

1 Title

How Adjective Ordering Preferences Develop in Children

2 Faculty Advisor

I will be conducting the proposed research under the direction of faculty advisors Gregory Scontras and Lisa Pearl.

3 Research Question

In English, it sounds much better to say “the small brown box” than “the brown small box.” Switching the order of these two adjectives completely changes the naturalness of the phrase. We would expect both phrases to communicate the same information, but English speakers seem to have intuitions that the second one is deviant while the other is natural. Adjective ordering preferences like these have received much attention in the language science research community, as it appears there are robust preferences for ordering adjectives not only in English, but also in many other languages around the world, such as Hungarian, Telugu, Mandarin Chinese, Dutch, Selepet, and Mokilese (Scontras, Degen, and Goodman, 2017). A recent study by Scontras, Degen and Goodman (2017) has found that adjective ordering preferences are based on speakers’ understanding of adjective subjectivity (for example, two people can disagree on whether something is small more easily than whether something is brown, making *small* more subjective than *brown*). Prior to the subjectivity hypothesis, the lexical semantic class hypothesis, which proposed that adjectives were ordered based on which lexical semantic class they belonged to, dominated. Scontras et al. (2017) examined subjectivity and adjective order, and found that an adjective’s distance from a noun can be predicted by the



subjectivity of an adjective as perceived by adult speakers, with less subjective adjectives



tending to be closer to the noun. Subjectivity was found to perform better than other theories in



determining adjective order preferences. However, very little is known about the development of these preferences. There has not been much research done on when adjective ordering first

develops in children, and the previous studies have focused on lexical semantic class being the



underlying representation rather than subjectivity.

I will be examining adjective ordering preferences in phrases produced by native English-speaking children to determine (i) if/when stable preferences emerge, and (ii) what the time

course of this development is (i.e., whether preferences are present very early in children or if



they instead develop over a longer period of time). I will also look at the input that children are

receiving to determine whether children could learn these preferences directly from their input.

This study will extend Scontras et al.'s research by conducting a corpus analysis of all the

available English data on CHILDES (MacWhinney, 2000), a collection of child-directed and

child-produced speech. The research will involve extracting adjective phrases from both child-

directed and child-produced speech to see when the adjective ordering preferences emerge, and

how well they correlate with adjective subjectivity. Although it is known that there are stable

adjective ordering preferences in English adult speakers, and that subjectivity predicts this, it is

not known whether children follow the same pattern. The findings of this study will provide

more insight into the development of linguistic preferences (i.e., adjective ordering) that rely on

cognitive representations (i.e., subjectivity).

4 Research Methods



A corpus study will be conducted to determine if child-directed and child-produced data exhibit the adjective ordering preferences seen in adults. The corpus study will look through all the available English data on the CHILDES database from the North American and United Kingdom corpora (1,927,582 child-produced utterances; 2,741,507 child-directed utterances; ages 0 months to 16 years). By analyzing the child-directed speech, we will be able to see what children are receiving as input from adults. The child-produced speech will then show us what adjective orders the children are producing. I will be extending the corpus study methodology from Scontras et al. (2017). Phrases with two adjectives in front of a noun (i.e., “adjective adjective noun”) will be extracted from the corpora. We will then calculate the mean distance of each adjective from the noun. Based on the subjectivity of adjectives determined by Scontras et al.’s study, the phrases yielded by the corpus in the child-produced speech will be examined to see if the same pattern of adjective ordering exists as predicted by subjectivity. For adjectives found in the child-directed or child-produced speech, I will be collecting **subjectivity scores** with an Amazon Mechanical Turk experiment in order to determine the ordering for those new adjectives, such as ‘itty’ or ‘teeny’. If the same preference is seen in children at all ages as it is in adults, this would indicate that adjective ordering preferences develop rapidly.



Additionally, the child-produced data will be analyzed across the ages, which will reveal when the adult-like adjective ordering pattern begins to emerge. I will also analyze adjective phrases found in the child-directed speech to determine what kind of input the children are receiving, and whether this input is transparently related to the adjective phrases they’re producing at each age. If the input does reflect the children’s output, it would indicate that the adjective ordering that children are producing are just as a result of repeating back what they hear from child-directed speech. However, if the child-directed speech (input) is different from

the child-produced speech (output), children must be doing something more complicated for them to produce the output we observe.

