On the Acquisition of Noun-Noun Compounds in Japanese

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Abstract

It is still an undetermined issue whether preschool children in a productive compounding language have robust knowledge comparable to that of the adults. The aim of this preliminary study is to explore how children interpret noun-noun compounds without depending on context in a comprehension task. 24 Japanese monolingual children (mean age: 5 ; 8) and 24 adult controls were asked to identify the head and to assign a meaning for a familiar compound and a novel one. It is shown that while children are still in the middle of developing their knowledge of internal structure and head-modifier relationships, both they and the adults were affected by pragmatic factors. This finding supports the claim that the acquisition of interface properties is inherently difficult.

Keywords : noun-noun compounds ／ language acquisition ／ headedness ／ relationships ／ familiarity

1. Introduction

The present study concerns the acquisition of endocentric noun + noun compounds (NNCs) in Japanese. Languages fall into two types depending on whether they allow productive NNCs or not (Clark 1993, Snyder 1995, Hiramatsu, Snyder, and Roeper 2000, Beck and Snyder 2001, etc.). In Germanic languages, compounding is productive and frequent. In contrast, in Romance languages such as French or in some non-Indo-European languages such as Hebrew, compounding is not productive and infrequent.

Japanese is one of the languages which belong to the former group (Snyder 1995, Sugisaki and Isobe 2000, etc.). Most NNCs in productive compounding languages show endocentricity. Thus, *ringo-zyuusu* 'apple juice' is a kind of juice, not an apple. In Japanese, the rightmost element serves as the head. This structural rule is called the Right-hand Head Rule (RHR) (Williams 1977).[1] In addition to the endocentric structure, there are several likely modifier-head relationships in word structure in languages in which NNCs are productive (Krott and Nicoladis 2005, Nicoladis and Krott 2007, Krott, Gagné, and Nicoladis 2009, etc.). For example, *kirin-enpitu* 'giraffe pencil' could be different kinds of pencils, including 'a pencil that HAS a picture of a giraffe on it' or 'a pencil which is used FOR drawing a giraffe.' Selection of relationships is context-dependent.

When and how can children learn such knowledge? Children's production and comprehension of NNCs has been the subject of theoretical and experimental research over the past twenty years or so, especially because NNCs can be seen as a reflection of properties of Universal Grammar, the initial state of the faculty of language. In this study, we examine children's and adults' ability to identify the head of a transparent and novel NNC and the ability to understand the relationships between the head and its modifier without depending on context.

2. Previous studies

2. 1 Word formations in Japanese

This section overviews the repertoire of word formations in Japanese NNCs. Word formations in Japanese can be roughly classified into four groups, in terms of possible combinations (Kageyama 1993):

(1) a. 'root + root', where we have a combination of (free or bound) morphemes, e.g. *mu-ti* lit. 'no-knowledge' = 'ignorance', *zi-sin* lit. 'ground-shaking' = 'earthquake'

b. 'root + stem', in which a bound morpheme is followed by a noun, e.g. *mi-seinen* lit. 'un (der) -adult age' = 'minor', *hu-keiki* lit. 'bad-times' = 'recession'

c. 'stem + stem', those which morphologically contain two stems, e.g. *zisin-gakusya* lit. 'earthquake -scholar' = 'seismologist', *keiki-kaihuku* 'business recovery'

d. 'word (or stem) + word', in which a noun is superficially attached to the right-hand (or left-hand) position of a NNC, e.g. *zisin-gakusya* kaigi lit. 'earthquake scholar meeting' = 'a meeting of the seismologists', *keiki-kaihuku houkoku* 'a report of the business recovery'

Stems are composed of two (free or bound) morphemes. According to Kageyama (1993), words can be classified into the following types:

