Cognition 136 (2015) 350–358

Contents lists available at ScienceDirect

Cognition

journal homepage: www.elsevier.com/locate/COGNIT

Brief article

Predictive processing of novel compounds: Evidence from Japanese

Yuki Hirose [a,*], Reiko Mazuka [b]

[a] The University of Tokyo, 3-8-1, Komaba, Meguro-ku, Tokyo 153-8902, Japan
[b] RIKEN Brain Science Institute, Hirosawa 2-1, Wako-shi, Saitama 351-01, Japan

ARTICLE INFO

Article history:
Received 30 November 2013
Revised 17 September 2014
Accepted 17 November 2014

Keywords:
Compound
Japanese
Compound Accent Rule
Anticipatory processing

ABSTRACT

Our study argues that pre-head anticipatory processing operates at a level below the level of the sentence. A visual-world eye-tracking study demonstrated that, in processing of Japanese novel compounds, the compound structure can be constructed prior to the head if the prosodic information on the preceding modifier constituent signals that the Compound Accent Rule (CAR) is being applied. This prosodic cue rules out the single head analysis of the modifier noun, which would otherwise be a natural and economical choice. Once the structural representation for the head is computed in advance, the parser becomes faster in identifying the compound meaning. This poses a challenge to models maintaining that structural integration and word recognition are separate processes. At the same time, our results, together with previous findings, suggest the possibility that there is some degree of staging during the processing of different sources of information during the comprehension of compound nouns.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

Recent studies have shown that the human parser is anticipatory in nature, which means it can compute structure or activates words in advance of actually receiving bottom–up evidence for the structure or word. Head-final languages are not an exception: pre-verb arguments are assigned syntactic structures (e.g., Inoue & Fodor, 1995, and subsequent work) and the phrase-final verb could be predicted on the basis of its preceding arguments (Kamide, Altmann, & Haywood, 2003, among others). While it seems reasonable to assume that processing below the level of the sentence could also be anticipatory, the previous literature is not conclusive.

We investigate the processing of novel $N_{modifier} - N_{head}$ endocentric head-final compounds (i.e., first constituent, C1, is a modifier attributing a property to the head, C2). We will demonstrate that compound representation is computed before the head C2 is processed, thus posing a challenge to models that assume lexical access and structure building are separate processes.

1.1. Incremental structural processing for compounds

Linguists argue that the morphological structure within compounds is explained by a set of syntactic rules (e.g., Lieber, 1983; Selkirk, 1982). While compounds with their own lexical entry could be processed without the creation of internal structure, the comprehension of novel compounds and at least some transparent compounds must involve the creation of some form of structure.

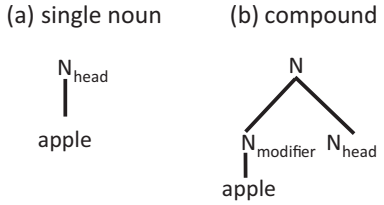
Relatively few psycholinguistic studies have investigated the structural processing of compounds. For example, upon encountering *apple*, the processor can either

* Corresponding author at: The University of Tokyo, Graduate School of Arts and Sciences, 3-8-1, Komaba, Meguro-ku, Tokyo 153-8902, Japan. Tel.: +81 3 5465 8746.
E-mail addresses: hirose@boz.c.u-tokyo.ac.jp (Y. Hirose), mazuka@brain.riken.jp (R. Mazuka).

http://dx.doi.org/10.1016/j.cognition.2014.11.033
0010-0277/© 2014 Elsevier B.V. All rights reserved.

assume that *apple* is a single head noun (e.g., (1a)), or that it is the modifier of a compound (e.g., (1b)), such as in *apple juice*. An incremental, predictive parser could potentially start building structure to accommodate the upcoming head noun in advance.

