

An exploration of principled mappings between English adjective order and subjectivity

Chloe Wright & Kaitlyn Harrigan*

Abstract. Adjective order in English is both very strict and largely intuitive. Recent research proposes subjectivity as an underlying mechanism for adjective order. The present studies aim to examine whether subjectivity is a productive cue for adjective ordering through two separate grammaticality judgment tasks. In the first task, participants rated grammatical and ungrammatical sentences containing *color* (typically closer to the noun) and *size* (typically further from the noun) adjectives paired with images of novel objects, *kertunks*. In the second task, participants completed the same design but with tables instead, and grammatical and ungrammatical sentences containing *material* (typically closer to the noun) and *shape* (typically further from the noun) adjectives. In each task, the images contained some combination of clear and ambiguous traits. If participants are sensitive to subjectivity in the moment, they should rate the ungrammatical sentences (e.g., color-before-size and material-before-shape) higher when the presented image is either of an ambiguous color or material and of a clear size or shape. We find that, in both tasks, participants are not more accepting of the ungrammatical order even when that order aligns with visual subjectivity in a given scene. This suggests that adjective order is not flexible based on context, and that any systematic relationship between subjectivity and order is learned and codified rather than relied upon in the moment.

Keywords. adjective order; subjectivity; grammaticality judgments; psycholinguistics

1. Introduction.

1.1. ENGLISH ADJECTIVE ORDER. Adjective order in English is both highly constrained and seemingly intuitive for native speakers (Whorf, 1945). For example, in a pairing of color and size adjectives, the color adjective is situated closer to the noun. English-speaking adults would produce (1) but not (2):

- (1) I saw a tiny, green frog.
- (2) *I saw a green, tiny frog.

Patterns for adjective order have been observed to be relatively consistent cross-linguistically. Among languages that use prenominal descriptors, the descriptors occur in the same order as they do in English. For example, these preferences can be seen in Hungarian, Telugu, Mandarin, and Dutch, all belonging to different language families (Dixon, 1982; Hetzron, 1978; LaPolla & Huang, 2004; Martin, 1969; Sproat & Shih, 1991). In languages with postnominal modification (i.e., descriptors occur following the noun), such as Selepet, Spanish, Mokilese, and Hebrew, the

* We thank the Linguistics Program, English Department, and Charles Center at William & Mary for funding to carry out this research. We are also grateful to the participants of the linguistics research group meetings, in particular Anya Hogoboom and Sadhwi Srinivas for valuable feedback on this work. Authors: Chloe Wright, William & Mary (cswright01@wm.edu) & Kaitlyn Harrigan, William & Mary (kharrigan@wm.edu).

descriptors occur in the inverse order (Dixon, 1982; Hetzron, 1978; Sproat & Shih, 1991; Kachakeche & Scontras, 2020; Scontras, 2023).

Many explanations for this attested order have been proposed, some based in syntax and others relying instead on adjective meaning (Vendler, 1963; Annear, 1964). Hypotheses dependent upon semantics argue a range of reasons, including: an adjective's inherentness to the noun, how context-dependent the adjective is, the absoluteness of the adjective (Whorf, 1945; Dixon, 1982; Ziff, 1960; Sproat & Shih, 1991; Wulff, 2003). A recent hypothesis updates and builds on some of these ideas, putting forth adjective subjectivity as the common idea between these suggestions (Scontras et al., 2017).

1.2. THE SUBJECTIVITY HYPOTHESIS. Scontras et al. (2017) propose subjectivity as the mechanism underlying English adjective order. They define subjectivity using faultless disagreement; in other words, the likelihood two speakers could disagree on an adjective's application to an object but neither be incorrect. They argue that adjectives that are more subjective—more likely to incur faultless disagreement—occur further from the noun they describe in multi-adjective constructions. Therefore, in (1) and (2) above, *green* should occur closer to the noun because it is the less subjective trait; speakers are more likely to disagree on size, but they are less likely to disagree on greenness.