(2) a. Simple words which cannot be further divided, e.g. *tiizu* 'cheese', *hosi* 'star'

b. Stems that can occur in isolation, e.g. *zi-sin* 'earthquake', *hana-bi* lit. 'flower-fire' = 'fireworks'

c. Morphological units consisting of two stems, e.g. *keiki-kaihuku* 'business recovery', *tonkatu-bentou* 'pork-cutlet lunch box'

Although research to date suggests that Japanese is a typical productive compounding language, two points deserve mention here. First, not all types of combinations are possible within a NNC. For instance, as already pointed out by Kageyama (1993), prefixes such as *hu-*, *mi-* 'non-', a non-autonomous constituent, cannot co-occur with a larger morphological unit (e.g. **mi-keiki-kaihuku* 'non-business recovery').

Second, the productivity of word formation processes ranges from restricted to extensive (Nomura 1984, Shimamura 1997). NNCs composed of two roots are more limited than others. Specifically, the same kinds of members, based on their origin, are predominantly combined and tend to be easy to lexicalize in Japanese, where nouns can roughly be divided into three groups, i.e. (i) the native nouns, (ii) the Sino-Japanese nouns comprising Chinese elements, and (iii) the foreign nouns which come from languages other than Chinese.

(3) a. *kyaku-ma*　lit. 'guest-space' = 'guest room'　(type (i) + type (ii))
b. *beniya-ita*　lit. 'venner-board' = 'plywood'　(type (iii) + type (i))
c. *meetoru-zyaku*　lit. 'meter-measure' = 'meter rule'　(type (iii) + type (ii))
(Nomura 1984: 52-53)

As Nomura (1984) observes, NNCs of these types are quite uncommon and are usually lexicalized. On the other hand, word formation processes at word (or word-plus) -level are more productive than those of morpheme-level, regardless of their combinational patterns.

(4) a. *yuki-gassen*　lit. 'snow fight' = 'snowball fight'　(type (i) + type (ii))
b. *piano-kyoositu*　lit. 'piano lesson' = 'piano school'　(type (iii) + type (ii))
c. *zyanbo-takarakuzi*　'jumbo lottery'　(type (iii) + type (i))

More and more complex words are possible if we recursively merge a new element with the NNCs:

(5) a. [[*yuki-gassen*] *kaizyoo*]　'ground for snowball fight'
b. [[*piano-kyoositu*] *dayori*]　'news from piano school'
c. [*nenmatu* [*zyanbo-takarakuzi*]]　'year-end jumbo lottery'

The heads of the NNCs exemplified above also occur in the rightmost position, although their meanings are more restricted, by adding modification. If we regard recursion as one of the measures/signs of the productivity of a NNC (Namiki 2001, Kageyama 2009, etc.), 'stem + stem' types such as (1c) or 'word + word' types (1d) are preferable to the others when examining children's identification of the head of a productive NNC. Of these, we will use 'stem + stem' types as stimuli in this experiment, because it seems to be easier for preschool children to identify the head, unlike in 'word + word' types.[2]

2. 2　Acquisition period

Most of the previous studies on the acquisition of NNCs indicate that the acquisition period for NNCs

correlates strongly with the degree of productivity and frequency from a cross-linguistic perspective. Most of these studies are based on a picture selection task or an elicited production task (Clark 1981, Clark, Gelman, and Lane 1985, Mellenius 1997, Sugisaki and Isobe 2000, Nakao, Akima, and Nakajima 2001, Nicoladis 2003, etc.).

For example, Clark et al. (1985) report that two- to three-year-old children acquiring English, in which NNCs are productive, can successfully produce novel NNCs in spontaneous speech and interpret them in comprehension tasks in experimental studies. In French and Hebrew, on the other hand, in which compounding is unproductive and infrequent, children cannot perform well at this stage and they are likely to coin and understand NNCs at later stages (Clark and Berman 1987, Clark 1998, Nicoladis 2002, 2003, etc.).

Although these tendencies have been noticed in many previous studies, whether this is on the right track is still an issue because of the following reasons. First, there have been few studies that tested the data both on children and on adults with the same materials. Thus, it remains unclear whether two-year-old (or older) children can successfully produce or interpret NNCs as adults do, without a significant gap.

