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Packaging Information as Fact Versus Opinion: Consequences of the (Information-)Structural Position of Subjective Adjectives

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ABSTRACT


How do we distinguish fact from opinion? We tested whether people's ability to detect opinion-based content—as indicated by the use of subjective adjectives (e.g., *amazing*, *frustrating*)—depends on the linguistic position of the adjective. Our results show that simply changing the linguistic structure of a sentence influences our perception of the sentence's subjectivity: The same basic information, packaged differently in linguistic terms, yields significantly different subjectivity ratings. Specifically, our results show that texts with subjective adjectives in syntactic positions associated with new information and "main news" are rated as more opinion-based than texts conveying the same core information with the same adjective presented in a position that presents the information as already-known information or as secondary information. We also show that this information-packaging effect is independent of whether the sentence provides grounds/evidence for the opinion. More generally, our results suggest that linguistic-packaging choices can be used to blur the distinction between fact and opinion or, at least, our ability to perceive opinion-based information as such.

Today, people are continuously faced with a large amount of information about current events through a variety of venues, including television, social media, news websites, and newspapers. This information can be presented rapidly, in short sound bites with little context, and is often intermixed with people's subjective opinions and reactions. A fundamental step toward making sense of such information is distinguishing objective, factual information from subjective opinions.

However, a recent study found that U.S. adults struggle with this key step (Mitchell et al., 2018). Over 5,000 participants were asked to classify news sentences as factual statements (regardless of accuracy) or opinion statements (regardless of whether they agreed). The statements covered a variety of topics and views. Some examples are "Government is almost always wasteful and inefficient"; "Increasing the federal minimum wage to 15 USD an hour is essential for the health of the U.S. economy"; "President Barack Obama was born in the United States"; "Spending on Social Security, Medicare, and Medicaid make up the largest portion of the U.S. federal budget." (Mitchell et al. classified the first two as opinion and the last two as factual.) Only 26% of people recognized all five factual statements as factual; only 35% recognized all five opinion statements as opinions. Mitchell et al. conclude that "even this basic task [distinguishing fact and opinion] presents a challenge" (p. 3).

The present paper aims to shed light on why people struggle with distinguishing facts and opinions. We test whether a statement being perceived as fact or opinion is modulated by its linguistic packaging. Can the same words, assembled in a different way, influence the extent to which a statement is perceived as more fact-like or more opinion-like? Language provides us with multiple packaging options for expressing the same basic information (e.g., Chafe, 1976; Lambrecht, 1996;

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Vallduví & Engdahl, 1996). For example, the three variants in (1) all convey the same two pieces of information: The orchestra is amazing (someone’s subjective opinion) and includes five violinists who have won prizes (a fact).

- (1a) The amazing orchestra included five prize-winning violinists. [prenominal modifier]
 (1b) The orchestra, which was amazing, included five prize-winning violinists. [appositive RC]
 (1c) The orchestra was amazing. It included five prize-winning violinists. [predicative]

In (1a), the subjective adjective “amazing” occurs directly before the noun “orchestra,” as a *prenominal modifier* (attributive adjective). In (1b), the adjective still describes the noun “orchestra” but now it occurs inside an *appositive relative clause* (. . . , *which was amazing*. . .). Appositive relative clauses (RCs) are a type of relative clause that typically conveys supplemental information that is not part of the “main news” (e.g., AnderBois et al., 2015; Loock, 2007; Potts, 2005; see also Dillon et al., 2017, and Harris & Potts, 2009). (They are typically marked with commas or dashes.) In (1c), the adjective occurs in predicative position (*The orchestra was amazing*). Thus, the adjective occurs in a different structural position in each sentence, but the core information conveyed by all sentences is the same.

The present paper investigates whether our ability to recognize that sentences like (1a), (1b), and (1c) contain subjective information is modulated by linguistic structure. We investigate whether people’s ability to detect opinion-based content indicated by subjective adjectives is decreased when the adjective is structurally packaged as part of the background information or as already-mentioned information, and heightened when the adjective is structurally packaged as part of the “main assertion” or as new, not-previously-mentioned information.

Consider (1d) and (1e). Intuitively, it seems that by using *unfair* as a prenominal modifier in (1d), the writer wants us to interpret the unfairness of the tax increase as an agreed-upon fact, not up for debate. In contrast, in (1e), with *unfair* in predicative position, the writer presents the sentence as his or her main assertion, an opinion that he or she knows is not shared by local lawmakers.

- (1d) Now, in addition to dealing with an unfair tax increase, New York’s governor and mayors are being hobbled by an unfair tax policy that is limiting their resources to confront Covid-19. (*Wall Street Journal*, Opinion – Commentary, 5 April 2020)¹
 (1e) Kentucky’s proposed gas tax hike is unfair and unnecessary [. . .] Some [lawmakers] may even tell us that a gas tax hike will actually help spark local economic investment. (*Courier Journal*, Opinion, 15 October 2018)²

We report a series of studies assessing these intuitions in a rigorous way with carefully controlled stimuli to see whether these different packaging options influence people’s ratings of how fact-like or opinion-like a text is. We systematically explore the effects of linguistic packaging with two classes of subjective adjectives: what we call complex subjective adjectives (e.g., *terrible*, *amazing*) and simple subjective adjectives (e.g., *long*, *heavy*). We use objective adjectives (e.g., *plastic*, *triangular*) as a control.

In this paper, we compare three hypotheses about how the linguistic position of two kinds of subjective adjectives affects people’s ratings of whether a text conveys factual, objective information or opinion-based, subjective information. We do this in a context wherein people’s own opinions and knowledge about current events are irrelevant, so potential effects of linguistic manipulations can be more clearly detected. Investigating how writers’ linguistic choices influence readers’ ability to detect subjective content is necessary for a better understanding of why people apparently struggle with the key task of distinguishing fact and opinion.

Conveying opinions with subjective adjectives: complex and simple adjectives

To investigate whether a person's ability to recognize opinion-based information is modulated by linguistic packaging, we use subjective adjectives (e.g., *amazing*, *funny*, *big*, *heavy*). These adjectives are ideal for this purpose, as they occur in a variety of linguistic positions. Below, we provide a definition of subjective adjectives, review prior work on linguistic packaging, and present three hypotheses on the effects of linguistic packaging for the perception of subjectivity.

Subjective adjectives convey evaluative information that reflects a person's subjective opinion or point of view rather than objective facts about the world. There exists an extensive literature in semantics on the topic of subjective adjectives (e.g., Anand, 2009; Cohen, 2010; Lasersohn, 2005; McNally & Stojanovic, 2017; Moltmann, 2010; Pearson, 2013; Sassoon, 2013; Stojanovic, 2007; and many others), focusing mostly on predicative constructions as in (2)—that is, structures of the type “[noun] is/was [adjective].” One of the best-known ways to test whether a particular adjective is subjective or objective is to see whether disagreement yields a contradiction. With a subjective adjective, two interlocutors can disagree without contradiction (3a), a phenomenon called faultless disagreement (Kölbel, 2003). With an objective adjective (3b), two interlocutors cannot disagree without someone being in the wrong.

(2a) The movie was terrible.

(2b) The bag is heavy.

(3a) Faultless disagreement with subjective adjectives (neither person is wrong):

Speaker A: The movie was terrible.

Speaker B: No, it wasn't, it was entertaining.

(3b) Contradiction with objective adjectives (one person must be wrong):

Speaker A: The shirt is cotton.

Speaker B: No, it's not.

In this paper, we test two main classes of subjective adjectives, which we refer to as (a) complex subjective adjectives and (b) simple subjective adjectives. Experiments 1 and 2 use complex subjective adjectives such as *amazing*, *beautiful*, *boring*, *unpleasant*. The subjectivity of these adjectives is complex because it can stem from multiple sources. For example, multiple dimensions/criteria can contribute to whether someone judges a particular place to be beautiful—for example, “the (ir-)regularity of the terrain, the sort of vegetation found there, the color of the sky, etc.” (McNally & Stojanovic, 2017, p. 21)—and people can differ in terms of which dimensions they view as more or less important (e.g., Kamp, 1975; McNally & Stojanovic, 2017; Sassoon, 2013). In addition, in some cases the subjectivity of these complex adjectives is rooted in personal experience (e.g., Bylinina, 2014; Lasersohn, 2005; McNally & Stojanovic, 2017). Such firsthand experience often involves multiple dimensions: I might think that a certain movie was boring, because it was long and did not have enough snappy dialog, but my friend might disagree, given that the movie had an unexpected ending. Here, my friend and I are weighting different dimensions in different ways when assessing our experiences of whether a movie is boring.³

In sum, the way in which complex subjective adjectives reflect people's opinions does not have a semantically simple source. These adjectives contrast with what we call simple subjective adjectives (e.g., *tall*, *heavy*, *fast*), which we investigate in Experiment 3. Simple subjective adjectives are gradable adjectives that only make reference to one dimension (e.g., height, weight, speed) and require that a certain threshold along that dimension is met. For example, for a person to count as tall, their height needs to surpass a certain threshold. The subjectivity of these adjectives stems from the fact that people may disagree about the threshold for what counts as, say, “tall” or “heavy” in a particular context (e.g., Kennedy, 2007; Klein, 1980; Solt, 2015; Unger, 1975). Thus, these adjectives are also subjective. But from a semantic point of view, their subjectivity is simpler: In each situation, it is constrained to one dimension.

