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Contextual Determinants of Adjective Order:
Beyond *Itsy Bitsy Teeny Weeny Yellow Polka Dot Bikini*

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Abstract

Previous research on adjective ordering in linguistics and psychology has focused primarily on the unmarked or default order of adjectives, as in *large blue car*. Inverted word order, as in *blue large car*, which violates the proposed semantic constraints on adjective placement, received relatively little attention. In two studies we show that the inverted order is not as limited in scope as previous researchers have argued. We propose that the inverted word order reflects the *subjective distance* principle: the attribute that is psychologically closer to the speaker is mentioned first. Our explanation draws on research on word order in binomials, thus connecting two previously unrelated research traditions on word order in linguistics and cognitive psychology.

Keywords: adjective ordering; binomials; context-dependency; semantics; pragmatics; subjective distance

Introduction

Why does *Itsy bitsy teeny weeny yellow polka dot bikini* sound so good to the ear? One possible factor is the choice of adjectives and their artful arrangement. What factors determine the 'right' order of adjectival modifiers in a phrase has been a topic of active inquiry in linguistics and psychology (Cinque, 2014; Danks & Glucksberg, 1971; Kotowski & Härtl, 2019; Martin, 1969; Scontras, Degen, & Goodman, 2017; Truswell, 2009; Wulff, 2003). According to the semantic approach, the order of adjectival modifiers is dependent on their semantic class, such as e.g. Color and Size. The underlying assumption is that semantic classes form a scale with respect to some psychological property, such as subjectivity. If class Size precedes class Color on the subjectivity scale, we expect that adjectives denoting size (e.g., *teeny weeny*) will precede adjectives denoting color (e.g., *yellow*)(cf. Dixon, 1982; Hetzron, 1978; Whorf, 1945).

Most of the research in the semantic tradition aims to explain the unmarked or default adjective order, as in *large blue car*. While many authors acknowledge that in some communicative situations the default, semantically determined word order can be overridden, the mechanisms that give rise to the inverted word order, as in *blue large car*, have received relatively little attention in the literature. One exception is a series of studies by Danks and co-authors in the early 70s (Danks & Glucksberg, 1971; Danks & Schwenk, 1972). These authors advocate a pragmatic approach and propose that the order of adjectives depends on how well they differentiate among salient contextual alternatives: the most discriminative adjective is mentioned first. For example, in a context in which two large cars, one red and one blue, are equally salient, color would be more discriminative than size, and would give rise to the inverted word order: *blue large car*. In this approach the communicative goals of conversation participants rather than semantic classes of adjectives and their properties determine adjective ordering.

One of the limitations of the pragmatic approach proposed by Danks and co-authors is that it only applies to cases in which the set of potential discourse referents and their attributes (the two cars in the example above) have already been established. Our two experimental studies demonstrate that the inverted adjective ordering is also attested in contexts without previously established referents. Such cases cannot be explained by reference to discriminative attributes, because there are no alternatives that need to be differentiated. Our explanation of the inverted word order in such contexts is based on research on flexible word order in binomials, i.e. constructions with two conjoined nouns or adjectives, as in *Democrats and Republicans* (Iliev & Smirnova, 2016; see also Cooper & Ross, 1975). Specifically, we propose that the inverted adjective order reflects the same psychological principle that was proposed to explain word order in binomials – the *subjective distance principle*. According to this principle, the attribute that is psychologically closer to the speaker is mentioned first. Our paper offers a principled explanation for inverted word order and uncovers parallels between two previously unrelated domains of research: word order in binomials and word order in adjectival modifiers.

Two Approaches to Adjective Ordering

The Semantic Approach

According to the semantic approach, the meaning of adjectives is responsible for the observed word order (Martin, 1969; Scontras et al., 2017). Several semantic features have been proposed in the literature as determinants of adjective ordering, including definiteness of denotation, inherentness (also referred to as intrinsicalness, substantiveness, and closeness to the noun in meaning), and subjectivity.[1] An adjective's definiteness of denotation is determined both by the number of nouns it can modify and by the number of senses an adjective may have in different contexts (Martin, 1969; Wulff, 2003). Adjectives which are relatively limited in the number of nouns they may modify, and whose denotations remain constant across varying contexts, are said to be more definite, and are positioned nearer to the noun (Martin, 1969). Thus, *old embroidered pillow* sounds more natural than *embroidered old pillow*, because the more definite adjective, *embroidered*, is positioned closer to the noun.