Second, most empirical research on children's acquisition to date has focused on highly familiar NNCs with transparent meaning such as *ringo-zyuusu* 'apple juice' (= FROM) or *tyoko-mikan* 'chocolate orange' (= HAS). Familiarity with the thing denoted by the NNC does seem to influence the ease with which novel combinations can be interpreted. It is reported that the dominant relationship is generally easier to select than less available ones (Gangé and Shoben 1997, Gangé 2002, Gangé and Spalding 2004). For example, *ringo-zyuusu* may be easier to interpret than *ringo-bako* 'apple box' (= FOR, LIKE, etc.), because the modifier *ringo* is typically used in the relationship FROM. Thus, children might interpret a NNC by analogy, based on past experience with phrases containing the same modifier, such as *ringo-zyamu* 'apple jam' or *ringo-ame* 'apple candy', in the case of familiar NNCs. Note that novel (or unfamiliar) NNCs (e.g. *ringo-bako*), unlike familiar ones, do not necessarily establish a common usage (i.e. the dominant relationship). It is doubtful, however, whether we can fully measure children's abilities only in case of familiar NNCs, because we can easily imagine a situation in which participants easily identify *zyuusu* as the head of *ringo-zyuusu* based only on past experience with the thing and without linguistic computation/application of a rule.

Third, Krott et al. (2009), following Krott and Nicoladis (2005) and Nicoladis and Krott (2007), contends that English-speaking children even around the age of five years cannot fully understand NNCs in comprehension tasks when given stimuli out of context. The participants in the previous studies might have relied heavily on context when they produced or processed NNCs. Note that the modifier-head relationships of novel NNCs in such studies would be frozen, since they were provided with not only the pictures of the two constituent words but also those of the NNCs, thus restricting interpretation to the one unambiguous type of relationship artificially illustrated in the picture. To avoid such a situation,

comprehension tasks by Krott et al.（2009）were carried out with no contexts. Thus, children（mean 5；8）were required to account for the meaning of a target NNC, something like *farm animal*, without depending on context（e.g. a picture of an animal which is LOCATED at a farm）when they were asked "What does 'farm animal' mean?". They report some important aspects of the acquisition of novel NNCs by English-speaking children. For example, 18.5% of the children's responses were the reversed pattern for headedness in NNCs. Of all child responses, 39.7% were dominant interpretations, i.e. interpretations that were preferred by adults.

Given these results, it remains unclear whether English-speaking children, even around the age of five years, fully understand NNCs. If so, taking away the benefit of pragmatic factors should provide us with a more accurate measure of children's knowledge of NNCs. The present study conducted such a comprehension task.

3. Experiment

The primary purpose of this experiment is to examine to what extent Japanese-speaking children are able to identify the head and understand the head-modifier relationships both in familiar and novel NNCs without pragmatic context, and to compare their results with those of the adults.

3. 1 Participants

The participants were 24 Japanese-speaking children. The average age for the kindergarteners was 5；8（range; 5；3－6；2, 12 boys, 12 girls）.[3] 24 graduate and undergraduate students, all native speakers of Japanese, participated in the experiment as a control group; the average age was 21; 1（range: 19; 7－21; 7）.

3. 2 Materials

For the constituents of NNCs, we selected the simple（or lexicalized）nouns that are given in *Kotoba-asobi-ekaado* "Word-Play Picture Cards" published by Suzuki Publishers（2000）, intended for children aged 4 to 6. We constructed 3 lists of NNCs, each list consisting of 14 items, and then we constructed three more lists in which the order of the nouns in the NNCs was reversed. A total of 84 NNCs（6 lists）were used as stimuli for the experiment（see the Appendix）. The familiarity of a NNC, which may affect the ease of interpretation of novel combinations, was determined based on the preferences shown by the control group of undergraduate students, 46 native speakers of Japanese, in the questionnaires we gave them. They were required to fill in the degree of familiarity for each NNC. Familiarity was rated on a scale of 1 to 7: 1 = not at all familiar; 7 = extremely familiar. A cluster analysis using the rating of familiarity showed three distinct subgroups: High, Middle, and Low. The dominant relationship for each NNC was also determined based on the responses preferred by the students（See the Appendix for