Intuitively, simple subjective adjectives are less subjective than complex adjectives. We tend to view claims about being boring or funny as more opinion-based than claims about being heavy or fast. This difference can be derived from work by Kennedy (2007), who shows that whenever possible, we interpret the elements of a sentence in line with their conventional meaning, and only as a “last resort” do we allow contextual factors to play a role (Principle of Interpretative Economy). Applying this idea to simple subjective adjectives essentially means that we prefer to apply conventional expectations about height, speed, and so on to whatever the adjective is describing. In many cases, within a particular sociocultural context there are clear conventionalized opinions for such things (e.g., what counts as tall for a person, fast for a car). This bias toward conventionalized meaning decreases subjectivity and leaves less room for individual opinions; we prefer to base our interpretation on conventionalized, shared thresholds.

This contrasts with complex subjective adjectives, which are less conventionalized. Even within a particular sociocultural context, people routinely disagree about whether, say, a television show is interesting or a person is funny. The bias to interpret linguistic elements based on their conventional meaning (Kennedy, 2007) seems weaker with complex subjective adjectives, presumably because their meanings are more multidimensional and more rooted in individual experience (e.g., Bylina, 2014; McNally & Stojanovic, 2017). These adjectives are thus more subjective. Given these differences in the types of subjective adjectives, testing them both allows us to assess the generality of our results. Experiments 1 and 2 test complex subjective adjectives; Experiment 3 tests whether our findings extend to simple subjective adjectives. Experiment 4 is a control study that investigates objective adjectives to check whether the patterns observed in Experiments 1 through 3 occur with nonsubjective, fact-based adjectives.

Consequences of linguistic packaging: main news versus secondary information

Let us now take a closer look at why one might expect linguistic packaging to modulate people’s perception of subjectivity. The key point is that not all information in a sentence is equally “news-worthy” (e.g., Birner & Ward, 1998; Prince, 1981; Vallduví, 1992). A sentence can contain various kinds of secondary, backgrounded information in addition to its “main news.” This observation has been extensively discussed by a variety of language researchers from many different perspectives, using a variety of concepts and terms (e.g., hot news versus not-so-hot news, Cornilescu, 1981; focus versus background, e.g., Hopper & Thompson, 1980; Jackendoff, 1972; Rochemont, 1986; at-issue versus not-at-issue meaning, e.g., Harris & Potts, 2009; Murray, 2010; Potts, 2005; Simons et al., 2010; Tonhauser, 2012; see also Karttunen & Peters, 1979; our aim is not to compare these different approaches). Here, we use the general terms *main news* and *secondary information* for ease of exposition. There is a widely accepted intuition that some positions typically map onto (a) the primary contribution of an utterance (“main news”) while others correspond to (b) secondary, backgrounded information.

The linguistic packaging choices in (1) differ in terms of whether the subjective adjective is presented as main news or as secondary information. Information in predicative position (e.g., *amazing* in (1c)) constitutes main news; whereas information inside an appositive RC (1b) or as a prenominal modifier of a definite noun (1a) is not the main contribution of the sentence (see e.g., Potts, 2005; Tonhauser, 2012). In both (1a) and (1b), the main news is the number of prize-winning violinists. (In this paper, we focus on definite nouns because that allows us to compare the linguistic packaging options in a maximally parallel way.)

One way to identify the main news is with question-answer pairs. Example (4) shows that adjectives in predicative position are main news, whereas adjectives in prenominal modifier position and in appositive RCs are not: Only response, (4c), with a predicative structure, is a natural-sounding answer to Speaker A’s question, because it puts the sought-after information in the main news position. Putting this information in a secondary information position (prenominal modifier (4a), or appositive RC (4b)), does not yield a natural-sounding answer, as shown by #).

(4) Speaker A: What did you think of the orchestra's performance?

Speaker B:

- (a) # The amazing orchestra included five prize-winning violinists.
- (b) # The orchestra, which was amazing, included five prize-winning violinists.
- (c) The orchestra was amazing. It included five prize-winning violinists.

So far, we have identified a two-way division into main news and secondary information. However, a further distinction needs to be made, concerning whether the information is already shared between the speaker and the addressee (e.g., Birner & Ward, 1998; Prince, 1981). The main news of an utterance is typically *new information* for the addressee (see (4a)). However, secondary information can be new information or information that is already shared by both the speaker and addressee. Whether something is known by both speaker and addressee maps onto the difference between prenominal adjectives and adjectives in appositive RCs.

Definites typically refer to something that is known to both the speaker and the addressee. Semantic analyses traditionally posit that the definite article presupposes that there exists exactly one mutually salient referent for the noun phrase (e.g., Russell, 1905, 1919): By saying “the amazing orchestra,” the speaker signals that both the speaker and the addressee can identify the one mutually salient orchestra that is amazing. Thus, by using a prenominal adjective with a definite noun, the speaker is signaling that the information conveyed by the adjective is not only secondary but also something that is already known and agreed upon by the speaker and the addressee. (We are assuming a context with one salient orchestra, not a contrastive context with two or more orchestras.) In contrast, with appositive RCs, the speaker is marking the adjective as conveying extra, supplemental (background) information that may not be previously known by the addressee (e.g., Cornilescu, 1981; Loock, 2007, 2010). Loock (2007, 2010) uses corpus analyses to show that the information in appositive RCs can be discourse-new—that is, mentioned in the discourse for the first time. Thus, although both prenominal modifiers and appositive RCs provide secondary, non-“main news” information, they differ in terms of whether that information is presented as new versus old: Whereas prenominal adjectives with definite nouns convey already shared, common-ground information, this is not necessarily the case with appositive RCs.

In sum, elements in different positions have different informational properties, in terms of whether they are (a) main news versus secondary information and (b) new information or already-known information. The association of these differences with different structural positions brings up the question of whether this influences people's recognition of subjective content.

Does linguistic packaging matter? Lexically based hypothesis versus structure-based hypotheses

Our experiments investigate whether our ability to recognize subjective content—that is, to detect that a sentence conveys an opinion—is modulated by linguistic packaging. We report a series of studies testing whether people's ability to detect opinion-based content—as indicated by the use of subjective adjectives (e.g., *amazing*)—depends on the linguistic position in which they occur. We ask two questions: First, are subjective adjectives that are part of the main news (in predicative position) recognized as more subjective than the same adjectives presented as secondary information (in prenominal position or in appositive RCs)? Second, are subjective adjectives that can be interpreted as new information (in predicative position and in appositive RCs) recognized as more subjective than the same adjectives presented as already-known information (in prenominal position)? The answers to these questions relate to three hypotheses.

First, according to a (purely) lexically based hypothesis, the structural position of an adjective is irrelevant. Under this view, the presence of any kind of subjective adjective, regardless of its position within a sentence, should be enough for a sentence to be recognized as containing subjective content.

According to a simple conceptualization of this view, subjective adjectives are consistent cues that a sentence contains opinion-based information, so the structural position of the adjective is not expected to have an effect.

This view is related to a large body of work arguing that the lexical semantics of subjective adjectives differ in fundamental ways from the semantics of objective adjectives (e.g., Bylinina, 2014; Lasersohn, 2005). For example, the observation that subjective adjectives allow faultless disagreement—whereas objective adjectives do not (Example (3))—has been used to argue that subjective adjectives (at least in predicative position) have semantic representations that are inherently relativized to individuals (e.g., by means of a special “judge” variable encoded in their semantics), unlike objective adjectives (see e.g., Bylinina, 2014; Lasersohn, 2005; Stephenson, 2007). These observations could be used as the basis for a strong version of a lexically based view, according to which people’s assessment of subjectivity is independent of the adjective’s linguistic position, due to the lexical representation of this class of adjectives. It is worth noting that a purely lexically based hypothesis is compatible with a situation where different classes of subjective adjectives (discussed below) elicit different overall subjectivity ratings but crucially predicts that these ratings are not modulated by the adjective’s structural position.

In sum, a purely lexically based hypothesis would lead us to expect no effect of adjectives’ structural position on people’s ratings of whether a text conveys a fact or opinion. Under a strongly lexical view, the three different packaging options exemplified in Example (1) should yield comparable results, because they all contain the same subjective adjective.

In contrast, according to a structure-based view, the extent to which subjective adjectives are perceived as conveying subjective content is modulated by linguistic packaging. This view has two subhypotheses: According to the main-news hypothesis, subjective adjectives that are part of main news are predicted to be recognized as being subjective more easily than subjective adjectives that are secondary information. According to the new-information hypothesis, subjective adjectives whose structural position signals that they are known information (prenominal modifiers) are less likely to be recognized as conveying an opinion, when compared to information that is not clearly marked as being already known (e.g., appositive RCs and predicative constructions). Crucially, these two hypotheses are by no means mutually exclusive: It could be the case that *both* dimensions—the main-news/secondary-information dimension and the known-information/new-information dimension—guide perception of subjectivity. We call this the combined hypothesis.