In one of the first psychological studies on adjective ordering, Martin (1969) contrasted different semantic features of adjectives and found that definiteness of denotation is the most reliable predictor of an adjective's position in a phrase (cf. Wulff, 2003). Martin proposed that the definiteness of denotation is directly related to an adjective's accessibility, which in turn determines the placement of adjectives. Definite adjectives are accessed faster than indefinite ones, because their meaning does not vary depending on the noun they modify. Therefore, less time is needed to scan the meaning of the definite adjective and to establish the relation between the property denoted by this adjective and the meaning of the modified noun. In this approach, the adjectives that are accessed faster – definite adjectives – appear closer to the noun. In production, the adjectives that were accessed first come last in a sequence of adjectives.

An adjective's inherentness is defined as the extent to which its intrinsic, essential properties reflect the properties of the noun it modifies. Adjectives denoting color, material, breed, nationality, and function are considered to be more inherent than adjectives denoting size, shape or similarly non-intrinsic qualities (Martin, 1969). More inherent adjectives are positioned closer to the noun. The scale in (1) ranks different semantic classes in terms of their inherentness.

(1) Personal judgment < Size < Color < Place of origin   **Noun**

less inherent ⟷ more inherent

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[1] Other possible determinants of adjective ordering are morphological weight, as well as various semantic considerations, including whether the adjectives refer to temporary or permanent properties, whether adjectives are subsective or intersective (Truswell, 2009), etc. See Scontras et al. (2017) and Kotowski and Härtl (2019) for evaluation of these models' predictions.

According to the scale in (1), based on the adjective classification in Danks and Glucksberg (1971), adjectives denoting size will be placed before adjectives denoting color, because the latter are more inherent and should be positioned closer to the nominal head (Noun).

Besides definiteness of denotation and inherentness, which dominated research on adjectives in the 60s and 70s, another semantic feature – subjectivity – came to the attention of psychologists and linguists (Hetzron, 1978; Quirk et al., 1985; Scontras et al., 2017). According to Quirk et al. (1985: 1341), there is "one principle accounting for all premodifiers: a subjective / objective polarity. That is, modifiers relating to properties which are […] visually observable, and objectively recognizable or assessible, will tend to be placed nearer to the head and be preceded by modifiers concerned with what is relatively a matter of opinion, imposed on the head by the observer, not visually observed, and only subjectively assessible."

Scontras et al. (2017) conducted the first experimental studies probing the effect of subjectivity on adjective ordering. The authors first measured ordering preference by eliciting naturalness ratings for adjective-adjective-noun sequences. Experimental participants were asked to indicate which ordering sounded more natural, e.g. *big blue box* or *blue big box*. Once ordering preferences were established, the authors tested adjective subjectivity by asking participants to indicate the subjectivity of the same adjectives on a sliding scale, ranging from "complete subjectivity" to "complete objectivity". Results indicated that adjective subjectivity indeed predicts ordering preference, where the higher an adjective's subjectivity is, the farther it is placed from the noun it modifies. The authors concluded that subjectivity alone was more reliably predictive of adjective ordering than other semantic features, including the adjectives' inherentness.

A common feature of all semantic accounts is that they are designed to explain the unmarked / default adjective ordering. While most authors working in this tradition acknowledge that the unmarked order can be violated, little is known about the mechanisms that regulate the ordering of adjectives in such cases. The exception is a series of work by Danks and colleagues, to which we turn next.