examples of dominant relationships).[4] To examine whether familiarity with NNCs may affect the results, we included the three conditions of familiarity. The child group and adult group were divided into six sub-groups arbitrarily, with each sub-group consisting of 6 subjects, to avoid a situation in which the degree of difficulty of each list would influence the results.[5]

3．3　Procedure

The participants were instructed to select the head noun from the two constituents in each stimulus (without pictures of the NNCs), after confirming that they can understand and name each of the constituents displayed on the screen of the computer.

（6）Sample procedure（translated from Japanese into English）[6]

Experimenter: (showing a picture of a giraffe) Do you know what this is?
Child: A giraffe!
Experimenter: (showing a picture of a pencil) Do you know what this is?
Child: A pencil!
Experimenter: (changing the computer screen to an eye fixation screen)
(i) Now, which does *giraffe pencil* refer to, 'giraffe' or 'pencil' ?
(ii) What kind of image do you have about 'giraffe pencil'?

A pilot test with two relatively familiar NNCs *kuriimu-pan* lit. 'cream bun' = 'sweet roll containing cream' (= HAS) and *ike-ahiru* 'pond duck' (= LOCATED) ensured that all children understood the task and performed well. They were successful in identifying the head and responded with the dominant relationship in the pilot test.

3．4　Predictions

As for children's interpretation of NNCs, we expected the following: if the children had robust knowledge of the RHR of 'giraffe pencil', they would select 'pencil' as the answer to the first question and give an answer in which the left noun semantically modifies the head as in 'a pencil that HAS the picture of a giraffe on it' to the second question. Furthermore, if their understanding of NNCs were affected by familiarity, the accuracy rate of High would show the best results of the three conditions.

4．Results

Two answers were obtained to the two questions above for each of the 14 different stimuli in a list from each participant.[7, 8] Before analyzing the responses, we replaced any stimulus in which the participants

could not name the object on the screen with a missing value. The two groups' mean scores on the RHR and the relationship in the NNCs for the comprehension task are summarized in Table 1.

Table 1. *Mean (%) and standard deviations for the RHR task and relationship task*

	RHR		Relationship	
	M	SD	M	SD
Children (n= 24)	57. 4	16. 9	45. 0	18. 4
Adults (n= 24)	91. 1	11. 3	89. 3	10. 9

Note: n = number; RHR = the Right-hand Head Rule; M = mean; SD = standard deviation

A 2 (language group: child group, or adult group) × 2 (task: the RHR and the relationship) repeated -measures analysis of variance (ANOVA) was performed on the test scores of the 48 participants. The results showed a significant main effect of the language group [F (1, 46) = 25.10, $p < .001$] and the task [F (1, 46) = 89.94, $p < .001$]. The interaction of these two variables was not significant [F (1, 46) = 3.78, p=.20]. Since language group conditions displayed a significant main effect, simple contrast analyses were carried out in order to clarify the difference between the two language groups. The adult group performed better than the child group [for the RHR; $t(46) = 63.00 < .001$; for the relationship; $t(46) = 98.90$, $p < .001$]. We performed further contrast analyses on the task type, which revealed that the RHR task elicited significantly better results than the relationship task in each language group [for the children; t (23) = 113.10, $p < .001$; for the adults [t (23) = 7.76, $p < .05$].

As for the familiarity condition, Table 2 summarizes the two groups' success rate on the RHR and relationship task.

