, $p > .05$, Time, $F(1, 8) = 2.29$, $p > .05$, nor an interaction effect for Time × Word Category $F(1, 8) = 0.02$, $p > .05$.

Figure 2 represents the caregivers' and children's mean token/utterance frequencies for CP words and non-CP words for Periods I and III.

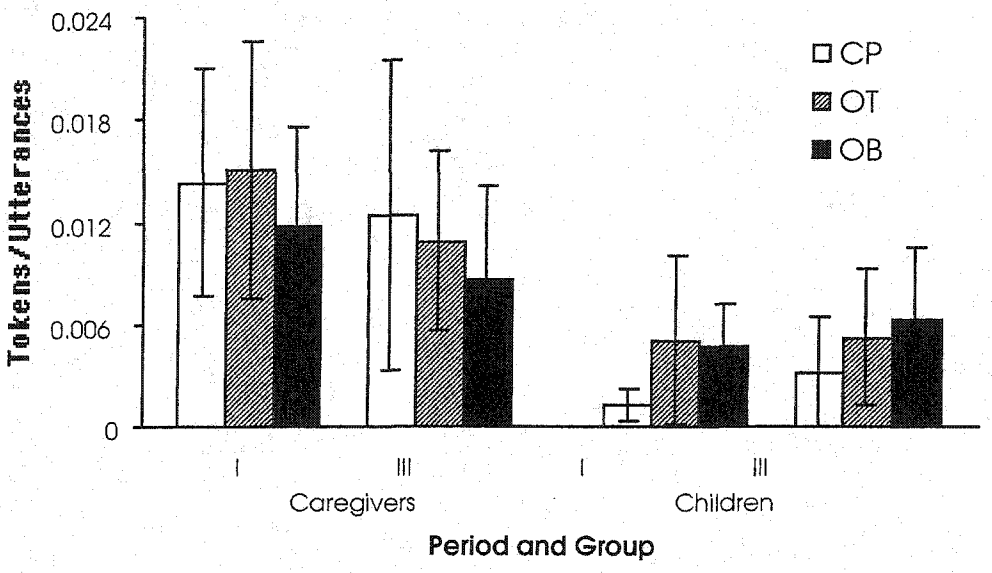

Figure 2. Mean token/utterance ratios for CP, OT, and OB words in the speech of caregivers ($n = 9$) and children ($n = 9$) at Periods I and III.

The children's use of CP tokens (1.3^{-03} at PI and 3.2^{-03} at PIII) did not differ from their use of OT tokens (5^{-03} at PI and 5.2^{-03} at PIII). A 2(Period) × 2(Word Category) ANOVA with repeated factors was performed on token/utterance ratios for OT and CP words for Periods I and III, and found no significant main effect for either Period, $F(1, 8) = 1.55$, $p > .05$, Word Category, $F(1, 8) = 3.91$, $p > .05$, nor a significant interaction effect for Period × Word Category, $F(1, 8) = 1.24$, $p > .05$. However, children used more OB tokens (4.7^{-03} at PI and 6.4^{-03} at PIII) than CP tokens. CP and OB token/utterance values were entered into a 2 × 2 ANOVA with repeated factors, revealing a significant main effect for Word Category, $F(1,8) = 5.60$, $p < .05$. Post-hoc pairwise comparisons

(TukeyHSD), failed to find significant differences between the mean token/utterance ratios of CP and OB words at Periods I and III. No main effect for Period was found, $F(1,8) = 4.30$, $p > .05$, nor was their a significant interaction effect, $F(1,8) = 1.40$, $p > .05$.

The caregivers' use of CP tokens appeared to decrease over time, relative to frequency of utterances (from 1.4^{-02} to 1.2^{-02}), as did their use of OT tokens (from 1.5^{-02} to 1.1^{-02}) and OB tokens (1.2^{-02} to 8.9^{-03}). To confirm this, a 2(Period) × 2(Word Category) ANOVA with repeated factors was performed on the caregiver token/utterance ratios for OT and CP words for Periods I and III, and revealed no significant main effect for either Period, $F(1, 8) = 1.63$, $p > .05$, Word Category, $F(1) = 0.01$, $p > .05$, nor an interaction effect for Period × Word Category, $F(1, 8) = 0.78$, $p > .05$. For CP and OB words, a 2(Period) × 2(Word Category) ANOVA with repeated factors was performed on the caregiver token/utterance ratios for OB and CP words for Periods I and III, and showed no significant main effect for Period, $F(1, 8) = 2.48$, $p > .05$, Word Category, $F(1, 8) = 0.93$, $p > .05$, nor an interaction for Period × Word Category, $F(1, 8) = 0.10$, $p > .05$.

Thus, while type data showed developmental differences between CP and OT words for the children, no significant difference existed between the number of CP and OT tokens per utterance used by children. Only OB words differed from CP words in terms of token frequency, indicating that children used object words with greater frequency. Results for the children did not reflect patterns in caregiver speech, where no increases in the use of CP words was found over time, either in terms of types or tokens.

Canonical CP Words

Table 2 presents the children's and caregivers' use of canonical CP words. The frequency with which each word was used in CP constructions is provided in parentheses.