Investigating the three structures in (1) allows us to test these hypotheses: If the new/old information dimension is what matters (new-information hypothesis), we expect adjectives in predicative position and in appositive RCs to be perceived as more subjective than the same adjectives in prenominal-modifier position. However, if the main-news/secondary-information dimension is what matters (main-news hypothesis), we expect adjectives in predicative position to be perceived as more subjective than those in prenominal-modifier position or inside appositive RCs. If both the main-news/secondary-information distinction and the known-information/new-information distinction are at play (combined hypothesis) we should observe a difference between all three configurations. The predicative position is associated with new information and main news, and the prenominal position is associated with neither, while information in appositive RCs can be associated with new information but not with main news.

These predictions are rooted in prior work showing that human-language processing and attentional systems privilege (a) new information and “main news” information over (b) old/given information and backgrounded information. Indeed, there seems to be a deep relationship between information structure and attention allocation: Prior work shows that backgrounded, known information, which is often also presupposed, is not processed as deeply or recalled as accurately as information that conveys the main news (e.g., Hornby, 1974; Lowder & Gordon, 2015; Sturt et al., 2004; Ward & Sturt, 2007; Zimmer & Engelkamp, 1981; see also Bredart & Doquier, 1989; Bredart & Modolo, 1988; Erickson & Mattson, 1981; Sanford & Sturt, 2002; Shafto & McKay, 2000). For example, Hornby tested people’s processing of cleft sentences such as “It is the *girl* who is riding the bicycle,” which distinguish the main contribution of the sentence (the new, focused information) from secondary, backgrounded

information. Participants were better at detecting mismatches when the mismatching information was part of the “main news” (the girl) than when it was part of the backgrounded, already-known information (the bicycle). In another study with clefts, Sturt et al. (2004) showed, using a change-detection paradigm, that depth of semantic encoding is modulated by linguistic packaging: Information that is presented as the main news is encoded more deeply than information presented as already known and backgrounded. Relatedly, other work found that the main news is remembered better (e.g., Birch & Garnsey, 1995; Birch & Rayner, 1997; Singer, 1976).

Recent work by Dillon et al. (2017) comparing appositive RCs to restrictive RCs (whose contents are not backgrounded) provides further evidence for a processing distinction between secondary/backgrounded information and non-backgrounded information: Dillon et al. show that the syntactic content of appositive RCs is less available in memory than that of restrictive RCs. (Dillon et al. discuss their results in terms of the at-issue/not-at-issue distinction.) Dillon et al.’s recent work dovetails nicely with Baker and Wagner’s (1987) earlier findings that when false information is presented in a parenthetical clause, participants are less likely to notice it (e.g., “The liver, which is an organ found only in humans, is often damaged by heavy drinking.”)

Overall, the general pattern that emerges is as follows: Information packaged as part of the “main news” and/or as new information to the addressee is prioritized over information that is already known and/or secondary: It is processed more deeply, attended to more, and recalled better. There is a close relation between attention allocation and information packaging. In our experiments, we test whether these effects influence people’s ability to detect subjective content, and we directly compare different linguistic structures to see if they differ in this regard.

Experiment 1

Experiment 1 compares subjectivity ratings of complex subjective adjectives in three different linguistic positions (prenominal modifier, predicative position, in an appositive RC) to probe for effects of structural position on the perception of subjectivity. Although different linguistic packaging options are known to influence depth of processing and recall, to the best of our knowledge the effects of different information-packaging options on our ability to recognize subjective, opinion-based information have not previously been systematically investigated.

Method

Participants

Participants were recruited via Amazon Mechanical Turk and completed the experiment via the Qualtrics web interface. For all the studies reported in this paper, MTurk participants had to have a U.S. IP address, at least 1,000 previously approved tasks (called Human Intelligence Tasks, HITs, on MTurk) and a 98% or greater HIT approval rate. Participants received USD 1.50.

Thirty-six native-English speakers were included in the final data analysis. We included only those who self-reported having been born in the United States, speaking English as their first language, and having normal/corrected-to-normal vision and hearing (no one had to be excluded for these reasons) and who made no more than two errors on six unambiguous practice items⁴ (one person was excluded based on the latter criterion). In addition, one participant was excluded because their responses on practice trials indicated that they had reversed the directionality of the scale, and one person was excluded to balance the number of participants per list. In all experiments reported in this paper, exclusion criteria were specified before data analyses on the target trials were conducted. The research reported in this paper was reviewed and approved by the USC Institutional Review Board.

Materials and design

The study had 20 targets and 36 fillers. In targets, we manipulated the presence and location of the subjective adjective. The baseline condition contains no adjective (Example (5a)); in the prenominal-modifier condition the adjective modifies the noun (attributive adjective, Example (5b)); in the appositive RC condition the adjective occurs in an appositive RC (Example (5c)); and in the predicative condition the adjective occurs in predicative position (Example (5d)). The critical noun is preceded by the definite article *the*. Crucially, all three adjective-containing conditions convey the same propositional information (orchestra = amazing; orchestra = included five prize-winning violinists), differing only in the linguistic packaging of this information.

- (5a) Baseline (no adjective): The orchestra included five prize-winning violinists.
- (5b) Prenominal modifier: The amazing orchestra included five prize-winning violinists.
- (5c) Appositive RC: The orchestra, which was amazing, included five prize-winning violinists.
- (5d) Predicative (two sentences, same propositional content as others): The orchestra was amazing. It included five prize-winning violinists.

Unlike Mitchell et al.'s (2018) study, we did not refer to real news events or facts related to current events. A potential concern with their study is that people's apparent inability to recognize factual information as such could stem from people not believing the information to be accurate. We avoided these problems (a) by designing items that could not be assessed for accuracy because they did not describe specific identifiable events and (b) by telling people that their task is not to evaluate accuracy. (Eventually, it would be ideal to look at news texts while controlling for these issues; we view this work as a foundational step in that direction.)

Each of the 20 targets used a different subjective adjective. We used a mix of positive and negative adjectives (based on norms from Warriner et al., 2013). Examples are *amazing*, *interesting*, *impressive*, *frustrating*, *tragic*, *unpleasant*. Further example items are in (Examples (6) through (7)). (The full list of adjectives is in the Appendix). The items were presented to participants using a Latin-square design, such that each item (and hence each adjective) occurred in each of the four conditions and each participant saw five items per condition. Each participant saw each item (and each adjective) only once. This is the case for all experiments reported in this paper.

- (6a) The fundraiser brought in several thousand dollars.
- (6b) The successful fundraiser brought in several thousand dollars.
- (6c) The fundraiser, which was successful, brought in several thousand dollars.
- (6d) The fundraiser was successful. It brought in several thousand dollars.
- (7a) The snowstorm impacted several cities.
- (7b) The terrible snowstorm impacted several cities.
- (7c) The snowstorm, which was terrible, impacted several cities.
- (7d) The snowstorm was terrible. It impacted several cities.

In Experiment 1, we controlled the semantic relation between the adjective and the rest of the text, such that the objective information provided grounds/evidence for use of the subjective adjective. For example, the information that the orchestra included five prize-winning violinists provides the evidence for describing it as amazing; the fact that the fundraiser brought in several thousand dollars provides the reason for describing it as successful; and the fact that the snowstorm impacted several cities is the grounds for describing it as terrible. (Experiments 2a and 2b test whether sentences in which the objective information does not provide grounds/evidence for use of the subject adjective show a different response pattern.)

The study included 36 fillers, which varied in their structure but resembled the targets in length. In addition, some were written as newspaper headlines. Most fillers were expected to be judged as fairly factual. We designed the fillers this way given that participants were told to read the sentences as if they were in newspapers or on news websites, and newspapers mostly contain facts. Some examples of these

fillers are “Over 76% of U.S. twelfth graders report getting less than 8 hours of sleep per night on school nights,” “Hurricane Causes Power Outage,” “The city closed the stadium. The mayor stated that it did not ‘meet the new safety standards introduced last year.’”

Procedure

The study was implemented using Qualtrics; participation took place over the Internet. Participants were instructed to treat the texts as coming from newspapers or news websites and to imagine that the sentences could come from any section (e.g., News, Opinion, Sports, Arts). Participants provided a subjectivity rating for each sentence, using a 6-point scale ($1 = \textit{fact}$, $6 = \textit{opinion}$). People were told that if they “feel strongly that the sentence or sequence of sentences conveys an opinion (in other words, contains subjective information),” they should rate the item as 6, whereas if they “feel strongly that the sentence or sequence of sentences does not convey an opinion (only contains objective, factual information),” they should rate it as 1. Participants were also encouraged to use 2, 3, 4, and 5 when they felt the sentence fell somewhere in between. We used the labels *fact/opinion* rather than *objective/subjective*, because the former are terms that everyone is familiar with. Crucially, the instructions made it clear that the presence of any subjective, opinion-based information means the sentence should be categorized as “opinion.” Indeed, all items contained objective, factual information (e.g., that the orchestra has five violinists). Example items were provided to help clarify the instructions. The instructions also emphasized that participants were not being asked to assess the accuracy of the information.