Table 2. *Success rate (%) on the basis of familiarity bias (High, Middle, Low)*

	RHR		Relationship	
Familiarity	Children	Adults	Children	Adults
High	65. 8	95. 0	53. 3	95. 0
Middle	53. 9	93. 4	45. 0	93. 4
Low	52. 5	85. 4	37. 7	79. 6

A 2 (language group: child group or adult group) × 3 (familiarity: High, Middle, or Low) two-way ANOVA was conducted for the RHR task. The results indicated a significant main effect of language group [F (1,74) = 180.05, $p < .001$] and familiarity [F (1,74) = 7.60, $p < .001$]. The interaction of these variables was not significant [F (1,74) = 1.56, p=.21]. In order to further examine the differences between the two groups, simple contrast analyses were performed. There was a significant difference

between the adult and child group [for High, t (74) = 173.70, $p < .001$; for Middle, t (74) = 173.70, $p < .001$; for Low, t (74) = 40.34, $p < .001$].

As for familiarity, the children understood the condition High better than Middle [$t(37) = 6.65$, $p < .05$] and Low [t (37) = 6.97, $p < .05$]. The difference between Middle and Low was not significant [t (37) = 37.38, $p = .08$] . On the other hand, simple contrast analyses for the adults showed that the accuracy rates for Low were significantly less than those for High [t (37) = 15.96, $p < .001$] and Middle [t (37) = 5.19, $p < .05$]. We could not detect a significant difference between High and Middle [t (37) = 1.94, $p = .17$].

The same ANOVA was carried out on the relationship task. There was a significant main effect of language group [F (1,74) = 214.93, $p < .001$] and familiarity [F (1,74) = 10.63, $p < .001$]. Again, the interaction of these variables was not significant [F (1,74) = 0.68, $p = .51$]. It was revealed by simple contrast analyses that the adult group answered more accurately than the child group [for High, t (74) = 246.42, $p < .001$; for Middle, t (74) = 84.60, $p < .001$; for Low, t (74) = 45.11, $p < .001$].

To test the difference in familiarity, further simple contrast analyses were performed. In the children's case, the condition High was significantly better understood than Low [t (37) = 8.15, $p < .001$]. There were no significant differences between High and Middle [t (37) = 3.40, $p = .07$], and Middle and Low [t (37) = 1.56, $p = .22$]. As for the adult group, there was a significant difference between High and Low [t (37) = 11.90, $p < .001$], and Middle and Low [t (37) = 6.34, $p < .05$] . No significant difference was observed between High and Middle [t (37) = 0.31, $p = .59$].

5. Discussion

The present study leads to the following important findings. First, the fact that the adults performed significantly better than the children on each task indicates that the ability necessary to form NNCs is not fully established at least at this stage, although it is important to also consider here the gap between children's and adults' linguistic and cognitive background (encyclopedic knowledge, Japanese proficiency, educational experience, working memory, etc.), especially with respect to the relationship task. Our results bring additional evidence from Japanese that the acquisition period for NNCs is later than expected (Krott and Nicoladis, 2005; Nicoladis and Krott 2007; Krott et al. 2009).

Second, children's and adults' success rates on the RHR task were significantly higher than the ones on the relationship task, suggesting that they are sensitive to contextual information in the interpretation of NNCs. Notice that the Maturational Hypothesis (Borer and Wexler 1987), according to which Universal Grammar is not fully available at birth but matures at later stages, would not account for this result. This is because significant differences in performance on these two tasks were observable even in the adult group. The result is consistent with the possibility that knowledge depending on the syntax-pragmatics interface (e.g. null subjects in pro-drop languages such as Italian) is more difficult to acquire and/or is