Table 2
Token frequencies for words used canonically in CP constructions by caregivers

		Period I		Period III	
		Caregivers	Child	Caregivers	Child
Anne	Drink	6 (6) [1]	0*	13 (12)	13 (12)
	Look	17 (17)	0*	61 (61)	4 (2)
	Ride	3 (1)	0*	5 (4)	2 (2)
	Sleep	2 (2)	0*	17 (13)	20 (16)
Aran	Drink	7 (7)	0*	5 (5)	1 (1)
	Cuddle	1 (1)	0	5 (5)	0
	Kiss	9 (9)	0*	4 (4)	1 (1)
	Look	27 (27)	0*	17 (17)	4 (4)
	Swim	1 (1)	0	7 (6)	2 (2)
Becky	Look	20 (20)	0*	41 (39)	10 (10)
	Ride	8 (8)	0*	1 (1)	0
	Sleep	7 (5)	0*	4 (4)	2 (2)
	Walk	10 (10)	0*	2 (2)	3 (1)
Dominic	Look	14 (8)	0*	29 (25)	1 (1)
	Poo	3 (3)	1	0	0
	Ride	3 (3)	0	3 (3)	0
	Sleep	1	0	1 (1)	0
Eve	Drink	1 (1)	0*	1 (1)	3 (3)
	Kiss	1 (1)	0	9 (9)	0
Nicole	Drink	3 (3)	0*	0	1 (1)
	Drive	4 (4)	0	0	0
	Look	27 (26)	0*	1 (1)	1 (1)
	Ride	11 (11)	2	0	0
Ruth	Look	12 (12)	0*	11 (9)	4 (4)
	Walk	1 (1)	0*	7 (6)	3 (1)
Sarah	Drink	1 (1)	0*	3 (3)	0
	Kick	1 (1)	0	0	0
	Kiss	2 (2)	0	0	0
	Walk	2 (2)	0*	0	1 (1)

* An asterisk indicates that the target word was used as a verb at least once by the child.

[1] Numbers in parentheses indicate the frequency with which words were used in CPs.

Overall, the caregivers used the following words (where the number of caregivers to use each is indicated in parentheses): *drink* (5), *look* (6), *ride* (4), *sleep* (3), *kiss* (3),

walk (3), *cuddle*, *drive*, *kick*, *poo*, and *swim*. However, none of these words were used by a child in a CP at Period I, while only two children used a canonical CP word as a noun at all in Period I. Dominic used *poo* once, and Nicole uttered *ride* twice. Thus, it seems that canonical use in CPs strongly delays the emergence of words in child speech.

Also possible is that canonical CP words were delayed because children had not yet mastered associated concepts. To rule this out, the frequency with which the words were used as verbs was determined for the caregivers and children, and noun-verb proportions were calculated for each word (noun / noun+verb).

Table 3 presents the mean number of noun and verb tokens used by the caregivers and children for words shown in Table 2. Also shown are mean noun-verb proportions.

Table 3

Mean noun-verb proportions (N/N+V) and mean token frequencies for Period I use of canonical CP words by caregivers and children.

	Caregivers	Children
Mean noun-verb proportion	0.34 (0.33)[1]	0.10 (0.30)
Mean number of noun tokens	7.1 (7.6)	0.10 (0.4)
Mean number of verb tokens	58.0 (100.2)	8.9 (15.1)

[1] Numbers in parentheses indicate standard deviations.

The children used canonical CP words as verbs with relatively high frequency at Period I, producing a mean of 8.9 tokens during Period I, compared to a mean of only 0.1 noun uses. As a result, children's mean noun-verb proportion for canonical CP words was 0.10 at Period I. In contrast, the caregivers had a mean noun-verb proportion of 0.34, using 7.1 noun tokens on average, and a mean of 58.0 verb tokens. Thus, the low

frequency with which the children produced canonical CP words as nouns does not seem attributable to a delay in development or access to the relevant concepts; the children's difficulty was not in using particular CP words per se – it was in using CP words as nouns. Not only did they use target words as verbs with relatively high frequency, but they also showed a large difference from the caregivers in the proportion with which they used the words as noun and verb.

Study 2. The acquisition of light verbs, and light verb constructions

Study 2 examined the children's use of the light verbs *do, have, get, give,* and *take*. Two questions were of interest. First, did the children use light verbs required for CP constructions with frequency at Periods I and III? Second, when were the children able to produce light verbs with full complement structure, to render possible the use of CP constructions? To achieve this, the mean number of light verb tokens used by the caregivers and children at Periods I and III was determined. This was contrasted with the production of light verb constructions with nominal complements.

Evidence that the children use light verbs frequently with nominal complements at Period I would fail to support the hypothesis that non-object nouns emerge late due to a CP production delay. However, evidence that light verbs are in general not used with nominal complements would suggest that non-object nouns emerge late due to a general absence of light verbs with nominal complements in child speech.

Method

Participants

Participants for Study 2 were the same as for Study 1. All 643 transcripts were obtained from CHILDES (Child Language Data Exchange System; MacWhinney, 2000). As in Study 1, transcripts were classified according to MLU (Brown, 1973; Barner et al., 1999), and assigned to Brown's Linguistic Stages (Brown, 1973; de Villiers & de Villiers, 1973), which were then grouped into four Periods (see Table 1, above).