Predictions

According to the lexically based hypothesis, the position of subjective adjectives does not affect subjectivity ratings. The baseline condition should be rated the least subjective (it contains no subjective adjective) and the three other conditions should be rated equally subjective. In contrast, a structure-based view predicts effects of linguistic packaging: The main news hypothesis predicts a binary split: greater sensitivity to subjective adjectives in the predicative condition than in the prenominal modifier or appositive RC conditions. The new-information hypothesis predicts a different binary split: greater sensitivity to subjective adjectives in the predicative and the appositive RC conditions than in the prenominal-modifier condition. The combined hypothesis predicts a three-way distinction: greater sensitivity to subjective adjectives in the predicative than in the appositive RC condition and greater sensitivity in the appositive RC than in the prenominal-modifier condition (predicative > RC > modifier).

Data analysis

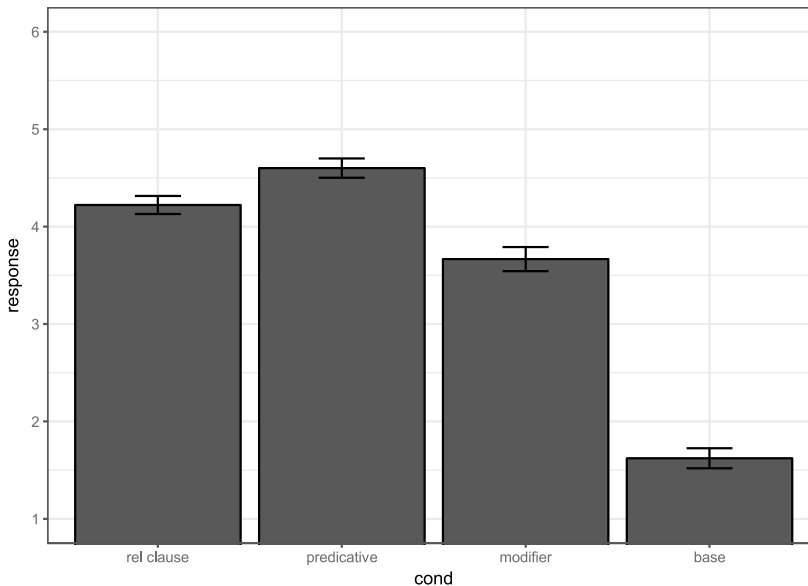
Data was analyzed using R (R Core Team, 2013). To assess the relationship between subjectivity ratings and the presence and location of subjective adjectives, we fit linear mixed effects regression models (lme4 1.1-20, Bates et al., 2015) to our data and used the emmeans package (emmeans 1.5.0, Lenth, 2018) to obtain Bonferroni-corrected pairwise comparisons (see e.g., Cunnings, 2012; Gibson et al., 2011, on using lmer on rating-scale data). “Condition” was entered as a fixed effect into the model. As random effects, we had intercepts for subjects and items in all models and by-subject and by-item random slopes for the effect of condition when justified by model comparison. (For each model, we started with the maximal random effect structure for subjects and items and used model comparison to identify the maximal random effect structure justified by the design and supported by the data. As random effects, we included intercepts for subjects and items in all models, and by-subject and by-item random slopes when they contributed significantly to the model ($p > .05$); Baayen et al., 2008). The particular lmer models that yielded the results reported in Tables 1 through 7 are provided in the Supplement. We analyzed both raw scores and z scores. We report the outcomes for the raw scores (Tables 1-7); z score analyses yielded largely the same basic pattern.⁵

Table 1a. Experiment 1 Mean Subjectivity Ratings by Condition, 1 = *fact*, 6 = *opinion*. (In this and subsequent tables and figures, standard errors and CIs were calculated according to Cousineau (2005) and corrected according to Morey (2008)).

Condition	Mean rating	SD	SE	95% CI
Baseline	1.622	1.387	0.103	0.204
Modifier	3.667	1.665	0.124	0.246
Predicative	4.600	1.334	0.099	0.196
Relative clause	4.222	1.242	0.092	0.183

Table 1b. Pairwise Comparisons for Experiment 1 (*p* values reflect Bonferroni correction).

	estimate	SE	t ratio	p
Baseline—modifier	−2.044	0.123	−16.661	<.0001
Baseline—predicative	−2.9778	0.123	−24.267	<.0001
Baseline—relative clause	−2.6000	0.123	−21.188	<.0001
Modifier—predicative	−0.9333	0.123	−7.606	<.0001
Modifier—relative clause	−0.5556	0.123	−4.527	<.0001
Predicative—relative clause	0.3778	0.123	3.079	0.013

**Figure 1.** The fact/opinion ratings for the four conditions in Experiment 1. On the 6-point scale, 1 = *fact*, 6 = *opinion*. In this and subsequent figures, error bars represent ± 1 standard error for within-subjects designs according to Morey (2008).

Results

The results for Experiment 1 are shown in Tables 1a and in Figure 1, with the results of the pairwise comparisons in Table 1b. The baseline condition is rated as significantly less subjective (i.e., more objective) than the other three conditions. All of the remaining conditions differ significantly from each other: The prenominal modifier condition, while rated more subjective than the baseline, is rated significantly less subjective than both the predicative and the RC conditions, and the RC condition is rated less subjective than the predicative condition.

Discussion

Experiment 1 tested the general question of whether linguistic packaging modulates how people perceive subjective information (structure-based view) or whether the mere presence of a subjective adjective triggers similar levels of subjectivity ratings regardless of structure (lexically based hypothesis). We also asked the more specific question of what informational properties of particular syntactic positions are responsible for potential structure-based effects. As regards the general question of whether differences in linguistic packaging modulate perceived subjectivity, the results of Experiment 1 show that, yes, this is indeed the case.

As regards the more specific question of what informational properties of the different structures drive these effects, Experiment 1 supports the combined hypothesis, according to which both the main news/secondary information distinction and the known information/new information distinction are at play. (Recall that adjectives in predicative position typically convey main news (which is new information), whereas prenominal modifiers and appositive RCs normally express secondary information, and that prenominal adjectives with definite nouns normally convey already shared, common-ground information, but this is not the case with appositive RCs.) Indeed, our results show a three-way split such that when the subjective adjective is a prenominal modifier, the text is rated less subjective than when the adjective is inside an appositive RC or the predicative position and the appositive RC condition is rated less subjective than the predicative condition. The pattern that emerges, from least to most subjective is: baseline < modifier < appositive RC < predicative.

Overall, the results of Experiment 1 show that people's subjectivity ratings are modulated by linguistic packaging: We can take the same basic information and structure it differently to raise or lower the likelihood that participants will judge a text as "opinion" or "fact."

One might wonder whether any complications arise from all subjective-adjective-containing conditions also containing facts. The presence of factual content should, if anything, shift *all* conditions toward factual ratings. The fact that we still observe differences between the baseline and the adjective-containing conditions (as well as within the adjective-containing conditions) suggests that even if there is an across-the-board boost happening, it does not mask differences between linguistic-packaging options and, thus, is not problematic for our claims.

Experiments 2a and 2b: presence/absence of a justification for the subjective opinion

A question left open by Experiment 1 concerns our decision to provide justification for the subjective adjective: The items in Experiment 1 were designed so that the rest of the sentence provided evidence/grounds/justification for use of the subjective adjective. For example, in "The fundraiser was successful. It brought in several thousand dollars" the information about the fundraiser bringing in several thousand dollars provides evidence for it being successful. What happens if no evidence is provided for why someone would hold the opinion conveyed by the subjective adjective? Consider "The fundraiser was successful. It was organized by the hospital." If someone uses a subjective adjective without giving any evidence for why they hold that opinion, would this trigger higher subjectivity ratings? One might expect this to be the case, because providing a justification could render something seemingly less subjective. To test this, Experiments 2a and 2b manipulated the presence of evidence for the opinion. It is also worth emphasizing that half the conditions in Experiments 2a and 2b (those with justification for the subjective adjective) serve as replications of Experiment 1 and allow us to test the robustness of the patterns observed in the first experiment.

Method

Participants

Recruitment, payment, and MTurk requirements were as in Experiment 1. For both Experiments 2a and 2b, 48 participants were included in the final analysis. (No one participated in more than one experiment.) The exclusion criteria were the same as Experiment 1, except for the following: Because

Experiments 2a and 2b were longer than Experiment 1, we included four catch trials/attention checks. Two were purely factual (e.g., “The sound of the jackhammer reached 95 decibels”) and two contained more-opinion-based content (e.g., “The play, which was performed by the graduating class, was rather long”). None used the same adjectives as targets. Participants were expected to select 1 or 2 for factual catch trials and 4, 5, or 6 for opinion-containing catch trials. We allowed a range of answers so only truly inattentive participants would be detected. Participants who made two or more errors on catch trials were excluded.

In Experiment 2a, two people were excluded for not self-reporting as U.S.-born native-English speakers, two for reporting visual or hearing impairments,⁶ two for low accuracy on practice items, three for low accuracy on catch trials, and two for low accuracy on both. In Experiment 2b, one person was excluded due to a hearing impairment, two for low accuracy on practice trials, three for low accuracy on catch trials, and five for low accuracy on both.⁷ In both experiments, one additional person was excluded to balance the number of participants per list.

Materials and design

To investigate whether the presence/absence of justification/evidence for the use of the subjective adjective influences subjectivity ratings, we manipulated (a) the presence and position of the subjective adjective as in Experiment 1 (baseline/no adjective, prenominal modifier, predicative, appositive RC) and (b) whether or not the rest of the sentence provides justification/evidence for the opinion conveyed by the adjective.