easier to be affected by L 1 attrition than that depending exclusively on narrow syntax, even in adult L 2 acquisition (Paradis and Navarro 2003, Sorace 2005, Serratrice, Sorace, Filiaci, and Baldo 2009, etc.). What causes the RHR-relationship asymmetry? Following Baker (1988), Roeper, Snyder, and Hiramatsu (2002), we assume that productive NNCs are derived in syntax.[9, 10] In the framework of the Minimalist program (Chomsky 2008, 2013, etc.), the operation *Label* ensures the endocentricity of structures (linearly, the RHR). What is of concern here is that *Label* is assumed to be a purely syntactic operation at work in the computational system, but not in the semantic/pragmatic modules. Although *Label* is considered to be a theory-internal notion (Chomsky 2013), the notion of headedness is still important, especially at the conceptual-intentional interface, to capture the effects of endocentricity on interpretation both in word structures and phrase structures. Note that *ringo-zyuusu*, as we have already seen above, is interpreted as a kind of juice, not an apple. Relationships such as HAS or FROM, on the other hand, operate on the semantic/pragmatic level. Thus, for the children's linguistic computation to be adult-like, they have to learn to interpret novel NNCs depending on context. It is possible that a large number of relationships make this more difficult to acquire.

Third, the results obtained on familiarity indicate that familiarity can influence the ease with which NNCs are interpreted. Although there are significant differences between the children's and adults' success rates on the two task conditions, children, like adults, did distinguish between familiar NNCs and not-so-familiar ones. Krott and Nicoladis (2005) conducted a comprehension task for English-speaking children based on the size of the family of constituents. They argue, based on scores provided for the modifiers and the heads, that children's interpretation of NNCs is especially affected by the size of the modifier's family of constituents. The size of the modifier's family of constituents refers to the number of NNCs that share the same modifier: a NNC containing a modifier with a larger family size is more frequent than a NNC containing a modifier with a smaller one. If our child participants relied on the size of the modifier's family of constituents in particular, the modifier nouns included in NNCs on the High list might be more frequent than the ones included in NNCs on the Middle or Low list. Further research needs to be conducted to confirm this.

6. Conclusion

The experimental results of the present study with Japanese-speaking children revealed that, unlike adults, even five-year-olds still have some problems in interpreting NNCs without contextual information. Nevertheless, the results presented here show that their behavior is essentially the same as the adults' in that the RHR-relationship asymmetry was observed in both groups, adding another piece of evidence to the view that knowledge depending on the syntax-pragmatics interface is inherently difficult to acquire in the course of grammatical and cognitive development (e.g. Sorace 2005).

Footnotes

1 Although right-headed NNCs like *ringo-zyuusu* seem to be the most productive type in Japanese, there are other types of NNCs in terms of headedness such as the following:

（i） a. Coordinate or double headed: *oya-ko* 'parents and their children', *kusa-bana* lit. 'grass-flower' = 'flower'

b. Exocentric or headless: *umi-neko* lit. 'sea-cat' = 'black-tailed gull'

c. Left-headed: *zyaga-bataa* lit. 'potato butter' = 'baked potato topped with butter'

We put these exceptions aside and concentrate on endocentric right-headed NNCs in this article.

2 Just for reference, there are forty-six NNCs that include one of the nouns used in this experiment, *hosi* or *sei* 'star' in the *Kozien*, the most authoritative Japanese dictionary.

3 In this experiment, we carried out tests three times at intervals of four months to assess the development of the children's knowledge of NNCs from a longitudinal perspective. We report on the results at the time of the first testing.

4 Although it would be interesting to investigate to what extent the relationships preferred by Japanese children are adult-like, we will not take up this question in this article.

5 A different list was randomly allocated to each sub-group at each testing. If a subgroup was presented with a certain list（e.g. list １）at the first testing, it was not subsequently presented with its reverse counterpart（e.g. list ２）at the second or third testing. All subjects saw each list once in one of the orders. The subjects who received list １ or ２ at the first testing received one of the other lists（i.e. ３, ４, ５ or ６）at the second testing.

6 The order of presentation of the two constituents in the NNCs was counter-balanced to discourage the participants from determining the head based on the given fixed linear order. A counter-balanced design was also used for the orders of the two nouns in testing of the RHR（e.g. "Which does 'giraffe pencil' refer to, 'giraffe' or 'pencil'?" or "Which does 'giraffe pencil' refer to, 'pencil' or 'giraffe'?"）to prevent the participants from inferring the structural head position based on the order in the question.