Materials and Coding

Five light verbs were examined. Non-light senses were defined as follows:

Have: to hold as a possession, privilege, etc. (e.g., *John has a car*)

Give: to transfer into the possession of another (e.g., *Give a doll to the child*).

Take: to transfer into one's possession, or control (e.g., *John took the apple*).

Do: to bring to pass an un-named action (e.g., *John did the lawn before the garden*).

Get: to gain possession of (e.g., *John got a new car*)

Analysis

Two main analyses were performed for Study 2. First, the frequency of each light verb in the speech of the children was calculated for Periods I and III (including both light and non-light senses). Second, it was determined how often each verb was used with nominal complements. These nominal complements were then examined to determine how many were pronouns, and how many were content-bearing. For example, personal and demonstrative pronouns such as *I, he, she, that* and *this* were deemed pronominal, while nouns such as *cat, Mommy, cake*, and *toy* were called content-bearing nominals, as they picked out a definite conceptual content. In addition, to contrast the children's use of

light verbs and complements to the use of the words by the caregivers, the first 50 instances of nominal complements to light verbs was inspected in caregiver speech for each child.

Results and Discussion

Table 4 presents the mean number of light verb tokens in child speech for Periods I and III. Also shown for Period I is the mean number of light verbs used with pronoun complements, and the mean number used with content-bearing noun complements.

Table 4

Mean number of light verb tokens in child speech at Periods I and III, and mean number used with pronominal and content-bearing noun complements at Period I

	Do	*Get*	*Give*	*Have*	*Take*
Period I					
Overall	50.3	50.7	1.0	12.6	4.6
	(51)[1]	(27.9)	(1.5)	(12.6)	(5.3)
With Complement					
Pronominal	20.0	10.2	0.4	5.7	1.8
	(24.6)	(9.9)	(1.3)	(6.0)	(2.3)
Content-bearing	2.6	13.9	0.3	3.7	1.6
	(3.5)	(13.1)	(0.7)	(3.4)	(2.6)
Period III					
Overall	513.7	428.6	22.7	322.1	53.6
	(431.7)	(217.2)	(21.6)	(206.3)	(28.3)

[1] Numbers in parentheses indicate standard deviations.

The children's use of light verbs varied from verb to verb. *Do* and *get* were used with mean frequencies exceeding 50 tokens, and *have* was used 12.6 times, on average. *Take* appeared a mean of 4.6 times, while *give* was used once per child, on average. Six children never used *give* during Period I. Although frequencies of 50 might afford children the chance to use frequent CP constructions, much lower frequencies found for *take* and *give* provided much less opportunity for production of CPs.

A substantial number of light verbs were used by the children without nominal complements. For example, the children used *get* a mean of 10.2 times with a pronoun complement, and 13.9 times with a content-bearing noun, compared to an overall mean frequency of 50.7 uses of *get*. Similarly, *do* was used with a pronoun 20 times on average, with a content noun 2.6 times, and overall 50.3 times, on average. A slightly larger proportion of tokens for *give, have* and *take*, were used with nominal complements.

In turn, analyses revealed that a large proportion of nominal complements used by the children were highly frequent pronouns such as *it* and *that*. For example, the pronoun *it* appeared as a complement to 248 light verb tokens, for the 9 children during Period I. Overall, 343 pronouns, including *it*, *her*, *one, that*, and *this* were used as complements to light verbs during Period I, constituting 63% of the 541 nominal light verb complements used by the children. The remaining percentage of nominal complements comprised a very small number of tokens. For example, *do* was used with a content-bearing nominal complement around 2.5 times on average at Period I, *get* around 14 times on average, *give* only 0.3 times, *have* 3.5 times and *take* 1.5 times. Thus, although the children used light verbs with relatively high frequency during Period I, they had not yet begun to use the verbs with content-bearing nominal complements to any great degree.

However, by Period III token frequencies increased for all target verbs. In three cases, (i.e. *do, get,* and *have*) mean frequencies were in the hundreds, allowing ample opportunity for the use of light verbs in CP constructions. Also, *give* was used by all children and attained a mean frequency of over 20, while *take* exceeded 50 tokens per child on average. Thus, even for the light verbs used least by the children, frequencies exceeded Period I values and offered many more opportunities to use CP constructions.

Table 5 presents the mean number of light verb tokens used by the caregivers at Periods I and III, and the mean proportion of content-bearing versus pronominal noun complements for the first 50 light verb complements used by each child's caregivers.

Table 5

Mean proportion of content-bearing nominals versus pronominal complements for first 50 nominal complements of light verbs, in caregiver speech

		Do	*Get*	*Give*	*Have*	*Take*
Period I	*Overall*	838.9	299.8	48.0	508.6	73.0
		(643.9)	(237.2)	(30.3)	(429.2)	(47.6)
	Content-bearing	0.2	0.7	0.8	0.8	0.6
		(0.2)[1]	(0.1)	(0.1)	(0.1)	(0.1)
Period III	*Overall*	1465.9	511.3	81.6	935.8	114.6
		(871.5)	(331.0)	(58.4)	(724.0)	(76.1)

[1] Numbers in parentheses indicate standard deviations.