The Pragmatic Approach

According to the pragmatic approach, communicative goals of conversation participants affect how adjectives are positioned in a noun phrase (Danks & Glucksberg, 1971; Danks & Schwenk, 1972). Specifically, more discriminative or informative adjectives tend to be mentioned first. In different communicative contexts, different features will be more informative, which explains variation in adjective ordering. In the experimental paradigm employed by Danks and co-authors, participants were presented with a set of objects, and were asked to choose the description of the target object (or referent) that would help the listener to distinguish it from non-referents. For example, if the set of objects consists of two cars, which have the same size,

large, but differ in color, one is blue and another one is red, the color is the most informative feature, and is predicted to be mentioned first. Thus, if the target object in question is the blue car, the participants are expected to describe it as *the blue large car*, mentioning the color attribute first, and violating the default word order (e.g., *the large blue car*), where size precedes color, as predicted by (1). The results of experimental studies confirmed this prediction in both comprehension and production tasks. Danks and Schwenk (1972) found that when color is the discriminative feature, it is mentioned first in 57 % of the cases. In the control condition, the normal word order, i.e. size before color, was preferred in 85% of cases.

Danks and co-authors argue that the pragmatic rule is more general and that the semantic rule based on inherentness, which explains the default adjective ordering, is in fact "the most *frequent* case of the more general pragmatic rule" (Danks & Glucksberg, 1971). That is, since more intrinsic adjectives tend to be less informative, they are less likely to discriminate between referents and non-referents, and, therefore, are less likely to appear first in a sequence of adjectives.

The pragmatic approach proposed by Danks and co-authors was criticized by the advocates of the semantic approach. For example, Martin and Ferb (1973) observe that the unmarked and marked adjective orders have different phonological and syntactic properties. The unmarked word order is characterized by constant stress on all adjectives (or by increasing stress) and by the lack of juncture (pause) between the adjectives, e.g. *large blue car*. Syntactically these phrases are argued to have a flat, multiple-branching structure. On the other hand, the contextually-determined order shows contrastive stress on the discriminating adjective, and a juncture, e.g. *BLUE, large car* Syntactically these constructions have a right-branching structure (see Kotowski & Härtl, 2019; Scott 2002; Sproat and Shih, 1988 for discussion). Since the unmarked and marked structures have different properties, they cannot be accounted for by the same rule, i.e. the general pragmatic principle proposed by Danks and co-authors.

Martin and Ferb (1973) and Richards (1975) further argue that while communicative demands can sometimes trigger the inverted word order observed in Danks and Schwenk's (1972) experiments (*BLUE large car*), the same effect can be achieved by preserving the unmarked order but stressing the informative adjective, as in *large BLUE car*. Richards (1975) argues that in the paradigm adopted by Danks and Schwenk (1972), the color adjective must be stressed to produce preference for the inverted word order. Another weakness of Danks and Schwenk's studies is that they only take into consideration two classes of adjectives: color and size. Based on these observations, Richards (1975: 213) concludes that "the speakers are reluctant to give up their a priori preference for normal order and will do so only under highly specialized circumstances." From this perspective, the inverted order is seen as an optional, limited in scope

phenomenon, which is peripheral to the study of adjective ordering in general.

While some of the criticism against the pragmatic approach might be justified, neither Martin and Ferb (1973), nor a more recent study by Scontras et al. (2017) offer a principled explanation of contextually-induced order. In what follows, we (i) present the results of two experimental studies which show that the inverted order of adjectives is more common and appears in a larger number of contexts than what was previously assumed, and (ii) propose that some cases of the inverted order can be explained by the *subjective distance* principle, which was proposed to explain word order in binomials (Iliev & Smirnova, 2016).[2] In the next section we compare the two phenomena and formulate our hypothesis about the effect of the subjective distance principle on inverted adjective ordering.

The Subjective Distance Principle in Binomials

Binomials are constructions with two conjoined elements belonging to the same lexical class, such as *Democrats and Republicans* (two nouns are conjoined) or *good and bad* (two adjectives are conjoined). While research on adjective ordering and word order in binomials has developed independently, there are surprising parallels between the two phenomena. First, word order in both domains is rather flexible, unlike word order in English in general. For example, while reversing the position of the subject and the verb results in purely ungrammatical constructions (*Slept John), adjectives and binomials show more flexibility, despite the fact that there is often a clearly preferred word order. Thus, while the binomial *men and women* is more frequent, *women and men* is also possible (Iliev & Smirnova, 2016).[3] Similarly, in the domain of adjectives, *large blue car* sounds more natural than *blue large car*, but the latter is also possible.