7 In the case of *ike-ahiru*, for example, some of the children responded with: *Ahiru-ga ike-ni iru-yo*. "There is a duck in the pond." Although the left noun *ahiru* does not modify the head *ike* in this sentence, we judged this kind of answers accurate. We suppose that some of them preferred an answer with a sentence because of their limited speaking skills, working memory, personal experience, etc. Incidentally, all adult controls answered with a relative clause such as *Ike-ni iru ahiru* 'a duck which is in the lake.'

8 We judged the following types of response as inaccurate: （i） the semantic properties of the modifier were not referred to（e.g. delicious curry for *korokke-karee* 'croquette curry', an owl that appears at night for *hugu-hukurou* 'globefish owl'）. An anonymous reviewer pointed out that the error may have been caused by the subject's limited working memory. Note that 'croquette-curry' and 'delicious curry' are not semantically inconsistent. When children gave this type of response, the experimenters asked them why they think so. If the subsequent answer correctly referred to the modifier, we marked the answer as accurate. Although this error may have been caused by their working memory, there were no children who gave only this type of response; （ii） the modifier-head relationship

was reversed (e.g. *wani-banana* 'crocodile banana' is a crocodile that eats bananas, *houki-mazyo* 'broom witch' is a broom used by a witch); (iii) the subject inserted the coordinating conjunction *to* 'and' between the modifier and the head (e.g. *suika-piza* 'watermelon pizza' is a watermelon and a pizza that are on the table, *zou-gorira* 'gorilla elephant' is a gorilla and an elephant that have lived together). As we have seen above, coordinate NNCs do exist in Japanese. Thus it might be more suitable to say that these answers were not so much inaccurate as treated as exceptions. It has been argued in many studies that coordinate constructions are different from NNCs in that they lack endocentricity, one of the important properties of productive NNCs (Munn 1993, Postal 1993, Nunes 2004). If we judge this type of answers accurate, this does not affect the total result; (iv) the answer was "I do not know."

9 Note that we consider only productive NNCs but not unproductive or lexicalized ones (e.g. *isi-atama* lit. 'stone -head' = 'obstinate'). As we have seen above, our results indicate that familiarity does influence the ease with which novel combinations are interpreted: the more familiar a NNC is the more easily a child is able to interpret it. In other words, it is possible that lexicalized NNCs are retrieved from associative memory without linguistic computation. This finding is consistent with the Dual Mechanism Morphology (e.g. Pinker 1999), according to which morphologically complex words can be divided into two types: those that are stored in memory as they are and those that result from combinative rules.

10 See Harley (2009) for compounding in the Distributed Morphology framework.

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Appendix

Table 3: Samples of stimuli

target items		Familiarity	Dominant relationship
tamanegi-sarada	'onion salad'	High	MADE OF
kiiui-gamu	'kiwi gum'	High	FROM
tonkatu-bentou	'fried pork cutlet packed box'	High	HAS
kaminari-gumo	'thunder cloud'	High	CAUSE
hanabi-basi	'fireworks bridge'	Middle	FOR
santa-huusen	'Santa Claus balloon'	Middle	LIKE
genkan-neko	'entrance cat'	Middle	LOCATED
houki-mazyo	'broom witch'	Middle	USE
katatumuri-byouin	'snail hospital'	Low	HAS
kasutanetto-kaba	'castanet hippopotamus'	Low	LIKE
tansu-sukaato	'chest skirt'	Low	LOCATED
hosi-niji	'star rainbow'	Low	MADE OF

Note: CAUSE（B causes A）; FOR（B is for A）; FROM（B comes from/is derived from A）; HAS（B has A）; LOCATED（B is located at A）; MADE OF（B is made of A）; USE（B uses A）