Caregivers seemed to differ from children, using content-bearing nouns in a mean of 80% of complement positions for *give* and *have*, in 70% for *get*, and in 60% for *take.*

Do was the only verb used less than 50% of the time on average with a content-bearing complement.

Considering these observations, the children's failure to produce non-object nouns could be taken to reflect a more general failure to produce full-fledged and productive light verb constructions with content-bearing nominals early in acquisition. Non-object nouns may be delayed by children's relatively late use of light verbs with full complement structures, and not due to constraints pertaining to conceptual development.

General Discussion

The present paper investigated the relationship between non-object nouns and their use in CP constructions in early acquisition. The first study compared children's and caregivers production of CP and non-CP words. The second study explored children's use of light verbs, and at what point they were used with nominal complements.

Together, results from the two studies suggested that while the children produced CP nouns with relatively low frequency, they also used very few light verbs with nominal complements, whether they denoted actions, objects, or other concepts. The children's relatively infrequent use of CP words was demonstrated in Study 1, which found significant differences in the extent to which CP versus non-CP words increased in frequency over time. Words used in CPs showed an increase in frequency later in acquisition when MLU values increased.

The impact of CPs was perhaps most evident in the analysis of canonical CP words. Of the nine children studied, only two produced noun tokens of words used canonically in CPs by caregivers, while no child produced a word in a CP construction at

Period I. By Period III, all children had begun using the words, with 18 types being used at least once in a CP.

In addition, results for Study 2 suggested that the children's failure to produce nouns in CP constructions was not necessarily due to the lexical semantics of the words, but might be symptomatic of a more general failure to produce nouns as complements to light verbs during early stages of acquisition. A close examination of the children's Period I use of light verbs revealed that only about half were used with noun complements at all, and that among these the majority were pronominal in nature (e.g., *it, that*). Also, it was found that the children differed in this respect from adults, who used a generous proportion of content-bearing nominal complements with light verbs.

These results support the hypothesis that the relatively late emergence of action-denoting nouns may be explained, in part, by their use in longer CP constructions (Oshima-Takane, et al., 2001). While most nouns (e.g., denoting states, objects, emotions, etc.) can occur in most any argument position, to denote an action a noun must almost always occur in a CP. Therefore, rather than being unable to produce the words on cognitive or conceptual grounds, children may be delayed in their production of action nouns because they do not produce the longer sentences required of CP constructions.

However, it should be noted that data presented here do present several questions for the CP delay hypothesis. For example, although Study 2 indicated that the children produced very few light verbs with content-bearing noun complements, it also provided evidence that the children used a number of light verbs with pronominal complements. Thus, the children *did* produce sentences long enough to house CPs (in terms of number of morphemes), but generally *did not* use this ability to produce CP constructions or any

other light verb construction featuring a content-bearing nominal. The question of why this might be raises several interesting possibilities.

One such possibility is that children's early vocabulary is full of lexical gaps, and that pronouns are used when content-bearing alternatives are either absent or not fully consolidated in the maturing lexicon. Just as children use light verbs to fill lexical gaps to talk about actions (e.g., Clark, 1978), an over-abundant use of pronouns might conceal difficulty in accessing content nouns, or signal their complete absence from the child's repertoire. Although the present study suggests that children do not lack the relevant vocabulary (i.e. content-bearing nouns), it does leave open the possibility that these words decrease in frequency when attentional resources are required in other domains, such as the production of longer or more demanding expressions. For example, when wishing to describe an action upon a person or thing, the child might be limited to producing a light verb construction with a pronominal complement, in place of an expression with more highly specified lexical items. Attentional resources that might be attributed to lexical retrieval are instead devoted to producing a longer and more complex transitive construction (see Thordardottir & Weismer, 2001, for a similar suggestion).

A second possibility is that children have simply not yet learned how to fill complement positions with content-bearing nominals. For example, Childers and Tomasello (in press) provided evidence that, when acquiring verb argument structure, children performed better on testing after training sessions involving the use of nonce verbs with both pronominal and content-bearing arguments, compared to those featuring content nouns alone. They argued that since pronouns occur with high frequency in argument positions in adult language, they may offer morpho-syntactic consistency that is

useful in identifying and acquiring novel syntactic constructions. Given this possibility, the early abundance of pronominal complements to light verbs in child speech might simply reflect the expression of default values in early representations of syntactic constructions. Thus, in combination with the overall challenge posed by producing content-bearing words in relatively long expressions (i.e. light verb constructions), the special role played by pronouns in early acquisition may contribute to the delayed use of action-denoting nouns in CP constructions.

While the use of action-denoting and deverbal nouns in CPs may delay their emergence in child language in English, factors such as canonical word order, noun ellipsis, and morphological variation may differentially affect the emergence of such words in other languages such as Japanese, Korean, Chinese, and Hungarian (see Bloom, Tinker, & Margulis, 1993; Choi, 2000; Choi & Gopnik, 1995; Gopnik & Choi, 1995; Nabors-Olah, 2001; Tardif, 1996; Tardif, Gelman, & Xu, 1999; Tardif, Shatz & Naigles, 1997; Yamashita, 1999). Such studies suggest that language-specific properties of the input may play an important role in determining the order with which children begin to produce members of syntactic categories like noun and verb, while the lexico-conceptual identity of words may play a lesser role cross-linguistically.

