Acquisition of Grammatical Categories: Role of Physical Objects and Input

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Abstract

English deverbal nouns (DVN) and Japanese verbal nouns (VN) denoting actions present a difficult problem to the semantic bootstrapping hypothesis, where children initially use the semantic information of a word to identify its grammatical category. The present paper investigated how children learn to use English DVN and verb pairs or Japanese VNs not only as verbs but also as nouns. In particular, the role of physical objects as well as the effect of input in this learning process was examined. It is suggested that children's understanding of the relationship between the action denoted by a DVN or a VN and the physical object associated with the action, together with the distributional cues provided in the input, facilitate the early flexible use of these words.

1. Introduction

In many languages there exist words denoting action or change of state, which are used as nouns. English deverbal nouns (DVN), which are nouns derived from a verb or verb stem, are examples of such words. For instance, *movement* is a DVN derived from the verb *move*. Some English verbs undergo a category change to become DVNs without affixation of an overt derivational morpheme, such as *kiss, hug,* and *walk* (Lieber, 1980; Marchand, 1969). These DVN and verb pairs pose an interesting learning problem to children acquiring language. This is because the same form can be used as either a noun or a verb denoting the same action, as shown in (1).

(1) a. Hug me
b. Give me a hug.

The word *hug* in (1a) is used as verb, whereas *hug* in (1b) is a DVN and forms a complex predicate with the light verb *give* (Cattell, 1984). Furthermore, some DVNs can denote actions and physical objects (or stuff) as in (2).

(2) a. Drink your milk.
b. Have a drink of milk.
c. Finish your drink.

How do children know that *drink* in (2a) is a verb and that *drink* in (2b) and (2c) is a noun? This is particularly problematic to the semantic bootstrapping hypothesis, where children initially use the semantic information of a word such as object, action, property, and so on, to identify its grammatical category such as noun, verb, adjective, etc. (Macnamara, 1972, 1982; Pinker, 1987; Nelson, Hampson, & Shaw, 1993). If children employ semantic bootstrapping, they are expected to misclassify English DVNs initially as verbs, even though these words are used as nouns in the input as in (1b). Pinker (1987) tried to solve this problem by suggesting that mothers tend to avoid deverbal nominalizations in their child-directed speech at the semantic-bootstrapping stage. However, other researchers such as Macnamara (1982) and Nelson et al.(1993) have shown that mothers do use these words flexibly as both nouns and verbs from early stages.

To resolve this problem, Macnamara (1982) proposed that at an early stage children have the constraint that a single word cannot serve as both an object and an action word. They initially use words associated with physical objects as nouns and words denoting actions as verbs. Only later do children begin to use these words as nouns and as verbs flexibly based on morphosyntactic information. In support of this view, Macnamara (1982) analyzed Sarah's early vocabulary taken from Brown's (1973) corpora and concluded that Sarah did not use the same words to denote a physical object and the action associated with it at early stages, even though her mother used them flexibly as referring to an object and an action. Although further evidence has been reported in support of Macnamara's view (Butt, 1995), more recent studies report some contradictory findings, suggesting that children use deverbal nouns and denominal verbs from early stages (Barner, 1999, Nelson et al., 1993; Oshima-Takane, 1999; Oshima-Takane, Barner, Elsabbagh & Guerriero, 1999).

A similar learning problem occurs when children acquire Japanese verbal nouns (Oshima-Takane, 1999; Yamashita, 1995). Just like English DVNs, Japanese verbal nouns (VNs) denote actions or changes of state. They are used as nouns as indicated in (3a). They can also form complex predicates with the verb *suru* (do), as shown in (3b) and (3c) (Hasegawa, 1991; Uchida & Nakayama, 1993).