To keep the number of conditions manageable, the design was split into two experiments that are partial replications of each other: Experiment 2a tested the baseline, prenominal-modifier and predicative configurations, with and without evidence for the subjective adjective ($2 \times 3 = 6$ conditions). Experiment 2b tested the baseline, appositive-RC and predicative configurations with and without evidence for the predicative adjective ($2 \times 3 = 6$ conditions).

Example items for both experiments are shown in (8) and (9). As in Experiment 1, the baseline condition contains no subjective adjective ((8a) and (9a)). The other conditions have the subjective adjective in modifier position, in predicative position or inside an appositive RC.

(8) Sample item for Experiment 2a (baseline, prenominal modifier, predicative)

No evidence:

(8a) The fundraiser was organized by the hospital.

(8b) The successful fundraiser was organized by the hospital.

(8c) The fundraiser was successful. It was organized by the hospital.

Evidence:

(8d) The fundraiser surpassed its annual goal.

(8e) The successful fundraiser surpassed its annual goal.

(8f) The fundraiser was successful. It surpassed its annual goal.

(9) Sample item for Experiment 2b (baseline, appositive RC, predicative)

No evidence:

(9a) The fundraiser was organized by the hospital.

(9b) The fundraiser, which was successful, was organized by the hospital.

(9c) The fundraiser was successful. It was organized by the hospital.

Evidence:

(9d) The fundraiser surpassed its annual goal.

(9e) The fundraiser, which was successful, surpassed its annual goal

(9f) The fundraiser was successful. It surpassed its annual goal.

In the No Evidence conditions, the objective information contained in the rest of the sentence does not provide a reason/grounds for the subjective adjective; for example, whether or not a fundraiser was successful is not related to its being organized by the hospital. In contrast, in the Evidence conditions, the objective information in the rest of the sentence does provide a reason for use of the subjective adjective; for example, the fact that the fundraiser brought in several thousand dollars is grounds for

judging it to be successful. As in Experiment 1, within the Evidence conditions and within the No Evidence conditions, all adjective-containing conditions convey the same propositional information and differ only in the linguistic packaging of this information.

The 24 targets in Experiments 2a and 2b were selected from a larger set based on pretesting. The final set only included items where (a) in the Evidence variant, the objective evidence was judged to be strong evidence for use of the subjective adjective (average score ≥ 4 on a 5-point scale from 1 = no evidence to 5 = strong evidence) and (b) in the No Evidence variant, the objective information was not judged to be strong evidence for use of the subjective adjective (average ≤ 2 on the 5-point scale). (The adjectives are listed in the Appendix). In addition to 24 targets, both Experiments 2a and 2b had 36 fillers. We used the same fillers as in Experiment 1.

Procedure

The procedure was the same as in Experiment 1.

Predictions

If presence/absence of evidence has no effect, the predictions for Experiments 2a and 2b are essentially the same as for Experiment 1. However, if conveying subjective information without providing a reason makes the subjective nature of that information more apparent, we expect the presence of a subjective adjective to trigger overall higher subjectivity ratings in the No Evidence conditions than in the Evidence conditions.

Data analysis

To check whether Experiment 1's results replicate, we used *lmer* and *emmeans* for pairwise comparisons (separately for Experiments 2a and 2b). To further assess whether presence of evidence modulates subjectivity ratings, we fit *lmer* models to the data from Experiment 2a and 2b (separately), with fixed effects of structure and presence/absence of evidence, to test for main effects and interactions. Model building and comparison were done as in Experiment 1. Further analyses compared Experiments 2a and 2b to each other.

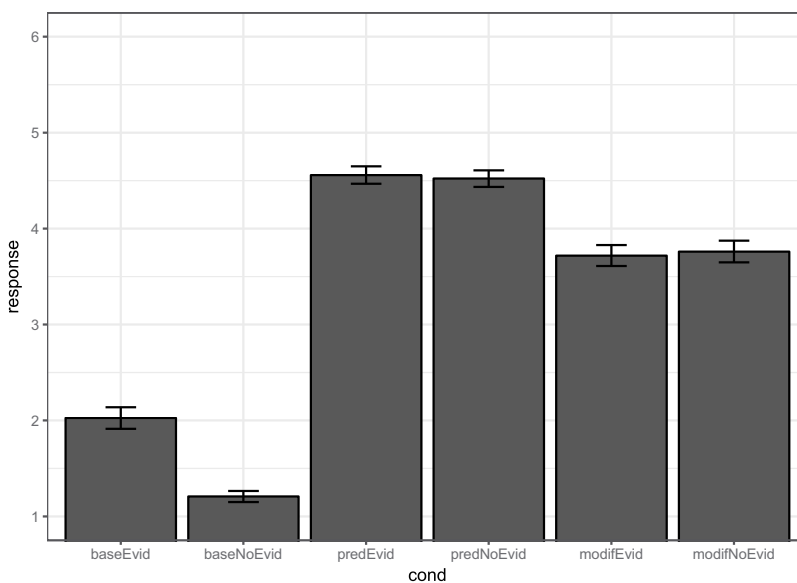


Figure 2a. The fact/opinion ratings for the six conditions in Experiment 2a. On the 6-point scale, 1 = fact, 6 = opinion. Error bars represent ± 1 standard error for within-subjects designs according to Morey (2008).

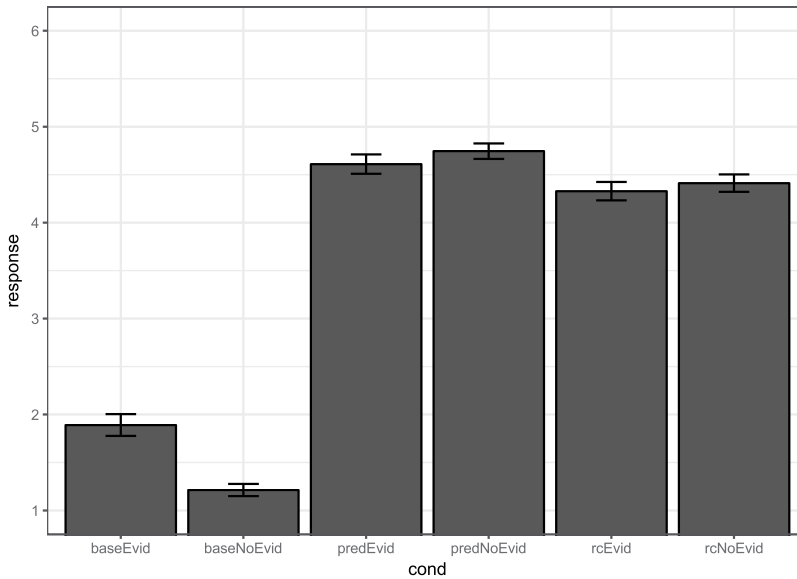


Figure 2b. The fact/opinion ratings for the six conditions in Experiment 2b. On the 6-point scale, 1 = fact, 6 = opinion. Error bars represent ± 1 standard error for within-subjects designs according to Morey (2008).

Results and discussion

Replication: Do the structural effects observed in Experiment 1 replicate?

Before investigating whether the presence of evidence has an effect on participants' subjectivity ratings, let us consider whether the pattern observed in Experiment 1 is replicated in Experiments 2a and 2b: Do we again find the following ranking, from least to most subjective: baseline < modifier < appositive RC < predicative? Visually, [Figure 2a and 2b](#) suggest that yes, this pattern is repeated in both the Evidence conditions and the No Evidence conditions of both Experiments 2a and 2b (see [Tables 2a and 2b](#) for descriptive statistics).

The pairwise comparisons in [Tables 3a and 3b](#) (models are provided in the Supplement) confirm the baseline < modifier < predicative ranking (from least to most subjective, Experiment 2a) and the baseline < appositive RC < predicative ranking (Experiment 2b). All differences are significant under

Table 2a. Experiment 2a Mean Subjectivity Ratings by Condition (1 = fact, 6 = opinion).

Condition	Mean rating	SD	SE	95% CI
Baseline evidence	2.026	1.552	0.112	0.221
Baseline no evidence	1.208	0.804	0.058	0.114
Predicative evidence	4.557	1.265	0.091	0.180
Predicative no evidence	4.521	1.191	0.086	0.169
Modifier evidence	3.719	1.512	0.109	0.215
Modifier no evidence	3.760	1.558	0.112	0.222

Table 2b. Experiment 2b Mean Subjectivity Ratings by Condition (1 = fact, 6 = opinion).