1.3. THE PRESENT STUDY. There is currently little research investigating how productive subjectivity may be as a cue for speakers. It is unclear whether people are sensitive to subjectivity in their environment when determining which order to employ or when determining which orders sound “natural.” There may be a correlation between subjectivity and adjective position, but is this correlation codified in learning or instead a result of situational decisions made by speakers? Further, how might speakers react when we force subjectivity onto traits that are usually more absolute?

The present study aims to answer these questions, employing two grammaticality judgment tasks to determine if visual cues can influence speakers' judgments of ungrammatical adjective orders. In pairing images of objects with both ambiguous and clear traits with grammatical and ungrammatical constructions, we gain insight into whether participants are flexible in their ordering preferences when the unnatural order aligns with which traits of an object are more visually subjective. If participants are sensitive to subjectivity in this way, we expect their acceptance of the ungrammatical order (2) to increase when the ungrammatical sentence is paired with an image that matches the subjectivity. For example, when given a frog that is clearly small but less clearly green, do participants allow the description in (2) more often?

2. Study 1. Participants completed a binary forced choice task where they were asked to rate the naturalness of given sentences paired with images of novel objects, called *kertunks*.

2.1. PARTICIPANTS. Participants were 94 undergraduate students from introductory Linguistics and Psychology courses at William & Mary. Students received course credit for their participation.

2.2. STIMULI. Stimuli were 12 unique images of the novel objects named *kertunks* generated using PowerPoint. *Kertunks* came in all combinations of four possible colors and three possible sizes. Colors were either clearly blue, clearly green, or one of two ambiguous/subjective colors (between green and blue). They were also either clearly large or small (as indicated by a human referent), or subjectively/ambiguously-sized (indicated by a lack of referent). See Figure 1 for

examples of the possible *kertunks* sizes and colors. Ambiguity and clarity of *kertunks* traits were verified using a norming study.

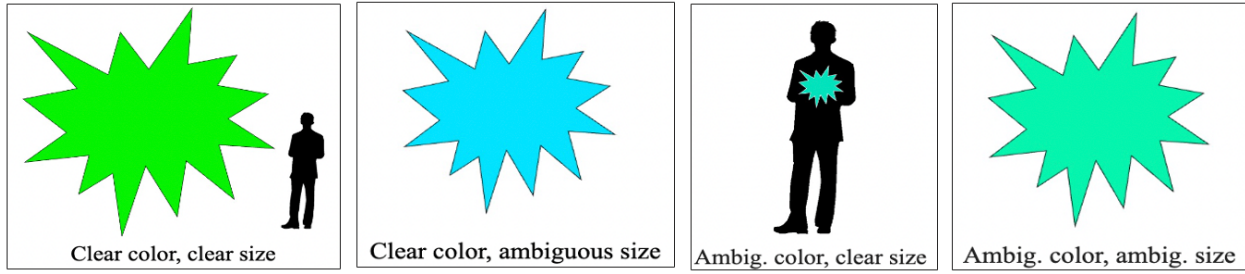


Figure 1. Colors and sizes of *kertunks*

2.3. DESIGN. Images were paired with sentences containing a color-adjective (either *green* or *blue*) and a size-adjective (*big* or *small*). Half of the 48 unique sentences were presented in the ungrammatical order of color-before-size (3), while the other half had the grammatical order of size-before-color (4).

(3) This is a green, big kertunk.

(4) This is a big, green kertunk.

Participants saw each sentence and image pair twice, for a total of 96 items. For each sentence, participants were asked to choose whether “This description sounds good” or “This description sounds bad” (presented in a random order for each question).

2.4. PROCEDURE. Participants completed the study remotely through Qualtrics.

2.5. RESULTS. Adults were overall more accepting of the grammatical orders, and did not increase in their acceptance of the ungrammatical order even when it aligned with visual subjectivity. Figure 2 shows participant preference of the given order when color and size were each ambiguous.