However, the results presented here do not rule out the possibility that a CP production delay co-exists with constraints imposed by factors surrounding concept acquisition. For example, children may be unable to produce action nouns early on due to conceptual limitations (Gentner, 1982; Gentner & Boroditsky, 2001), and later on due to language specific constraints such as use in CP constructions.

In conclusion, although lexico-conceptual semantics may play a role in determining the emergence of members of lexical classes, such explanations cannot alone account for the results reported here. By Period I, the children showed no problem producing abstract words (e.g., *name*), while they did show problems with nominal forms of words used in CP constructions. Coupled with the finding that the children used relatively few content-bearing nominals as complements to light verbs, data concerning the production of early nouns suggested that certain action-denoting nouns may emerge late in child speech due to their use in CP constructions in caregiver speech, and not because children lack mastery of the concepts they involve.

References

Barner, D., & Bale, A. (2001, April). *Going strapless: Early acquisition and the bootstrapping hypotheses.* Poster presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Barner, D., Guerriero, A. M. S., & Oshima-Takane, Y. (1999, January). *The calculation of mean length of utterance: Methods for assigning transcripts to Brown's linguistic stages.* Paper presented at the first meeting of the Japanese Government International Cooperative Project: A Crosslinguistic Study for a Universal Developmental Index, Tokyo.

Bates, E., Dale, P. S., & Thal, D. (1995). Individual differences and their implications for theories of language development. In P. Fletcher & B. MacWhinney (Eds.), *The handbook of child language* (pp. 323-328). Oxford, England: Blackwell Publishers.

Bloom, L., Lifter, K., & Hafitz, J. (1980). Semantics of verbs and the development of verb inflection in child language. *Language, 56*, 386 412.

Bloom, L., Tinker, E., & Margulis, C. (1993). The words children learn: Evidence against a noun bias in early vocabularies. *Cognitive Development, 8*, 431-450.

Braine, M. D. S. (1987). What is learned in acquiring word classes – a step toward an acquisition theory. In B. MacWhinney (Ed.) *Mechanisms of language acquisition* (pp. 65-87). Hillsdale, NJ: Lawrence Erlbaum.

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

Cattell, R. (1984). *Composite predicates in English.* New York: Academic Press.

Childers, J., & Tomasello, M. (in press). The role of pronouns in young children's acquisition of the English transitive construction. *Developmental Psychology.*

Choi, S. (2000). Caregiver input in English and Korean: Use of nouns and verbs in book-reading and toy-play contexts. *Journal of Child Language, 27,* 69-96.

Choi, S., & Gopnik, A. (1995). Early acquisition of verbs in Korean: A cross linguistic study. *Journal of Child Language, 22,* 497-529.

Clark, E. V. (1978). How children describe time and order. In C. A. Ferguson & D. I. Slobin (Eds.), *Studies of Child Language Development* (pp. 585-606). New York, NY: Holt, Rinehart and Winston.

Clark, E. V. 1993. *The Lexicon in Acquisition.* Cambridge, MA: Cambridge University Press.

de Villiers, J. G. & de Villiers, P. A. (1973). A cross-sectional study of the acquisition of grammatical morphemes in child speech. *Journal of Psycholinguistic Research, 2,* 267-278.

Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. A. Kuczaj II (Ed.), *Language development, 2: Language, thought, and culture* (pp. 301-334). Hillsdale, NJ: Lawrence Erlbaum.

Gentner, D., Boroditsky, L. (2001). Individuation, relativity, and word learning. In M. Bowerman & S. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 215-256). England: Cambridge University Press.

Goldberg, A. (1998). Patterns of experience in patterns of language. In M. Tomasello (Ed.) *The new psychology of language* (pp. 203-219). New Jersey: Erlbaum.

Goldberg, A., (1995). *Constructions: A construction grammar approach to argument structure.* Chicago: University of Chicago Press.

Goldin-Meadow, S., Seligman, M., & Gelman, R. (1976). Language in the two-year-old. *Cognition, 4,* 189-202.

Gopnik, A., & Choi, S. (1995). Names, relational words, and cognitive development in English and Korean-speakers: Nouns are not always learned before verbs. In M. Tomasello & W. Merriman (Eds.), *Relations between linguistic and cognitive development* (pp. 63-80). Hillsdale, NJ: Lawrence Erlbaum.

Grimshaw, J. (1981). Form, function, and the language acquisition device. In C. L. Baker & J. McCarthy (Eds.), *The logical problem of language acquisition* (pp. 165-182). Cambridge, MA: MIT Press.

Macnamara, J. (1982). *Names for things. A study of human learning.* Cambridge, MA: MIT Press.

MacWhinney, B. (2000). *The CHILDES project: Tools for analyzing talk. Third Edition.* Mahwah, NJ: Lawrence Erlbaum.

Marantz, A. (1997). No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. *University of Pennsylvania Working Papers in Linguistics, 4,* 201-225.

Nabors-Olah, L. (2001, April). *Noun and verb production of young speakers of English and Hungarian.* Poster session presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Nelson, K., Hampson, J., & Shaw, L. K. (1993). Nouns in early lexicons: Evidence, explanations and implications. *Journal of Child Language, 20,* 61-84.