Condition	Mean rating	SD	SE	95% CI
Baseline evidence	1.890	1.567	0.113	0.223
Baseline no evidence	1.213	0.877	0.063	0.125
Predicative evidence	4.609	1.401	0.101	0.199
Predicative no evidence	4.745	1.116	0.081	0.159
RC evidence	4.328	1.329	0.096	0.189
RC no evidence	4.411	1.255	0.091	0.179

Table 3a. Pairwise Comparisons for Experiment 2a (p values reflect Bonferroni correction).

		estimate	SE	t ratio	p
Evidence	Baseline—modifier	-1.693	0.207	-8.188	<.0001
	Baseline—predicative	-2.531	0.199	-12.723	<.0001
	Modifier—predicative	-0.839	0.127	-6.588	<.0001
No evidence	Baseline—modifier	-2.55	0.11	-23.247	<.0001
	Baseline—predicative	-3.31	0.11	-30.174	<.0001
	Modifier—predicative	-0.76	0.11	-6.927	<.0001

Table 3b. Pairwise Comparisons for Experiment 2b (p values reflect Bonferroni correction).

		estimate	SE	t ratio	p
Evidence	Baseline—predicative	-2.719	0.179	-15.219	<.0001
	Baseline—RC	-2.438	0.155	-15.747	<.0001
	Predicative—RC	0.281	0.123	2.285	0.0816
No evidence	Baseline—predicative	-3.531	0.0976	-36.177	<.0001
	Baseline—RC	-3.198	0.0976	-32.762	<.0001
	Predicative—RC	0.333	0.0976	3.415	.0021

Bonferroni correction, except for the predicative-RC comparison in the Evidence conditions of Experiment 2b, which is marginal under Bonferroni ($p = .08$), significant without Bonferroni. The t value exceeds $|2|$, the commonly accepted cutoff ($t = 2.285$, see Tables 3a and 3b).

Additional analyses comparing the modifier condition in Experiment 2a to the appositive RC condition in Experiment 2b show that the *modifier* < *appositive RC* ranking is also replicated: The appositive RC condition in Experiment 2b is rated more subjective than the prenominal modifier condition in Experiment 2a (main effect of experiment, $\beta = -0.693$, $SE = 0.1773$, t value = -3.554 , p value < .001; no main effect of evidence, $\beta = 0.0625$, $SE = 0.0824$, t value = 0.759 , p value = 0.448 ; no experiment-by-evidence interaction, $\beta = -0.0417$, $SE = 0.1647$, t value = -0.253 , p value = 0.8). This replicates Experiment 1.

Numerically, the mean ratings for the different adjective-containing conditions in Experiments 1, 2a, and 2b match up very closely across experiments (prenominal modifier: Experiment 1 = 3.67, Experiment 2a Evidence/No Evidence = 3.72/3.76; predicative: Experiment 1 = 4.6, Experiment 2a Evidence/No Evidence = 4.56/4.52, Experiment 2b Evidence/No Evidence = 4.61/4.75; appositive RC: Experiment 1 = 4.2, Experiment 2b Evidence/No Evidence = 4.33/4.41).

In sum, Experiments 2a and 2b both replicate the finding from Experiment 1 that the adjective's position modulates people's subjectivity ratings—in line with a structure-based view, but not predicted by a lexically based hypothesis. More specifically, results of all three experiments support the combined hypothesis and suggest that both the main-news/secondary-information distinction and the known-information/new-information distinction play a role: Subjective adjectives presented as already-known information receive lower subjectivity ratings as do subjective adjectives that are packaged as secondary information—that is, not as part of the main news.

Does the presence/absence of evidence for the opinion modulate subjectivity ratings?

Now, let us assess whether the presence/absence of a reason for using a certain subjective adjective modulates subjectivity ratings. Does lack of evidence trigger higher subjectivity ratings? Figures 2a and 2b suggest that in the predicative, RC, and modifier structures, presence/absence of evidence for the opinion has no effect: The bars are comparable.

To test this, statistical analyses on the subjectivity ratings for the predicative and modifier structures in Experiment 2a and the predicative and RC structures in Experiment 2b were conducted using mixed-effect models. We included structure type and presence/absence of evidence as fixed effects (coded as 0.5 and -0.5). As random effects, we included intercepts for subjects and items in all models and by-subject and by-item random slopes when justified by model comparison (see data analysis

section of Experiment 1; models are provided in the Supplement). As expected, both models reveal a main effect of structure (Experiment 2a: $\beta = 0.799$, $SE = 0.102$, $t = 7.829$, $p < .0001$, Experiment 2b: $\beta = -0.307$, $SE = 0.074$, $t = -4.129$, $p < .0001$) but crucially no main effect of evidence and no interaction between evidence and structure type in either Experiment 2a or 2b ($|t|s < 1.5$, $ps > 0.14$). This indicates that absence of evidence for the subjective opinion does not boost subjectivity ratings.

Additional analyses were conducted to address potential concerns regarding an unexpected difference in the baseline conditions of Experiments 2a and 2b: the baseline conditions in the Evidence versions were rated more subjective than the baseline conditions in the No Evidence conditions, although neither contains a subjective adjective. Additional analyses (reported in the Supplement) show that even if we take into account the bias exhibited by the baseline conditions, we still find no effect of evidence presence/absence—in other words, we find no support for the idea that participants rate a text with a subjective adjective as being more subjective when no reason/evidence/justification for the subjective opinion is provided.

Experiment 3: simple subjective adjectives

The results of Experiments 1, 2a, and 2b show that people's subjectivity ratings are influenced by the syntactic position of complex subjective adjectives: Adjectives that are prenominal modifiers trigger lower subjectivity ratings than adjectives that are inside appositive RCs or in predicative position, regardless of whether the rest of the text contains a justification for the opinion or not. This supports a structure-based view—more specifically, it supports the combined hypothesis according to which both the main-news/secondary-information distinction and the known-information/new-information distinction influence perceived subjectivity. Experiment 3 tests the robustness of this result by testing whether it applies to a simpler class of subjective adjectives—namely, unidimensional gradable relative adjectives such as *tall*, *heavy*, and *fast*.

Method

Participants

Participant recruitment, payment, and exclusion criteria were the same as in Experiments 2a and 2b. Two people were excluded for not reporting their status as U.S.-born native-English speakers, and one person was excluded due to a vision impairment. Furthermore, one person was excluded for low accuracy on practice items, three for low accuracy on catch trials, and four for low accuracy on both practice and catch trials. Three people were excluded to balance the number of participants per list. Thirty-two participants were included in the final analysis.

Materials, design, procedure

The study consisted of 24 targets, 36 fillers, and four catch trials. The fillers were the same as in the preceding studies, and the catch trials were adapted from Experiments 2a and 2b. In the target items, as in Experiment 1, we manipulated the presence and location of the adjective, for a total of four conditions. (New items were created because changing the adjectives in the sentences used in Experiments 1, 2a, and 2b did not yield sensible items.) An example is shown in (10). To ensure maximally natural-sounding items, the objective information in the items in Experiment 3 does not provide a reason/evidence for using the subjective adjective. Given that Experiments 2a and 2b show that the presence/absence of evidence has no effect, we do not expect this change to have any consequences. (The target adjectives are provided in the Appendix). The procedure was the same as Experiments 1, 2a, and 2b.

(10a) Baseline (no adjective): The bridge connected the villages to each other.

(10b) Prenominal modifier: The wide bridge connected the villages to each other.

(10c) Appositive RC: The bridge, which was wide, connected the villages to each other.

(10d) Predicative (two sentences, same propositional content as others): The bridge was wide. It connected the villages to each other.

Predictions

If our findings regarding the effects of linguistic packaging on the perception of subjectivity extend to this simpler class of subjective adjectives, the predictions are the same as for Experiment 1. We also expect the subjectivity ratings for the class of simple subjective adjectives to be overall lower than for complex subjective adjectives, given Kennedy's (2007) observations regarding a preference for using conventionalized thresholds whenever possible.

Results

The results for Experiment 3 are in Figure 3 and Tables 4 and 5. Visually, the cline of subjectivity ratings parallels Experiments 1, 2a, and 2b: baseline < modifier < appositive RC < predicative, with the RC and predicative conditions receiving more-similar ratings than the others. The pairwise comparisons show that the baseline condition (with no adjective) is rated less subjective than each of the adjective-containing conditions and that the modifier condition is rated less subjective than the predicative condition. The difference between the modifier and RC structures does not reach significance under strict Bonferroni correction, although it is significant without Bonferroni ($p = .02$); the t value is greater than $|2|$ ($t = -2.392$). However, there is no indication that the RC and predicative

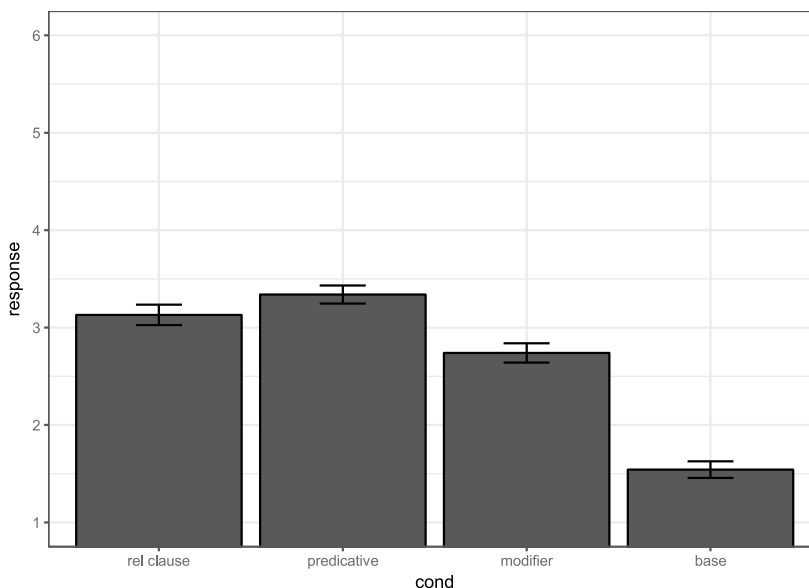


Figure 3. The fact/opinion ratings for the four conditions in Experiment 3. On the 6-point scale, 1 = fact, 6 = opinion. Error bars represent ± 1 standard error for within-subjects designs according to Morey (2008).

