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Morphological constraints in children's spoken language comprehension: A visual world study of plurals inside compounds in English

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ABSTRACT

Many previous studies have shown that the human language processor is capable of rapidly integrating information from different sources during reading or listening. Yet, little is known about how this ability develops from child to adulthood. To gain insight into how children (in comparison to adults) handle different kinds of linguistic information during on-line language comprehension, the current study investigates a well-known morphological phenomenon that is subject to both structural and semantic constraints, the *plurals-in-compounds effect*, i.e. the dislike of plural (specifically regular plural) modifiers inside compounds (e.g. *rats eater*). We examined 96 seven-to-twelve-year-old children and a control group of 32 adults measuring their eye-gaze changes in response to compound-internal plural and singular forms. Our results indicate that children rely more upon structural properties of language (in the present case, morphological cues) early in development and that the ability to efficiently integrate information from multiple sources takes time for children to reach adult-like levels.

1. Introduction

Successful and efficient language processing requires the ability to utilize multiple cues from different sources (e.g. grammar, lexicon, semantics, pragmatics) within short time intervals. Most previous experimental research has focused on the nature of the mature language processing system demonstrating that adults are indeed capable of rapidly and efficiently integrating information from different sources during language processing (e.g. Spivey, Tanenhaus, Eberhard, & Sedivy, 2002; Tanenhaus & Trueswell, 2005). Children's language processing has only been examined in a small number of studies using online techniques (see Clahsen, 2008 for review), and the question of how the human language processor develops from child to adulthood remains largely unanswered. Against this background, the current study investigates constraints on modifiers inside compounds as a window to the information sources children (in comparison to adults) employ during language processing.

Compounds in English offer a strong contrast between singulars (which are preferred), irregular plurals (which are less acceptable), and regular plurals (which are even worse) as compound-internal modifiers; compare, for example, *owl*/*ox breeder* vs. *owls*/*oxen breeder*). The distribution of plurals inside compounds has been derived from the interplay of different kinds of constraints. The preference for irregular over regular plural non-heads (e.g. *mice eater* vs. *rats eater*) has been attributed to a *morphological* constraint that bans outputs of regular inflectional processes (e.g. *–s* plurals in English) to be entered as non-heads into

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lexical compounds (e.g. Berent & Pinker, 2007). The preference of singular over plural non-heads inside compounds (e.g. *rat*/*mouse eater* vs. *rats*/*mice eater*) has been attributed to a *semantic* constraint against compound-internal modifiers that specify multiple entities (Haskell, MacDonald, & Seidenberg, 2003). With these properties, the so-called 'plurals-in-compounds effect' (Berent & Pinker, 2007) offers an interesting case to investigate the timecourse of language processing, specifically, of how and when morphological and semantic information are employed during language comprehension. However, most previous studies have examined children's and adults' relative sensitivity to these constraints in offline judgment and elicited production tasks (e.g. Gordon, 1985; Ramscar & Dye, 2010). The present study is the first to investigate children's (in comparison to adults') online processing of plurals in compounds.

The plurals-in-compounds effect has also featured prominently in debates about the role of innate constraints on child language acquisition. Starting with Gordon (1985), several studies have shown that three-to-five-year-old children allow irregular plurals inside compounds but consistently omit correct regular and overregularized *–s* plurals from inside compounds. Thus, children may sometimes produce incorrect plural forms such as *mouses*, but never as a non-head element of a compound (e.g. *mouses eater*). Gordon (1985) argued that children are sensitive to the ban against regular plurals inside compounds even though this contrast is not available from adult speech. Pinker (1999: 208) took this finding as a '…product of the innately specified architecture of the(ir) language system…'. However, the nature of the plurals-in-compounds effect in children is controversial. Ramscar and Dye (2010) have argued that these claims are unnecessary and that the distribution of plurals inside compounds can indeed be learned from the input. The current study complements this controversy with novel findings from an investigation of the timecourse of the compounding constraints during spoken language comprehension. We employed the visual world paradigm in which participants' looks to visual displays were monitored while they were listening to compounds with regular and irregular plural as well as singular modifiers. Our findings show that the different compound-internal modifiers affect participants' looking-while-listening performance and that there are developmental changes from child to adult in this domain.

2. Constraints on inflections inside compounds in English

The constraints on modifiers inside compounds have been examined in a number of previous offline rating and production studies. Results from acceptability judgment tasks (Cunnings & Clahsen, 2007; Haskell et al., 2003) have shown that compounds containing singular nouns as non-heads are preferred over plural forms inside compounds. This contrast has been derived from the *semantics* of compounds (Berent & Pinker, 2007; Haskell et al., 2003). Typically, the non-head of a compound refers to a kind, not an individual or its properties. A *mouse eater* eats mice in general, not a particular type or number of mouse. A *handgun* refers to a particular kind of gun and may still be used with one or two hands. In English, a singular noun form is identical to a bare nominal stem and is therefore more acceptable inside a compound than a plural form, which is explicitly marked for NUMBER. An additional contrast is between regular and irregular plurals as non-heads of lexical compounds, e.g. *rats eater* vs. *mice eater*. Regular plurals inside compounds are judged considerably worse than irregular plurals (e.g. Cunnings & Clahsen, 2007; Haskell et al., 2003), and in elicited production, young children, adolescents, and adult native speakers include significantly more irregular plurals than regular ones inside compounds (e.g. Gordon, 1985; Murphy, 2000; van der Lely & Christian, 2000). The source of this contrast is controversial. Several linguists have argued that this phenomenon is grammatical in nature, reflecting a contrast between lexically stored and grammatically computed forms. Kiparsky (1982) argued that regular inflection is strictly ordered after other morphological processes such as irregular inflection, derivation, and compounding so that regular inflectional affixes are effectively prevented from appearing inside compounds; see also Di Sciullo and Williams (1987), Borer (1988), and Wiese (1996) for related accounts.

As an alternative to this morphological constraint, Haskell et al. (2003) proposed that the surface-form properties of regular plural nouns are responsible for their ban inside compounds, specifically a dislike of modifiers with sibilant-final codas; see also Seidenberg, MacDonald, and Haskell (2007) and Ramscar and Dye (2010). Another non-morphological attempt (Buck-Gengler, Menn, & Healy 2004) to explain this phenomenon claims that regular plural non-heads are less likely to be produced inside compounds than irregular ones because the surface forms of the former overlap more with their corresponding singular forms (e.g. *rats* vs. *rat*) than the surface forms of the latter (e.g. *mice*vs. *mouse*). Consequently, the preferred forms for modifiers inside compounds, namely singular forms, are more easily accessible from regular than from irregular plurals.

There are, however, problems with these non-morphological accounts. The supposed dislike of compound modifiers with sibilant-final codas has been disconfirmed by results from acceptability judgment tasks (Berent & Pinker, 2007; Cunnings & Clahsen, 2007) showing that compounds such as *fox chaser* or *news reader* are rated as being fully acceptable by native speakers of English, and that *mice eater* and *geese eater* are rated better than *rats eater* and *ducks eater*, even though all of these compounds contain modifiers with *s*/*z* final codas. The problem with Buck-Gengler et al.'s (2004) proposal is that if accessibility to the preferred singular form was the decisive factor, then it would be mysterious why in acceptability judgment tasks regular plural non-heads (from which the singular is supposed to be easily accessible) are dispreferred over irregular ones in compounds.

For these reasons, we do not think that any of the proposed non-morphological accounts of the plurals-in-compounds effect is viable and instead maintain that the dislike of regular plurals inside compounds is due to a morphological constraint that restricts concatenative regular