Ninio, A. (1999). Pathbreaking verbs in syntactic development and the question of prototypical transitivity. *Journal of Child Language, 26*, 619-53.

Oshima-Takane, Y., Barner, D., Bellamy, S., Butt, R., Boudewijnse, G.-J., & Weinlick, A. (1999). *Coding gestalt and non-gestalt words as nouns or verbs.* Unpublished manuscript, McGill University, Montréal.

Oshima-Takane, Y., Barner, D., Elsabbagh, M., & Guerriero, S. M. (1999, August). *The learning of deverbal nouns.* Poster session presented at the VIIIth Congress of the International Association for the Study of Child Language, San Sebastian, Basque Country.

Oshima-Takane, Y., Barner, D., Elsabbagh, M., & Guerriero, S. (2001). Learning of deverbal nouns. *Proceedings for the VIIIth Congress of the International Association for the Study of Child Language*, San Sebastian, Basque Country.

Pinker, S. (1984). *Language learnability and language development.* Cambridge, MA: Harvard University Press.

Pinker, S. (1989). *Learnability and cognition: The acquisition of argument structure.* Cambridge, MA: Bradford Books.

Sachs, J. (1983). Talking about the there and then: The emergence of displaced reference in parent-child discourse. In K. E. Nelson (Ed.), *Children's language, 4.* Hillsdale, N.J.: Erlbaum.

Schlesinger, I. (1971). Production of utterances and language acquisition. In D. Slobin (Ed.), *The ontogenesis of grammar* (pp. 63-101). New York, NY: Academic Press.

Tardif, T. (1996). Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabularies. *Developmental Psychology, 32,* 492-504.

Tardif, T., Gelman, S., & Xu, F. (1999). Putting the "noun bias" in context: A comparison of English and Mandarin. *Child Development, 70,* 620 635.

Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns before verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language, 24,* 535-565.

Theakston, A. L., Lieven, E. V. M., Pine, J. M. & Rowland, C. F. (1999). The role of performance limitations in the acquisition of 'mixed' argument structure at stage 1. In M. Perkins & S. Howard (Eds.) *New directions in language development and disorders* (pp. 127-152). New York, NY: Plenum.

Thordardottir, E., & Weismer, S. (2001). High frequency verbs and verb diversity in the spontaneous speech of school-age children with specific language impairment. *International Journal of Language and Communication Disorders, 36,* 221-244.

Uziel-Karl, S. (2000). Children's verb lexicon. *Proceedings of the 30th child language research forum,* (pp. 41-49). Stanford, CA: Center for the Study of Language and Information, for Stanford Linguistics Association.

Yamashita, Y. (1999). The acquisition of nouns and verbs in young Japanese children: Why do verbal nouns emerge early? In A. Greenhill, H. Littlefield, & Cheryl Tano (Eds.), *Proceedings of the 23rd Annual Boston University Conference on Language Development* (pp. 741-752). Somerville, MA: Cascadilla.

Appendix A

Transcript classification and ages of children at Periods I-III.

Child	Period[1]	Age (Y;M.D)	# of Sessions	# of utterances
Anne	I	1;10.7 – 1;11.20	12[2]	3464
	III	2;4.0 – 2;9.10	19	12040
Aran	I	1;11.12 – 2;0.9	8	2140
	III	2;4.27 – 2;8.19	22	5830
Becky	I	2:0.7 – 2;2.30	18	5736
	III	2:6.5 – 2;11.15	32	12383
Dominic	I	1;10.25 – 2;2.9	21	5729
	III	2;7.3 – 2;10.16	18	6172
Eve	I	1;6.0 – 1;7.0	4	1799
	III	1;10.0 – 2;3.0	12	7058
Naomi	I	1;2.29 – 1;10.14	13	2030
	III	2;3.0 – 3;3.26	23	4489
Nicole	I	2;0.25 – 2;5.26	30	6738
	III	3;0.10 – 3;0.10	2	710
Ruth	I	1;11.15 – 2;4.29	34	8647
	II	2;5.6 – 2;11.21	32	11773
Sarah	I	2;3.5 – 2;7.28	24	6493
	III	3;2.10 – 4;5.14	62	15610

[1] Period I includes transcripts having MLU values between 1.01 – 1.99; Period III includes transcripts with MLU values between 3.00 and 3.99 (see Barner, Guerriero, & Oshima-Takane, 2000).

[2] Sessions for Anne, Aran, Becky, Dominic, Nicole and Ruth were 30 minutes in duration each. Sessions for Eve were each one hour, while Sarah's varied, with an average of 30 minutes and 45 seconds. No information concerning session duration was available for Naomi.

Appendix B

Physical object target words

Bottle	Brush	Button	Comb	Cover
Crayon	Dress	Drink±	Drum	Fish
Hammer	Iron	Lock	Phone	Pin
Plug	Pump	Ride±	Shop±	Shovel
Slide	Step±	Swing	Tape	

Non-Object target words

Used in CP

Bite	Colour	Cough	Cuddle	Dance
Drink	Drive	Exercise	Help	Hug
Jump	Kiss	Kick	Look	Love
Mess	Name	Paint*	Party	Poo*
Push	Rest	Ride	Shop	Sleep
Step	Stop	Spank	Swim	Walk
Wash	Wee			

Not in CP

Bang	Blow	Burn	Butter*	Call
Climb	Crash	Cry	Cut	Drop
Dust*	End	Fall	Fight	Glue*
Joke	Laugh	Load	Pat	Peek
Peel	Peep	Pull	Rain	*Rock*
Rub	Run	Scratch	*Scream*	Shower
Smack	Smell	*Smile*	Smoke*	Sneeze
Sniff	Snooze	Snow*	*Shot*	Squeak
Squeeze	Stack	Stroke	Suck	Sulk
Surprise	Swop	Talk	Taste	Throw
Tickle	Top	Try	*Water**	Wave
Wipe				

± Indicates words used as nouns to denote both objects and non-objects.