(3) a. benkyoo-ga suki. '(I) like study'
b. benkyoo-o suru. 'do study'
c. benkyoo suru. 'do study'

In (3b), the verb *suru* is separated from the VN by the accusative case marker -o, whereas the verb *suru* is directly attached to the VN in (3c). If VNs in (3b) function as nouns and those in (3c) function as verbs as proposed by Hasegawa (1991), then VNs pose the same learning problem to Japanese

children as is faced by children learning English DVNs, because both expressions (3b) and (3c) denote the same action. Further, like English DVNs, some VNs can denote a physical object as well as an action (Miyamoto, 1999). However, no studies have investigated whether the learning of English DVNs and Japanese VNs can be accounted for by the same learning mechanisms. The present paper directly addressed this issue by studying how children learn to use English DVNs and Japanese VNs. In particular, we investigated the role of physical objects as well as the effect of input in learning flexible use of words as both noun and verb.

2. Methods

2.1. Participants

English data consisted of a total of 113 transcripts of two children taken from CHILDES (MacWhinney, 1999): Naomi aged 1;2 to 4;9 (Sachs, 1983) and Eve aged 1;6 to 2;3 (Brown, 1973). Japanese data consisted of a total of 134 transcripts of two children; Ryo aged from 1;3 to 3;0 and Tai aged from 1;5 - 3;1 (Miyata, 1992; Miyata, 2000; Miyata, in press; Oshima-Takane, MacWhinney, Sirai, Miyata, & Naka, 1998). Transcripts were grouped into four developmental periods based on MLU values. Table 1 summarizes children's MLU and age ranges by period.

Table 1. Children's MLU and age ranges by period

Period	MLU	English		Japanese	
		Naomi	Eve	Tai	Ryo
I	1.00 – 1.99	1;2 – 1;10	1;6 – 1;7	1;5 – 1;8	1;3 – 2;2
II	2.00 – 2.99	1;10 - 2;2	1;8 - 1;9	1;8 – 2;0	2;2 – 2;6
III	3.00 – 3.99	2;3 – 3;3	1;10 - 2;3	2;1 – 2;7	2;6 - 3;0
IV	4.00 and above	3;3 – 4;9	-	2;8 – 3;1	

2.2. Materials

Sixteen English DVNs were selected from "West's General Service List of English Words with Semantic Frequencies", which documents the frequency of words of various grammatical categories in adult written language (West, 1967). Only DVNs satisfying the following criteria were selected as target words for the present study:

1) noun/verb pairs bearing identical phonemic representation
2) noun/verb pairs having logically related meanings

Noun/verb pairs were considered to have logically related meanings if an action denoted by a verb form (e.g., *Drink your juice*) took on a noun form that denotes the action (e.g., *Have a drink of juice*) or a physical object

associated with the action (e.g., *Finish your drink*). Three of the original 16 target words could be used to denote a physical object (i.e., *drink*, *swing*, and *ride*) and were called Gestalt words following Macnamara's suggestion (Butt, 1995). The remaining 13 target words were called Non-Gestalt words because there is no physical object associated with them.

Four types of Japanese VNs were located in the transcripts of Ryo and Tai: those of Chinese origin (e.g., *benkyoo* 'study'), Japanese origin (e.g., *kaimono* 'shopping'), English origin (e.g., *kisu* 'kiss'), and baby talk origin (e.g., *nenne* 'sleep', *pon*[1] an onomatopoeia for throwing). Among 34 different VNs located in the transcripts, a total of 24 VNs satisfying the selection criteria described in the next section were included in the present analysis**.** Four of them (i.e., *chuusha* 'injection', *shikko* 'pee', *denwa* 'phone', *tonton* hitting onomatopoeic sound; a baby word denoting the hitting action with a toy hammer) were Gestalt words and the remaining 20 target words were Non-Gestalt words.