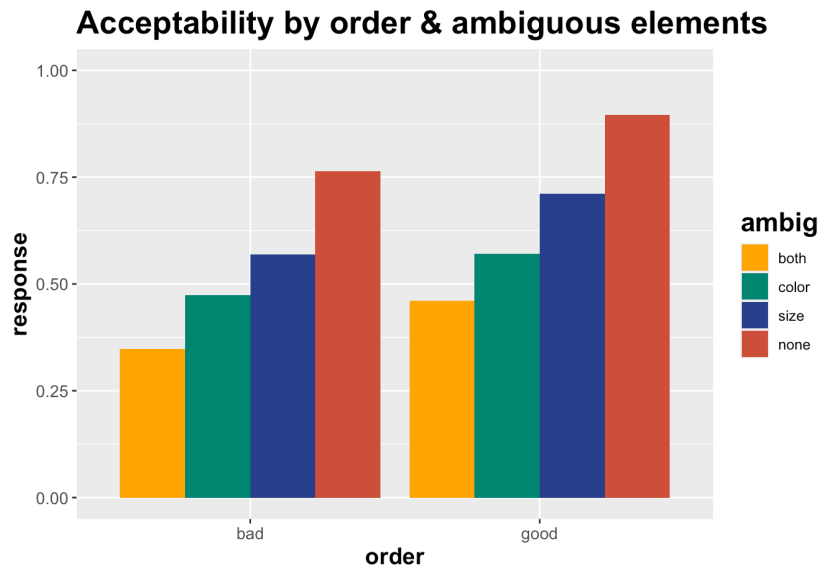


Figure 2. Study 1: Acceptability of each order based on number of ambiguous traits

The results were analyzed in R using a binary logistic regression model (R Core Team, 2021; RStudio Team, 2020), with *naturalness rating* as the dependent variable, *order* (*good*,

bad) and *ambiguous element* (*both, color, size, neither*) as fixed effects, and *subject* as a blocking variable. We find a main effect of adjective *order* [$X^2_{(2)} = 43.429, p < 0.001$]; participants rated *bad* orders worse significantly more than they did the *good* orders. We also find a main effect of number of *ambiguous element* [$X^2_{(2)} = 319.840, p < 0.001$]; participants rated sentences lower overall when one or both traits in the image were ambiguous.

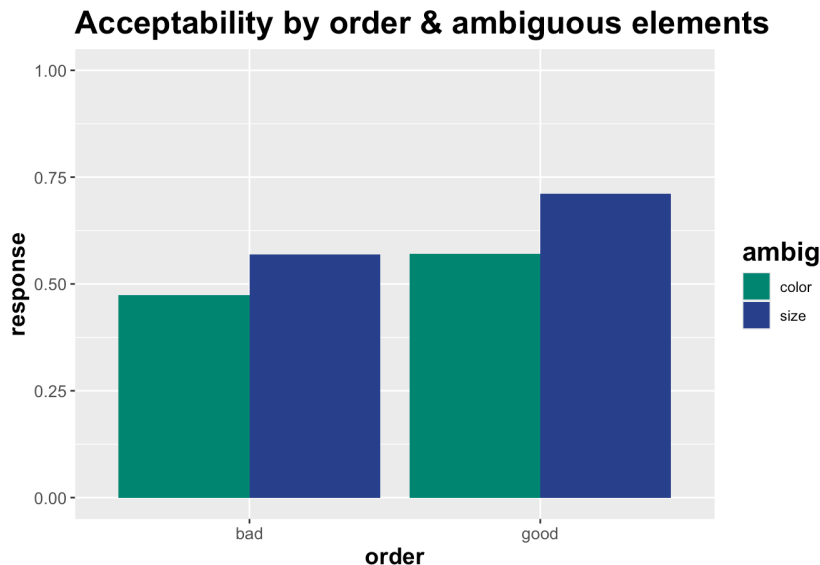


Figure 3. Study 1: Acceptability of each order based on which trait was ambiguous in the given image