* Indicates words that could be used to denote substances.

Appendix D

Reliability for coding

	Anne	Aran	Becky	Dom.	Eve	Naomi	Nicole	Ruth	Sarah
%	94.6	89.6	93.2	94.8	96.3	90.4	85.8	92.5	91.9

Chapter 4: General Discussion

The studies presented in this thesis investigated the status of syntax-semantics correspondences in early child language, beginning with an analysis of words that can be used as either noun or verb, and then examining whether the emergence of non-object words is delayed due to their use in complex predicate constructions by caregivers.

Results from these studies represent a significant contribution to our knowledge of how early syntactic and semantic representations relate to children's production of nouns and verbs. First, Paper 1 provided the first comprehensive study of words that can be used as both noun and verb, by examining both deverbal nouns and their verb counterparts and denominal verbs and their corresponding nouns, and by analyzing the production data of nine children and their caregivers. This unique analysis provided evidence that the noun bias previously observed at the earliest stages of acquisition (e.g., Gentner, 1982), may extend as late as Brown's Late Stage 1, when some children are as old as 2 years and 8 months old (e.g., Sarah). The study revealed that through Late Stage 1, the children used a majority of object (OB) words consistently as nouns and a majority of non-object (OT) words consistently as verbs. In addition, an analysis of all nouns used by the children showed that most were OB words. In each case, the degree of this polarization was greater in child speech than in the speech of caregivers, indicating a definite bias in the language of children. Also, results concerning the use of ordinary nouns and verbs indicated that while caregivers used more verb tokens than noun tokens, the children showed the opposite pattern, and used a greater number of nouns than verbs.

While providing evidence that the children used OT words infrequently as nouns and seldom with flexibility, Paper 1 also found interesting exceptions to this trend in the

analysis of words used as both noun and verb by the caregivers. An analysis of OT words that the children used consistently as nouns indicated that a very small number were used by the caregivers in complex predicate (CP) constructions. However, in the case of OT words that the children used flexibly, a somewhat larger proportion were used in CP constructions by the caregivers, providing a preliminary indication that use in CPs may lead children to produce target words as verbs rather than as nouns (see Nelson, Hampson, & Shaw, 1993; and Oshima-Takane et al., 2001, for conflicting views).

Paper 2 presented the first systematic comparison of CP and non-CP words, and also provided the first complete account of how children use light verbs with nominal and pronominal complements at Brown's Stage 1. First, to investigate whether the infrequent use of non-object nouns in child speech might be due to their use in CP constructions, Paper 2 compared children's production of CP and non-CP nouns. Results from this analysis suggested that the children's production of CP words showed a greater increase over time compared to OT words. In addition, the difference was attributable to children's relatively infrequent use of CP words at early stages. This result suggested that, early in acquisition, children rarely produce words that are used in CPs by caregivers, and that later in acquisition when mean length of utterance (MLU) values are greater, children produce CP words with frequencies equaling those of other non-object words. Thus, results from Paper 2 provided the first comprehensive analysis of the CP delay hypothesis (Oshima-Takane et al., 2001), and supported the hypothesis that certain words may emerge late in language acquisition due to their use in CP constructions.

To add support to this conclusion, Paper 2 also analyzed children's production of light verbs during early acquisition, and determined to what extent such verbs were used

with nominal complements. Since CP constructions comprise the use of a light verb with an event-denoting nominal as complement, evidence that children use light verbs with nominal complements early on but not CPs would fail to support the CP delay hypothesis, and would suggest that CP words are delayed by purely semantic factors. Instead, results indicated that very few light verb tokens were used with content-bearing nominal complements, whether denoting actions, events, or physical objects. Thus, the children's failure to produce CP words with high frequency may have resulted from a more general problem in producing light verbs with content-bearing noun complements. Thus, the analysis of light verbs supported the idea that CP words emerge late due to children's inability to consistently produce constructions with sufficient length and content to express both a light verb and a content-bearing noun complement.

The findings presented in this thesis have important consequences children's early language production should be understood. While providing evidence of a noun bias into Brown's Late Stage 1, the studies presented here suggested that such a bias may not be the exclusive result of cognitive factors (see Gentner, 1982; Gentner & Boroditsky, 2001). Instead, certain classes of words may emerge later in acquisition because their frequent expression requires longer, complex predicate constructions (Oshima-Takane et al., 2001). Consequently, the studies also bring into question the nature of the noun bias as described in younger children, and whether a CP delay or other language-specific factors may impact on the expression of specific classes of words. Although the delayed use of CP words cannot alone account for the degree of noun bias found in previous studies, evidence in support of the CP delay hypothesis does suggest that more attention should be paid to sub-patterns in early child language before conclusions concerning

cognitive constraints, etc. are drawn. Future studies should examine how language-specific expressions of morphological and syntactic configurations might delay the expression of particular argument structures, thematic roles, and other semantic classes of lexical items. Also, experimental studies concerning the CP delay hypothesis are required, to confirm that children comprehend expressions using CP words, but are unable to utter them due to production limitations related to MLU.