2.3. Analysis

The morphological analysis program MOR/JMOR was performed on the transcripts (MacWhinney, 1999; Naka, 1998). Then, all utterances containing target words produced by the child and by the mother were searched by the KWAL program and were coded to indicate (1) whether or not a target word was associated with a discrete physical object, (2) whether it was used as noun, verb, or undecided, (3) whether it was used as part of a complex predicate or not, and (4) whether utterances containing the target words were spontaneous or imitative (Oshima-Takane, Barner, Bellamy, Butt, Boudwijnse, & Weinlick, 1999; Oshima-Takane, Miyata, & Naka, 1999). Target words were classified as noun or verb on the basis of surrounding words and bound morphemes such as determiners, plurals, possessive markers and verbal inflections for English data, and topic markers (e.g., *wa*, *mo*), postpositions (e.g., *ga, o, ni, de*), the copula verb *da* and the light verb *suru* for Japanese data. In Japanese, a VN in the VN+*suru* construction (e.g., *benkyoo suru* "do study')[2] was classified as verb usage, whereas a VN in the VN-o *suru* construction was classified as noun usage (Hasegawa, 1991). Pragmatic context was taken into consideration for words that could denote either an object or an action. For example, in the utterance "Doggie took a drink" the word *drink* must denote an action because an animal cannot be said to be taking an object (e.g., a glass of juice).

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[1] Only onomatopoeia which were used clearly as a noun (e.g., *pon wa doko* 'Where is pon?") or as a verb (e.g., *pon shite* 'throw ') were included in the present analysis.

[2] VN+yaru was classified as verb usage because both the child and the mother used VN+suru and VN+yaru interchangeably.

Utterances containing only a target word were classified as a single-VN utterance and were excluded from the present analysis unless the pragmatic context clearly indicated that it was used as noun or as verb (e.g., *tonton* 'an onomatopoeic expression for a hammer' in response to a question, "What is this?", pointing to a toy hammer). The VN with an argument construction (e.g., *Papa benkyoo* 'Daddy study') was classified as undecided, […cut…]

3. Results

3.1. English data

Table 2 summarizes frequencies of three Gestalt words which can refer to either objects or actions (*swing*, *drink*, and *ride*) in the child's speech and in the input. Frequencies of nouns used in complex predicates are shown in parentheses. *Drink* and *ride* were used productively as verb by both Naomi and Eve, while *swing* was used productively only by Naomi. As for noun use, only *drink* was used productively by both children. *Swing* and *ride* were used productively as nouns by Naomi only. She passed the criteria for productive flexible use for two Gestalt words: *drink* and *ride*. Eve passed the criteria for productive flexible use for only one Gestalt word: *drink*. Each Gestalt word that was used flexibly as both noun and verb by a child was used flexibly in the input as well. Naomi's mother used all three Gestalt words as both verbs and nouns and so did Naomi. However, Naomi passed the criterion for flexible productive use for two words only: *drink* and *ride*. Eve's mother used one Gestalt word *drink* as both noun and verb. Eve used *drink* and *swing* but passed the criteria for flexible productive use for *drink*

Table 2. Frequency of Gestalt words in children's speech and in the input.

Naomi and Input

	Input		Naomi			
					Productive use[1]	
words	Verb	noun	verb	noun	verb	noun
Swing	6	6	1	14	-	II
Drink	20	1	48	11	II	II
Ride	6	1 (1)	5	7 (4)	IV	III

[….cut…]

4. Discussion

Many English Non-Gestalt words and Japanese Non-Gestalt VNs were consistently used as verbs in the speech of both mothers and children. However, some of them were used flexibly as nouns and verbs in the input from early stages. There was no indication that mothers avoid deverbal nominalizations or nominal use of VNs to simplify children's learning task as

suggested by Pinker (1987). Furthermore, children produced some target words flexibly as nouns and verbs early in acquisition. For instance, both Naomi and Eve used *drink* flexibly as noun and verb at an early stage. More importantly, they used *drink* to denote an action (e.g., *drink your juice*) as well as a physical object (e.g., *your drink*). This result is taken as evidence that children do not need the constraint that a single word cannot be used to denote both an object and an action. Furthermore, children did not always begin by using the Gestalt words as nouns as suggested by Macnamara. Some such words were initially used as nouns but others were used as verbs or as both nouns and verbs from the beginning. Further evidence against Macnamara's constraint was the finding that the child did not always begin by using Non-Gestalt words as verbs. These results suggest that the original semantic bootstrapping hypotheses, as formulated by Macnamara (1982) and Pinker (1987), fail to provide a satisfactory account of how children learn English DVNs and Japanese VNs.