Restricting to only cases with a single ambiguous trait (either *color* or *size*, see Figure 3), we ran another binary logistic regression model. *Naturalness rating* was again the dependent variable, *order* and *ambiguous element* were fixed variables, and *subject* was included as a blocking variable. We found no interaction between adjective *order* and *ambiguous element* [$X^2_{(1)} = 3.13, p = 0.08$]. Participants were not more accepting of the *bad* order in contexts where it matched the subjectivity of visual elements.

2.6. DISCUSSION. The results of Study 1 indicate that participants are not sensitive to subjectivity of visual elements when forming ordering preferences. In fact, where we might expect their acceptance of ungrammatical orders to increase when presented with a clearly-sized but ambiguously-colored *kertunk* if they are computing subjectivity of visual elements in real time, we instead see that this is the case when they are least accepting of the ungrammatical order.

One possible confound is the specific combination of *size* + *color* adjective categories. There is evidence that *color* adjectives behave uniquely; sometimes, as a trait, color is overspecified, while in other instances it may be omitted (Schriefers & Pechmann, 1988; Rubio-Fernandez, 2016). These facts, in tandem with the frequency of multi-adjective descriptions constructed from *size* + *color* descriptors in cultural discourse (e.g., *little black dress* or *Big Yellow Taxi*), we considered the possibility of interference from the specific adjective categories we used. Study 2 sought to address this possibility, employing adjectives of material and shape, which have no such cultural connotations.

3. Study 2. Participants completed a separate binary forced choice task in Study 2, rating the grammaticality given sentences paired with images of tables.

3.1. PARTICIPANTS. Participants were 92 undergraduate students from introductory Linguistics and Psychology courses at William & Mary. Students received course credit for their participation.

3.2. STIMULI. Stimuli were 16 unique images of tables generated using PowerPoint. Tables came in all combinations of four possible shapes (square, round, or one of two ambiguous shapes between square and round) and four possible materials (wooden, metal, or one of two combinations of wooden and metal). See Figure 4 for examples of the possible materials and shapes of tables.

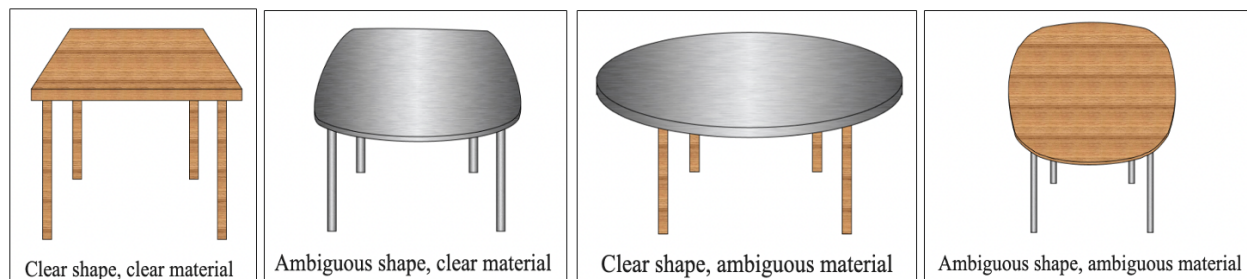


Figure 4. Materials and shapes of tables

3.3. DESIGN. As in Study 1, images of tables were paired with sentences containing material and shape adjectives. Half of the 72 unique sentences were presented in the ungrammatical order of material-before-shape (5), while the other half used the grammatical order of shape-before material (6).

(5) This is a wooden, square table.

(6) This is a square, wooden table.

Participants rated each sentence-image pair twice, for a total of 144 items. As in Study 1, participants were asked to choose whether “This description sounds good” or “This description sounds bad” (presented in a random order for each question).