An Amazon Mechanical Turk experiment will be done to determine the subjectivity of adjectives found in the CHILDES database for which we do not have subjectivity judgments from Scontras et al. This experiment will be replicating Scontras et al.'s methodology for their subjectivity experiments. An online survey will display 30 adjectives one at a time to participants and will ask them to indicate how subjective they think it is. This will provide me with the subjectivity scores for the new adjectives. Following this, I will be able to further assess which hypothesis concerning predicting adjective ordering, subjectivity or lexical semantic class, is more supported by the data. I will use Bayes factors to determine the probability of the data given each hypothesis. By comparing the likelihood of each hypothesis producing the data, I will be able to see whether subjectivity or **lexical semantic class** more strongly supports the data.



5 Literature

A. Adults: Mature knowledge

In Scontras et al.'s study, a corpus analysis was conducted on naturalistic speech data produced by adults. Phrases that matched the pattern "adjective adjective noun" were extracted. Scontras et al. then calculated the mean distance for each adjective from the noun. The study used a variety of adjectives from various semantic classes (e.g., *value*, *dimensional*, *color*, *material*, etc.). In the second phase of the study, experimental participants were asked to indicate using a slider which adjective orderings were more natural. This method determined that stable ordering preferences exist in adults. In a separate set of experiments, the authors then had participants indicate how subjective an adjective was, on a scale from completely objective to

completely subjective. The results of these corpus and behavioral experiments demonstrated that adult English speakers preferred to place adjectives they deemed less subjective closer to the noun. They found that subjectivity scores accounted for 70% of the variance in the ordering preference data. After comparing the results of their subjectivity hypothesis with other proposals from the literature, such as the lexical semantic class hypothesis, the authors concluded that subjectivity is the best predictor of adjective ordering.

B. Children: Developing knowledge

Scontras et al.'s study was limited to adult behavior, so the question of when these strong preferences emerge remains unanswered. There have been several studies examining adjective ordering preferences in children, but they have not been successful in answering this question or in establishing the connection to subjectivity. Bever (1970) proposed that adjective order was determined by how closely related lexically an adjective is to a noun, with the more noun-like adjectives closer to the noun they are modifying. For example, the sentence "large is my favorite size" is ungrammatical, while "red is my favorite color" is acceptable. *Red* can often be used as both a noun and an adjective, while *large* can only be used as a noun, and so *red* is more related to a noun than *large* is. This suggests that the phrase "the large red house" should be more natural than "the red large house." Bever also conducted an experiment with children between two and five years of age, and found that younger children performed better on repeating unnatural adjective orders, such as "the plastic large pencil fell from the table". This would seem to indicate that younger children do not yet have stable adjective ordering preferences.

Martin and Molfese (1972) attempted to recreate Bever's experiment, but identified serious flaws with the repetition task, such as that they were unable to replicate Bever's findings, producing significantly different results. This led them to conclude that the repetition task was

not a good measure for adjective ordering preferences. They instead used a production task, finding that three and four year olds produced phrases with adjectives denoting cleanliness closer to the noun than color adjectives, while the adult preference is for adjectives denoting color to be closer (i.e., small clean yellow house). This result provides early evidence that child preferences differ from adult preferences, but only with respect to these specific adjective kinds. Another study (Hare and Otto, 1978) had children in grades one through five arrange three adjectives of size, color, and material with a noun to create adjective phrases that they thought were correct. The authors discovered that children in each succeeding grade level chose the adult preferred order of size-color-material-noun more often than children in the preceding grade level. This seems to provide yet more evidence for some kind of developmental trajectory, but with a focus on lexical semantic class, rather than on subjectivity, as was determined to be the predictor for adjective ordering by Scontras et al.

These developmental studies indicate that adjective ordering preferences develop or strengthen over time. However, there is some disagreement among these studies on the age of acquisition, and where the preferences come from. With the question of where adult preferences come from finally addressed by Scontras et al. (i.e., the perceived subjectivity of the adjective), we can now examine child speech to discover when these preferences are emerging.

6 References

- Bever, T.G. (1970) The cognitive basis for linguistic structures. In J.R. Hayes (Ed.) *Cognition and the Development of Language*. New York, NY: Wiley.
- Hare, V.C., & Otto, W. (1978) Development of preferred adjective ordering in children, grades one through five. *The Journal of Educational Research*, 71(4), 190-193.

MacWhinney, B. (2000). *The CHILDES Project: Tools for analyzing talk. Third Edition.*

Mahwah, NJ: Lawrence Erlbaum Associates.

Martin, J.E., & Molfese, D.L. (1972) Preferred adjective ordering in very young children.

Journal of Verbal Learning and Verbal Behavior, 11, 287-292.

Scontras, G., Degen, J., & Goodman, N.D. (2017) Subjectivity predicts adjective ordering preferences. *Open Mind: Discoveries in Cognitive Science*, 1(1), 53-65.

Approved by

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