(1)



Clearly, at least some interpretation of such compounds must wait until the head is encountered. The meaning of compositional compounds such as *apple juice* is generated through the relational structure (*apple juice* → juice MADE FROM apples; *baby oil* → oil FOR babies), based on the semantic content of the head noun (Gagné & Spalding, 2009). However, the structural configuration for the compound (e.g., (1b)) could still be built in advance, if there is good reason to expect that C1 will ultimately constitute a compound non-head. One possibility is that the (im)plausibility of C1 as a single noun could affect comprehenders' expectations. However, Staub, Rayner, Pollatsek, Hyönä, and Majewski (2007) found an on-line preference for a single head noun analysis in English for C1 (*e.g., cafeteria*) of a compound (*e.g., cafeteria manager*) in early measures of eye-movement, even when this resulted in a temporarily implausible interpretation (e.g., *the new principal talked to the cafeteria manager...*) (cf. Kennison, 2005[1]), regardless of the compound frequency. Cohen and Staub (2014) showed that the very early preference for C1 in novel compounds is also unaffected by the preceding context. While plausibility and context fail to cause an early commitment to the compound structure in reading, we will demonstrate that prosody can trigger compound interpretation in speech.

1.2. Prosodic cue in processing compounds

Most languages exhibit prosodic cues for noun-noun compound status (e.g., *gréen house* vs. *green hóuse*). In many languages, the prosodic structure of compounds cannot be interpreted without hearing both C1 and C2. For example, in English, the stress status (primary/secondary) of C1 often has to be determined relative to that of C2. In contrast, the prosody on C1 alone in German compounds can indicate compound/single noun status. The first words of compounds have shorter durations (Isel, Gunter, & Friederici, 2003) and higher average pitch (Koester, Gunter, Wagner, & Friederici, 2004) than single nouns.

Previous work in compound recognition has addressed whether compounds are accessed via conceptual combination of the individual parts that are accessed separately (a decompositional route), in addition to the access as a whole (a direct route) (see MacGregor & Shtyrov, 2013 for review). Studies have shown that prosody can influence the choice of the route. Cross-modal priming studies by Isel et al. (2003) suggest that compound interpretation relies on the information from C2. When compounds occur with the compound prosody, they observed semantic priming from C1, but only when C2 was semantically transparent, suggesting that the priming from C1 occurs due to retrospective activation during decompositional processing of the compound as a whole. In contrast, Holle, Gunter, and Koester (2010) argued that access to C1 occurs immediately without waiting for the head, even with a compound prosody. In an ERP study, they found an N400 when C1 was a non-word. One possible cause of the difference in the results of these two studies is that the actual acoustic cues used to indicate compound prosody were defined in relative terms in German and may have differed between different studies (Koester et al., 2004).[2] In any case, these studies were not designed to detect whether compound structure was built while C1 was processed.

A series of ERP studies by Koester et al. (2004) may be the most relevant to our question. In a sequence of numeral classifier + C1 + C2 (Experiment 3), the number mismatch between the numeral classifier and C1 elicited a LAN when C1 was a single head, thereby carrying single noun prosody; whereas, there was no such reaction to the number mismatch between classifier and C1 when C1 carried compound prosody. Koester et al. concluded that the parser activates the decompositional route upon detecting the compound prosody on C1. While their results show that a single noun interpretation is halted at the point when C1 is encountered with compound prosody, their results do not address our question of whether compound structure is anticipatorily created at this point.

We will use Japanese novel noun-noun compounds to directly investigate whether compound structure is created prior to the processing of the head, as the characteristics of compound prosody in Japanese make them useful for this purpose.

1.3. Prosody of Japanese compounds

The Compound Accent Rule (CAR) (see Kubozono, 2008, for review) in Japanese provides cases wherein the pitch accent on C1 alone can indicate compound status. In Japanese, accentuation is lexically determined: A word is either accented or unaccented and if accented, the position of the accent is lexically specified. In our materials, accented words carry an accent on the initial

[1] Kennison (2005) has reported results where readers are insensitive to the anomaly of C1 in singular form, presumably because they are not committed to the single head reading, though she did not directly demonstrate the readers instead committed to a compound interpretation. The different outcome between Kennison (2005) and Staub et al. (2007) might be attributed to the difference in methodology (SPR vs. eye-tracking), each of which might be tapping into the different stages of compound processing (see our discussion in the later section).

[2] In addition, the nature of the tasks was different. For Holle et al. study, one might not expect compound prosody to play a role in the processing of compounds where C1 is a non-word, as any compound which starts with a non-word must also necessarily be a non-word.

Download English Version:

https://daneshyari.com/en/article/7287480

Download Persian Version:

https://daneshyari.com/article/7287480

Daneshyari.com