3.4. PROCEDURE. Participants completed the study remotely through Qualtrics.

3.5. RESULTS. Adults were overall somewhat more accepting of the grammatical order, and did not increase in their acceptance of the ungrammatical order when it aligned with visual subjectivity. Figure 5 shows participant preference of the given order when material and shape were each ambiguous.

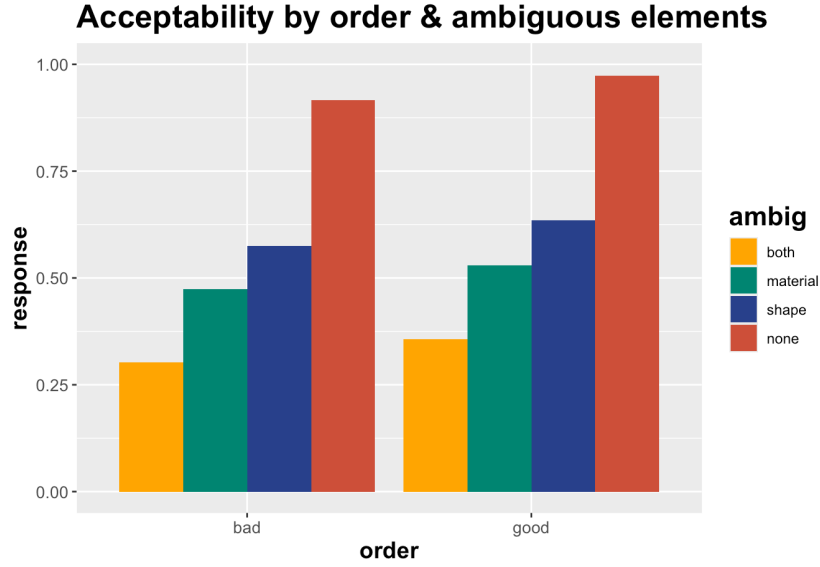


Figure 5. Study 2: Acceptability of orders based on number of ambiguous traits

The results were analyzed in R using a binary logistic regression model, which had *naturalness rating* as the dependent variable, *order* (*good*, *bad*) and *ambiguous element* (*both*, *material*, *shape*, *neither*) as fixed effects, and *subject* as a blocking variable. We find a main effect of adjective *order* [$X^2_{(2)} = 20.652$, $p < 0.001$], indicating that participants rated *bad* orders significantly worse than they did the *good* orders. We also find a main effect of *ambiguous element* [$X^2_{(2)} = 677.312$, $p < 0.001$]; participants again rated sentences lower overall when one or both traits in the image were ambiguous.

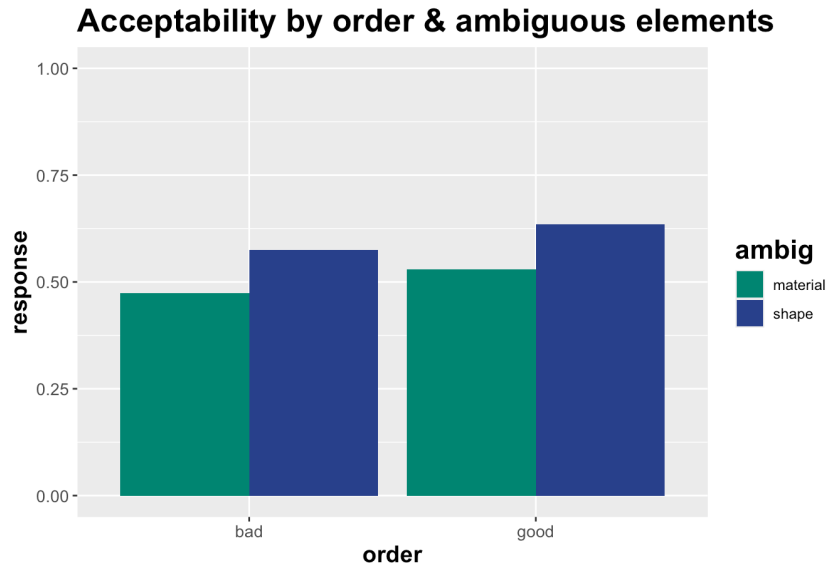


Figure 6. Study 2: Acceptability of each order based on which trait was ambiguous in the given image