References for General Introduction and General Discussion

Au, T. K., Dapretto, M., & Song, Y. (1994). Input vs. constraints: Early word acquisition in Korean and English. *Journal of Memory and Language, 33,* 567-582.

Barner, D., & Bale, A. (2001, April). *Going strapless: Early acquisition and the bootstrapping hypotheses.* Poster presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Bates, E., Bretherton, I., Shore, C., & Snyder, L. (1984). *Early language inventory: Part I: Vocabulary checklist.* University of California at San Diego.

Bates, E., Dale, P.S., & Thal, D. (1995). Individual differences and their implications for theories of language development. In P. Fletcher & B. MacWhinney (Eds.), *The handbook of child language* (pp. 323-328). Oxford, England: Blackwell Publishers.

Bloom, L., Tinker, E., & Margulis, C. (1993). The words children learn: Evidence against a noun bias in early vocabularies. *Cognitive Development, 8,* 431-450.

Braine, M. D. S. (1992). What sort of structure is needed to "bootstrap" into syntax? *Cognition, 45,* 77-100.

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

Choi, S., & Gopnik, A. (1995). Early acquisition of verbs in Korean: A cross linguistic study. *Journal of Child Language, 22,* 497-529.

Fodor, J. A., (1966). How to learn to talk: Some simple ways. In F. Smith & G. Miller (Eds.), *The genesis of language* (pp. 105-122). Cambridge, MA: MIT Press.

Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. A. Kuczaj II (Ed.), *Language development, 2: Language, thought, and culture* (pp. 301-334). Hillsdale, NJ: Lawrence Erlbaum.

Gentner, D., & Boroditsky, L. (2001). Individuation, relativity, and word learning. In M. Bowerman & S. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 215-256). England: Cambridge University Press.

Goldin-Meadow, S., Seligman, M., & Gelman, R. (1976). Language in the two-year-old. *Cognition, 4,* 189-202.

Gopnik, A., & Choi, S. (1995). Names, relational words, and cognitive development in English and Korean-speakers: Nouns are not always learned before verbs. In M. Tomasello & W. Merriman (Eds.), *Relations between linguistic and cognitive development* (pp. 63-80). Hillsdale, NJ: Lawrence Erlbaum.

Grimshaw, J. (1981). Form, function, and the language acquisition device. In C. L. Baker & J. McCarthy (Eds.), *The logical problem of language acquisition* (pp. 165-182). Cambridge, MA: MIT Press.

Harley, H., & Noyer, R. (1998). Licensing in the non-lexicalist lexicon: Nominalization, roots and the encyclopedia. *MIT Working Papers in Linguistics, 32,* 119-137.

Macnamara, J. (1972). Cognitive basis of language learning in infants. *Psychological Review, 79,* 1-13.

Macnamara, J. (1982). *Names for things. A study of human learning.* Cambridge, MA: MIT Press.

Marantz, A. (1997). No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. *University of Pennsylvania Working Papers in Linguistics, 4,* 201-225.

Nelson, K., Hampson, J., & Shaw, L. K. (1993). Nouns in early lexicons: Evidence, explanations and implications. *Journal of Child Language, 20,* 61-84.

Nabors-Olah, L. (2001, April). *Noun and verb production of young speakers of English and Hungarian.* Poster session presented at the Biennial Meeting of the Society for Research in Child Development, Minneapolis, MN.

Oshima-Takane, Y., Barner, D., Elsabbagh, M., & Guerriero, S. M. (1999, August). *The learning of deverbal nouns.* Poster session presented at the VIIIth Congress of the International Association for the Study of Child Language, San Sebastian, Basque Country.

Oshima-Takane, Y., Barner, D., Elsabbagh, M., & Guerriero, S. M. (2001). Learning of deverbal nouns. *Proceedings for the VIIIth Congress of the International Association for the Study of Child Language,* San Sebastian, Basque Country.

Pinker, S. (1984). *Language learnability and language development.* Cambridge, MA: Harvard University Press.

Schlesinger, I. (1971). Production of utterances and language acquisition. In D. Slobin (Ed.), *The ontogenesis of grammar* (pp. 63-101). New York, NY: Academic Press.

Tardif, T. (1996). Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabularies. *Developmental Psychology, 32,* 492-504.

Tardif, T., Gelman, S., & Xu, F. (1999). Putting the "noun bias" in context: A comparison of English and Mandarin. *Child Development, 70,* 620-635.

Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns before verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language, 24,* 535-565.

Yamashita, Y. (1999). The acquisition of nouns and verbs in young Japanese children: Why do verbal nouns emerge early? In A. Greenhill, H. Littlefield, & Cheryl Tano (Eds.), *Proceedings of the 23rd Annual Boston University Conference on Language Development* (pp. 741-752). Somerville, MA: Cascadilla.