There are indications that input plays an important role in learning flexible use of Japanese VNs, English DVNs and their verb counterparts. For instance, Gestalt and Non-Gestalt words used flexibly as nouns and verbs by a child were a subset of those used as nouns and verbs in the input. Furthermore, complex predicates for the English DVNs and Japanese VNs were not produced by a child unless they were used in the input. However, there are some indications that the input alone cannot explain the child's use fully. English data indicated that children used Gestalt words flexibly as nouns and verbs early on even though Gestalt words were used as verbs predominantly in the input. By contrast Non-Gestalt words were used primarily as verbs by children and their noun usage appeared only during the later developmental stages, even though they were used flexibly as verbs and nouns in the input from early on. Although Japanese data did not necessarily follow these patterns, the results indicated that frequency of use as noun or verb in the input did not by itself predict similar use in early child language. The finding that children used some Non-Gestalt words to denote a physical object creatively also supports this view. The following example (4) indicates that Ryo initially used *benkyoo* 'study' to refer to a physical object, desk, despite the fact that the mother had never used it in that way.

(4) Ryo (2;7.4; Period III)
*RYO: *kore* . 'this'
*RYO: *Mama*@v , *obenkyoo aru yo* . 'Mom, there's a study.'
%act: touching his sister's desk
*RMO: *n* ? 'hm?'
*RYO: *obenkyoo aru yo*. 'there's a study'
*RMO: *tsukue*? 'desk?'

Ryo's creative use of *benkyoo* 'study' as referring to his sister's desk seems to indicate that he understood the relationship between the action denoted by the VN *benkyoo* 'study' and the physical object, desk, associated with the action. A similar creative use of DVNs was observed in English-speaking children. The following example (5) shows that Sarah used a verb, *cut*, as noun to refer to a physical object, knife:

(5) Sarah (2;3.5; Period I)
*ROG: *what's this?*
*SAR: *a (s)poon.*
*ROG: *a spoon.*
*ROG: *What's this?*
%exp: knife
*SAR: *a cut*.
*MOT: *Sarah*.
%par: deprecating laugh
*MOT: *she knows what it does*.
%par: deprecating laugh

As noted by her mother, Sarah understood the function of the object, and used the name (i.e., *cut*) for it to refer to the knife itself. This type of error using artifact kind nouns and associated verbs have been reported in the literature (e.g. Kuczaj, 1978; Maratsos & Chalkey, 1981). The present study [….cut…]

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文法カテゴリの獲得におけるインプットと物理的事物の役割

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動作を意味する英語の動詞派生名詞(DVN)と日本語の動名詞(VN)は、単語の基本的な意味カテゴリーが、文法獲得に初期起動的役割を果たすとする意味的初期起動仮説に難しい問題を提供する。子供は、動作カテゴリーの意味をもつ単語にたいして、動詞を付与すると仮定するため、英語の動詞派生名詞や日本語の動名詞の獲得の際に混乱を引き起こすと考えられるからである。本研究では、英語母語児と日本語母語児、それぞれ2名の発話データを縦断的に分析することにより、英語の動詞とその派生名詞、および、日本語の動名詞の動詞的使用と名詞的使用がどのように獲得されるのか検討した。本研究の結果から、親のインプットだけでなく、動詞派生名詞や動名詞が指示する動作とそれと密接な関係のある物理的事物の理解が、英語の動詞とその派生名詞の使用、そして、日本語の動名詞の名詞的使用と動詞的使用を促進することが示唆された。