Figure 6 restricts the data to only cases with a single ambiguous trait (either *material* or *shape*). We ran another binary logistic regression model run on this restricted dataset. *Naturalness rating* was again the dependent variable, *order* and *ambiguous element* were fixed variables, and *subject* was included as a blocking variable. We found an interaction between adjective

order and *ambiguous element* [$X^2_{(1)}=12.88, p=0.0016$]. Despite a significant interaction effect, the difference is not in the expected direction—participants perform better when the incorrect order does not align with visual subjectivity. Therefore, participants were not more accepting of the ungrammatical order in contexts where it matched the subjectivity of visual elements.

3.6. STUDY 2 DISCUSSION. As in Study 1, participants were not more accepting of the ungrammatical order when it was paired with an image that displayed subjective traits matching that order. Instead, they preferred the ungrammatical order the least when the ambiguous trait’s descriptor came first in the description. People are not behaving flexibly in a way that aligns with visual subjectivity; instead, they are rigid in their judgments.

4. General Discussion. Across two studies, we find that people are not flexible in their ordering judgments in a way that aligns with visual subjectivity of relevant properties. This suggests that adjective order is not flexible based on context, and that any systematic relationship between subjectivity and order is learned and codified rather than relied upon in the moment. In both studies, people seem to be influenced by truth-value judgments; though they were instructed to avoid evaluating whether the statement was true or not and simply judge its naturalness, participants performed worse as the number of ambiguous elements increased. In both studies, their acceptance of even the grammatical order was variable—they preferred it the most when both traits were clear, with their acceptance of it decreasing when one or both traits were ambiguous.

In Study 1, we considered whether the lack of flexibility might have been an effect of the specific adjectives used; *size + color* is a highly canonical combination, with countless examples from the cultural lexicon easily accessible: *Clifford the Big Red Dog*, *little black dress*, *Big Yellow Taxi*, *Little Blue Truck*, *great white shark*, *Big Red Machine*, *Little Red Riding Hood*, etc. Given the prevalence of the grammatical order in daily use, attempting to sway people’s judgments for this specific combination may have been more difficult. Color adjectives may also behave differently than other kinds. Color is often overspecified in descriptions; that is, even when it is not needed to uniquely identify a referent, speakers typically include it in their descriptions (Schriefers & Pechmann, 1988). Sometimes, however, it is also omitted; for example, in cases where color is a part of a speaker’s prototypical representation of an object—like a banana, which is stereotypically yellow—it may be left out (Rubio-Fernandez, 2016). In these instances, adding *yellow* to *banana* feels redundant, as *banana* seems to naturally entail *yellow*.

The unique behavior of color, as well as the cultural connotations of *size + color* strings, motivated the implementation of Study 2. Given that results fell out almost identically with adjectives of different classes (*material + shape*) indicates that Study 1 results were not impacted by these possible confounds. Instead, in a grammaticality-judgment context, people do not seem to be flexible in a way that aligns with visual ambiguity.

Ongoing work attempts to mediate the effect of truth-value judgments by reframing participants’ responses. Rather than asking them about naturalness, a follow-up study provides two options for descriptions and have the participant choose which description most closely matches the given image. While this design asks a slightly different question, it still aims to understand whether people are sensitive to the subjectivity of different visual cues in their environment when forming orders.