Table 4. Experiment 3 Mean Subjectivity Ratings by Condition (1 = fact, 6 = opinion).

Condition	Mean rating	SD	SE	95% CI
Baseline	1.542	1.179	0.085	0.168
Modifier	2.739	1.371	0.099	0.195
Predicative	3.338	1.289	0.093	0.183
Relative clause	3.130	1.437	0.104	0.205

Table 5. Pairwise Comparisons for Experiment 3 (p values reflect Bonferroni correction).

	estimate	SE	t ratio	p
Baseline—modifier	-1.199	0.204	-5.882	<.0001
Baseline—predicative	-1.797	0.196	-9.145	<.0001
Baseline—relative clause	-1.589	0.199	-7.994	<.0001
Modifier—predicative	-0.599	0.133	-4.492	<.0001
Modifier—relative clause	-0.391	0.163	-2.392	0.139
Predicative—relative clause	0.208	0.154	1.352	1.000

structures differ reliably in their subjectivity ratings. We return to this below. As before, numerically the predicative condition is rated the most subjective.

Comparing simple and complex subjective adjectives

To test whether subjectivity ratings for the simple subjective adjectives in Experiment 3 are lower across the board than for the complex subjective adjectives in Experiment 1 (with the same four-condition design), we fit lmer models with “experiment” as a between-studies factor (see Supplement). The results confirm that, in all conditions, subjectivity ratings for the class of simple subjective adjectives are lower than for complex subjective adjectives ($\beta = -0.840$, $SE = 0.240$, t value = -3.501 , $p < .001$).

Discussion

Let us first consider the general question of whether differences in syntactic packaging of subjective adjectives influence people’s subjectivity ratings. Experiment 3 provides evidence that the effects of linguistic packaging on perceived subjectivity extend—at least partially—to the semantically simpler class of unidimensional relative adjectives. These results support the structure-based view over the lexically based hypothesis and confirm that even with relatively less subjective adjectives, linguistic packaging has significant effects on subjectivity ratings.

What about the more specific question of what informational properties of particular syntactic positions are responsible for these effects? Experiment 3 shows that texts with simple subjective adjectives in prenominal modifier position are rated more subjective than the baseline but less subjective than texts with the same adjectives in predicative position. The results also point to a difference between the modifier and appositive RC conditions, in the same direction as the preceding studies—that is, that subjective adjectives presented as new information yield higher subjectivity ratings than the same adjectives in positions not associated with new information. These patterns echo what we found in Experiments 1, 2a, and 2b. Surprisingly, in Experiment 3 there is no reliable difference between the predicative and RC conditions (the comparison relevant for testing effects of main-new status). As a whole, Experiment 3 provides clearer evidence for new-information status modulating perception of subjectivity than for main-news status modulating perception of subjectivity. However, given that Experiments 1, 2a, and 2b already showed that the difference between the predicative and RC conditions is smaller than the difference between these structures and the modifier condition, the null result concerning the predicative and RC conditions in Experiment 3 may simply be due to lack of power.

Experiment 3 also shows that the subjectivity ratings for simple subjective adjectives are overall lower than for complex subjective adjectives, in line with the hypothesized preference to use conventionalized thresholds with unidimensional adjectives when possible. Thus, there are meaningful differences between subclasses of subjective adjectives. Nevertheless, both classes tested here show similar effects of structural position. These results are not predicted by a purely lexically based hypothesis, according to which the adjective’s structural position has no effect.

Experiment 4: objective adjectives

The results of Experiments 1, 2, and 3 show that the structural position of two kinds of subjective adjectives modulates comprehenders' subjectivity ratings. In other words, these results suggest that the extent to which people can detect that a text contains opinion-based information depends on the linguistic packaging of that information. However, can we be certain that the increased subjectivity of the adjective-containing conditions (relative to the baseline) is indeed due to the adjectives being *subjective*? Prior work in computational linguistics suggests that the mere presence of any kind of adjectives may be associated with an increased perception of subjectivity (see e.g., Wiebe, 2000, for related work). This raises the possibility that the presence of any kind of descriptive information—even if it is objective—would show the same kind of linguistic packaging effects we saw in Experiments 1 through 3. If so, this would mean that our results are not about subjectivity, per se, but about the presence of adjectives. To determine whether or not the increase in subjectivity in the adjective-containing conditions of Experiments 1 through 3 (relative to the baseline) is associated with the subjective nature of the adjectives, Experiment 4 tests objective adjectives. The interpretation of objective adjectives (e.g., *plastic*, *ceramic*, *international*, *electric*) is not dependent on subjective opinions. For example, they do not allow faultless disagreement (see Example 3). Thus, we now ask whether we see the same increase in subjectivity ratings due to the mere presence of adjectives, even if the adjectives are objective.

Method

Participants, materials, design, and procedure

Recruitment, payment, MTurk requirements and exclusion criteria were as in Experiments 2a, 2b, and 3. One person was excluded because they did not report status as a U.S.-born native-English speaker; one was excluded for a hearing impairment; one for low performance on both practice items and catch trials; and six for low performance on catch trials. Two more people were excluded to balance the number of participants per list. Thirty-two participants were included in the final analysis. Targets were the same as Experiment 3, except that subjective adjectives were replaced with objective adjectives (see Appendix). An example is in (11). The fillers were the same as Experiment 3. The procedure was the same as Experiments 1, 2, and 3.

- (11a) Baseline (no adjective): The bridge connected the villages to each other.
- (11b) Prenominal modifier: The wooden bridge connected the villages to each other.
- (11c) Appositive RC: The bridge, which was wooden, connected the villages to each other.
- (11d) Predicative (two sentences, same propositional content as others):
The bridge was wooden. It connected the villages to each other.

Predictions

If any kind of adjective increases subjectivity ratings, we expect all adjective conditions to differ from the baseline. If opinion dependence is responsible for boosting subjectivity ratings, we don't expect sentences with objective adjectives to differ from baseline.

Results

The results are in Figure 4 and Table 6: All conditions receive similarly low subjectivity ratings. Statistical analyses (Table 7) show that none of the conditions differ significantly from each other, except for the baseline and the predicative condition. However, given that neither the baseline nor the predicative condition differ from any of the other conditions (which also do not differ from each other) and the 95% CIs overlap, this difference is hard to interpret.

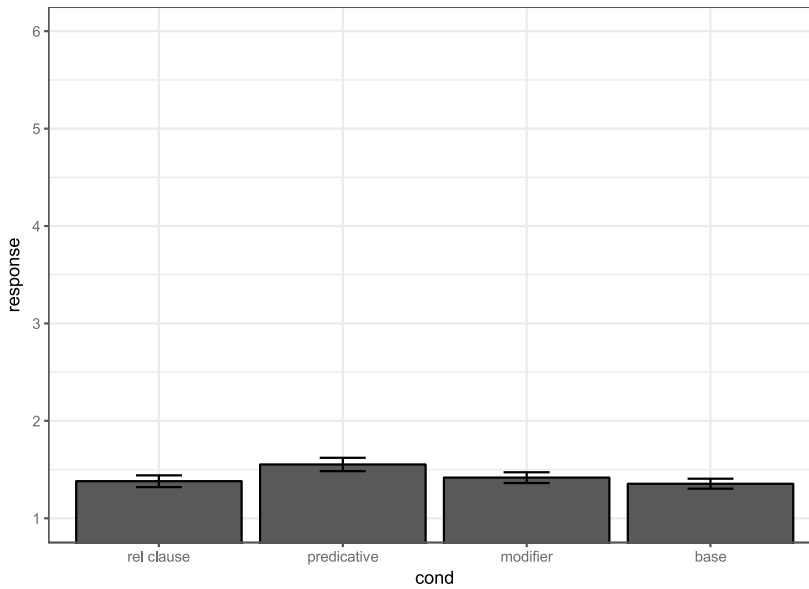


Figure 4. The fact/opinion ratings for the four conditions in Experiment 4. On the 6-point scale, 1 = fact, 6 = opinion. Error bars represent ± 1 standard error for within-subjects designs according to Morey (2008).

Table 6. Experiment 4 Mean Subjectivity Ratings by Condition (1 = fact, 6 = opinion).

Condition	Mean rating	SD	SE	95% CI
Baseline	1.354	0.709	0.051	0.101
Modifier	1.417	0.774	0.056	0.110
Predicative	1.552	0.957	0.069	0.136
Relative clause	1.380	0.839	0.065	0.119

Table 7. Pairwise Comparisons for Experiment 4 (p values reflect Bonferroni correction).

	estimate	SE	t ratio	p
Baseline—modifier	-0.0625	0.07171	-0.872	1.000
Baseline—predicative	-0.1979	0.07171	-2.760	0.0356
Baseline—relative clause	-0.0260	0.07171	-0.363	1.000
Modifier—predicative	-0.1354	0.07171	-1.888	0.3564
Modifier—relative clause	0.0365	0.07171	0.508	1.000
Predicative—relative clause	0.1719	0.07171	2.397	0.1008

Comparing objective and subjective adjectives

To see whether the subjectivity ratings for the objective adjectives in Experiment 4 are lower across the board than ratings for the complex subjective adjectives in Experiment 1 and the simple subjective adjectives in Experiment 3, we used lmer models with “experiment” as a between-studies factor. The results confirm that, in all conditions, the subjectivity ratings for objective adjectives are lower than for complex subjective adjectives (Experiment 4 versus Experiment 1: $\beta = -2.102$, $SE = 0.190$, t value = -11.06 , $p < .00001$) and simple subjective adjectives (Experiment 4 versus Experiment 3: $\beta = 1.26172$, $SE = 0.21065$, t value = 5.990 , $p < .00001$). As expected, sentences with objective adjectives receive lower subjectivity ratings.

Discussion

Experiment 4 shows that objective adjectives pattern differently from subjective adjectives. We do not find strong evidence for the idea that the mere presence of *any* adjective increases subjectivity ratings across the board. Thus, these results support the conclusion that positional effects arise only in contexts in which opinion dependence is present. We find hints of the predicative condition being judged numerically more subjective than the baseline, but the finding that neither the predicative condition nor the baseline condition differ from the other conditions do not allow us to conclude that this difference is very strong.⁸

General discussion

At first blush, the difference between objective facts and subjective opinions seems clear. However, Mitchell et al. (2018) found that people's ability to distinguish fact from opinion is lower than one might expect. To better understand why, the series of experiments presented in this paper investigates whether and how linguistic-packaging choices influence people's ability to recognize subjective content. Language offers multiple ways to package the same basic information (e.g., Birner & Ward, 1998; Vallduví, 1992) and different packaging options are known to influence depth of processing, attention allocation, and recall (e.g., Hornby, 1974; Sturt et al., 2004; Ward & Sturt, 2007; Zimmer & Engelkamp, 1981; see also De Saussure, 2013), but to the best of our knowledge, the potential effects of different information-packaging options on our ability to recognize subjective information have not been systematically investigated in prior work.

We used subjective adjectives (e.g., *important*, *amazing*, *frustrating*, *impressive*) in three positions (as prenominal modifiers, in predicative position, and in appositive RCs) to test for the potential effects of linguistic packaging on people's perception of subjectivity. We investigated *whether* subjective adjectives in different syntactic positions influence subjectivity ratings, and *what informational properties* of particular syntactic positions are responsible for these effects: Is our ability to distinguish fact from opinion (a) influenced by whether the information is packaged as main news or as secondary information (main-news hypothesis), (b) influenced by whether the information is presented as new information or already-known/old information (new information hypothesis), or (c) influenced by both dimensions (combined hypothesis)? We also consider a lexically based hypothesis, according to which the presence of a subjective adjective should trigger comparable ratings of subjectivity in any structural position.

As regards the question of whether subjective adjectives in different syntactic positions influence people's subjectivity ratings, the answer based on our results is a clear yes. Sentences conveying the same core information, using the same words, can receive different subjectivity ratings depending on how those words are put together. To the best of our knowledge, our work is the first to provide systematic evidence showing that linguistic packaging has a significant effect on people's perception of how fact based or opinion based a particular text is. Given that we live in a world where, on a daily basis, people encounter a flow of information often consisting of a mix of fact and opinion, our finding that simply changing the linguistic structure of a sentence influences perception of subjectivity is a step toward better navigating this information flow.

As regards the question of what informational properties of particular positions are responsible for the linguistic-packaging effects, our data support the combined hypothesis. The results show effects of both (a) the distinction between already-known and new information and (b) the distinction between main news and secondary information: When subjective adjectives are in positions that can be associated with new information (predicative position, appositive RCs), the text receives higher subjectivity ratings than when the same adjectives are in a position associated with old/already-known information (prenominal modifiers of definite nouns). These patterns exist with both complex subjective adjectives (e.g., *amazing*, *frustrating*) whose subjectivity can stem from multiple dimensions (Experiments 1, 2a, and 2b), and—though somewhat less clearly—with simple subjective adjectives

(e.g., *heavy*, *narrow*), whose subjectivity stems from differences in judgment about thresholds (Experiment 3). Furthermore, Experiments 1, 2a, and 2b show that subjective adjectives in predicative position (associated with main news) elicit higher subjectivity ratings than adjectives in appositive RCs (associated with secondary information). This provides evidence that the main-news versus secondary-information distinction also modulates subjectivity ratings. Experiment 4 shows that with objective adjectives, there is no clear evidence of different packaging having an effect on subjectivity ratings.

Furthermore, Experiments 2a and 2b show that the linguistic-packaging effects hold independently of whether the text provides justification/evidence for the subjective adjective. One might have expected subjectivity ratings to be higher when the rest of the sentence provides no justification/evidence for why the speaker holds the opinion signaled by the subjective adjective, but we did not find this to be the case across the board. This highlights the robustness of the linguistic-packaging effects on subjectivity ratings and suggests they are not dependent on reasoning about the semantics of the rest of the sentence.

As a whole, our findings have implications not only for our understanding of how humans process subjective information, but also for people's communicative choices. Our findings complement existing work on framing effects in psychology and economics. In their 1981 paper, Tversky and Kahneman already highlighted the importance of information packaging by showing that our decisions are influenced by how the alternatives are formulated. For example, when faced with statistically comparable outcomes, participants were more likely to opt for a positive frame (an outcome described in terms of lives saved) rather than a negative frame (an outcome described in terms of deaths). Relatedly, McNeil et al. (1982) showed physicians were more likely to select a treatment option whose outcome was described in terms of survival rates rather than mortality rates, even when the outcomes were logically equivalent.

Our studies show that the power of linguistic packaging extends to the subjective domain, and can have significant effects on humans' ability to pick up on opinion-based information: If a speaker/writer wants to sneakily present an opinion as an objective fact, they should present the relevant subjective information in prenominal modifier position and not in predicative position. Our results suggest that linguistic-packaging choices can be used to blur the distinction between fact and opinion, or at least our ability to perceive opinion-based information as such.

Notes

1. <https://www.wsj.com/articles/a-tax-break-for-coronavirus-hit-states-11586112131> retrieved 9/20/2020.
2. <https://www.courier-journal.com/story/opinion/2018/10/15/kentuckys-proposed-gas-tax-hike-unfair-and-unnecessary/1647435002/> retrieved 9/20/2020.
3. Our term *complex subjective adjectives* is largely synonymous with adjectives described as predicates of personal taste and multidimensional adjectives. However, this distinction is not relevant for the issues investigated in this paper.
4. The six practice items expressed opinions or were fully factual but did not use the structures or adjectives tested in targets. For example, "The well-known establishment has the tastiest sandwiches in the whole town" expresses an opinion about taste using a superlative; we expected it to be rated 5 or 6 on the 6-point scale (*1 = a sentence is all fact; 6 = it contains opinion-based content*). "Afterwards, the president met with the prime minister as well as the foreign minister to discuss the upcoming constitutional debate" is factual; we expected it to be rated 1 or 2. Instructions (below) explained that presence of *any* opinion-based information means a sentence should be treated as "opinion."
5. In some cases, singularities arose with *z* score analyses (even with the simplest random effect structure), presumably due to lack of variance (e.g., in Experiment 4, all conditions receive uniformly low ratings).
6. We asked about (noncorrectable) vision and hearing in all experiments, because auditory and visual impairments can limit individuals' access to English-language input.
7. A potential concern with MTurk is the decrease in data quality that researchers began to observe in summer 2018 (e.g., Chmielewski & Kucker, 2020; Kennedy et al., 2020). Given these concerns, we used a variety of data-validity indicators (both practice items and catch trials) to exclude participants, in line with the advice of Chmielewski and Kucker. Our exclusion numbers may seem high but are lower than Chmielewski and Kucker's: They found

that 38% to 62% of MTurk participants failing at least one data-quality validity indicator in summer/fall 2018 and in spring 2019.

8. There is a precedent for predicative position being linked to subjectivity: Corpus work shows adjectives that often occur in the predicative position are more likely to be subjective than adjectives in other positions (Wiegand et al., 2013).

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Appendix

A. Adjectives used in target items of Experiment 1

amazing, beautiful, boring, fair, frustrating, important, impressive, interesting, pleasant, powerful, provocative, significant, successful, surprising, terrible, tragic, unfair, unpleasant, upsetting, wonderful

B. Adjectives used in target items of Experiments 2a and 2b

amazing, amusing, beautiful, boring, confusing, exhilarating, fair, frustrating, important, impressive, intimidating, pleasant, powerful, provocative, significant, successful, surprising, terrible, tragic, unfair, unpleasant, unsuccessful, upsetting, wonderful

C. Adjectives used in target items of Experiment 3

big, cold, deep, dull (in the sense of “not sharp”), expensive, fast, hot, inexpensive, large, long, loud, narrow, new, old, quiet, rich, shallow, short, slow, small, smooth, thin, wide, young

D. Adjectives used in target items of Experiment 4

American, Armenian, ceramic, circular, concrete, cylindrical, electric, French, German, international, iron, Japanese, leather, metal, Mexican, octagonal, organic, plastic, rectangular, Russian, square, triangular, tropical, wooden