5. Conclusion. The present studies sought to quantify sensitivity to subjectivity of visual properties as it relates to English adjective order. Participants completed two grammaticality judgment tasks, rating the naturalness of sentences with both grammatical and ungrammatical adjective

orders when paired with images containing combinations of subjective and objective traits. We find that participants are not more likely to rate the ungrammatical order as sounding more natural even when it matches visual subjectivity; in other words, when the usually-closer adjective was made to be ambiguous in a given image, participants did not prefer the description where that adjective was in the first, rather than the second, position.

The results here act as a steppingstone to understanding the role that subjectivity plays in speakers' judgments about adjective orders. While previous research has established a link between order and subjectivity, these findings indicate that this link is possibly learned and codified during acquisition rather than relied upon as a productive cue.

References

- Annear, Sandra S. 1964. The ordering of pre-nominal modifiers in English. *Project on Linguistic Analysis Report*, 8, Ohio State University Research Foundation.
<https://files.eric.ed.gov/fulltext/ED012005.pdf>
- Dixon, Robert M. 1982. *Where have all the adjectives gone? and other essays in semantics and syntax*. Mouton. <https://doi.org/10.1515/9783110822939>
- Hetzron, R. 1978. On the relative order of adjectives. In H. Sella (Ed.), *Language Universals*. 165–184. Tübingen, Germany: Narr.
- Kachakeche, Zeinab, & Gregory Scontras. 2020. Adjective ordering in Arabic: post-nominal structure and subjectivity-based preferences. *Proceedings of the Linguistic Society of America (PLSA)* 5(1). <https://doi.org/10.3765/plsa.v5i1.4726>
- LaPolla, Randy J., & Chenglong Huang. 2004. Adjectives in Qiang. In R.M.W. Dixon & A.Y. Aikenvald (Eds.), *Adjective Classes: A Cross-Linguistic Typology*. 306–322. Oxford, UK: Oxford University Press.
- Martin, J. E. 1969. Some competence-process relationships in noun phrases with prenominal and postnominal adjectives. *Journal of Verbal Learning and Verbal Behavior* 8. 471–480.
[https://doi.org/10.1016/S0022-5371\(69\)80091-5](https://doi.org/10.1016/S0022-5371(69)80091-5)
- R Core Team. 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.r-project.org/>
- RStudio Team. 2020. RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL <http://www.rstudio.com/>.
- Rubio-Fernández, Paula. 2016. How redundant are redundant color adjectives? An efficiency-based analysis of color overspecification. *Frontiers in Psychology* 7.
<https://doi.org/10.3389/fpsyg.2016.00153>
- Scontras, Gregory, Degen, Judith, & Goodman, Noah D. 2017. Subjectivity predicts adjective ordering preferences. *Open Mind* 1(1). 53–66. https://doi.org/10.1162/OPMI_a_00005
- Scontras, Gregory. 2023. Adjective Ordering across languages. *Annual Review of Linguistics* 9(1). 357–376. <https://doi.org/10.1146/annurev-linguistics-030521-041835>
- Schriefers, H., & Pechmann, T. 1988. Incremental production of referential noun phrases by human speakers. *Advances in natural language generation* 1. 172–179.
- Sproat, Richard, & Chilin Shih. 1991. The cross-linguistic distribution of adjective ordering restrictions. In: Georgopoulos, C., Ishihara, R. (eds) *Interdisciplinary Approaches to Language*. Springer, Dordrecht. https://doi.org/10.1007/978-94-011-3818-5_30
- Vendler, Zeno. 1963. The grammar of goodness. *The Philosophical Review* 72(4). 446–465.
<https://doi.org/10.2307/2183030>

- Whorf, Benjamin L. 1945. Grammatical categories. *Language* 21(1). 1–11.
<https://doi.org/10.2307/410199>
- Wulff, Stephanie. 2003. A multifactorial corpus analysis of adjective order in English. *International Journal of Corpus Linguistics* 8(2). 245–282. <https://doi.org/10.1075/ijcl.8.2.04wul>
- Ziff, Paul. 1960. *Semantic Analysis*. Ithaca, NY: Cornell University Press.