Second, in both domains phonological factors might affect word order to some extent. For example, in binomials and adjectives, word length and the number of syllables appear to affect word order: the shorter word and the word with a lesser number of syllables tends to be mentioned first. This explains *bread and butter* and *boots and saddles* in binomials (Cooper & Ross, 1975: 79), and the order of adjectives in *the long intelligent book* (Wulff, 2003). Importantly, however, the phonological rule explains some of the data, but reference to semantic and pragmatic constraints, which in turn are seen as a reflection of deeper psychological principles, is needed in both domains.

One explanation for the word order in binomials is the *subjective distance* principle proposed by Iliev and Smirnova (2016). According to this principle, the attributes that are psychologically closer to the speaker – more

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[2] Not to be confused with subjectivity in Scontras et al. (2017), discussed in the previous section.

[3] Binomials with relatively flexible word order, such as *men and women*, should be distinguished from the so-called freezes, where the order is fixed, as in *here and there* (cf. the ungrammatical *there and here).

desirable, more familiar, or closer to the identity of the speaker more generally – will tend to be mentioned first in binomials (cf. Cooper & Ross, 1975). A series of studies confirmed this prediction in the domain of consumer preferences, political orientation, religion, gender, race, and geographic locations. For example, the analysis of the corpus of senate speeches showed that in the domain of political orientation, liberals are more likely to use *Democrats and Republicans*, thus mentioning their own political party first, while conservatives prefer the reversed word order: *Republicans and Democrats*. In another study, Iliev and Smirnova (2016) analyzed the distribution of gender words in binomials, looking at the literary work of more than 6000 authors. They found that female authors, when compared to male authors, tended to mention words referring to females first, as in *sister and brother*, *women and men*, and *daughter and son*. The distribution of gender words in binomials is particularly illuminating as it shows how the subjective properties of the speakers can override the default or more common word order, such as *men and women*.

We hypothesize that the subjective distance principle can also explain some cases of inverted word order in adjectival sequences. Specifically, we predict that the attribute that refers to a more desirable property according to the speaker would be mentioned first. The two studies below test this hypothesis for written and spoken modality.

Experimental Studies

Study 1: Adjective Order in Written Language

Participants Twenty-one participants were recruited from Amazon Mechanical Turk web service. All participants indicated that they were native speakers of English. The average age was 38 years old (the youngest 19, and the oldest 69). 48% were male, and 52% were female. The participants were compensated for their participation.

Stimuli Each stimulus consisted of two adjectives followed by a noun. All nouns referred to common objects: shoes, table, scarf, bike, watch, cat, and restaurant. The adjectives within the same nominal phrase belonged to different semantic classes, e.g. color and material in the case of *brown suede shoes*. We intentionally avoided modifiers belonging to the same semantic class within a query, since it has been observed that members the same semantic class are not ordered with respect to each other. For example, both *clever brave man* and *brave clever man* are possible, where *brave* and *clever* belong to the same semantic class – human propensity (Dixon, 1982). Moreover, unlike Danks and Schwenk (1972), who used only color and size adjectives, we included adjectives belonged to different semantic classes, including color, material, size, origin, and composition.

Design and Procedure At the beginning of the study, the participants read a short story introducing the main protagonist, Jim. Jim was looking for an object or place online, and needed help formulating his search queries.

Next, participants saw 7 questions, each dedicated to a particular item that Jim was looking for. The seven items were Shoes, Table, Scarf, Bike, Watch, Cat, and Restaurant. Each item had two attributes, e.g. color and material for shoes. For each item, there were two conditions. In one condition (Condition A), the context of the story specified that one attribute was more important than another. In another condition (Condition B), the importance of the attributes was reversed. For example, in condition A for Shoes, the participants learned that the color (brown) is very important to Jim, but material (suede) is less important. In condition B for the same item, the material (suede) was very important and the color (brown) was negotiable. (See the Appendix for the exact formulations.)

The participants then saw two alternative formulations of a query. Each formulation mentioned the two attributes but in a different order, e.g. *brown suede shoes* and *suede brown shoes*. The participants were asked to choose the formulation that is more appropriate given the context. Each participant saw only one condition per item (between-subject design). The conditions and the choice of the order in which two alternative queries were presented were randomized. Table 1 shows the list of stimuli and the two alternative formulations for each query.

Table 1: List of stimuli and the default word order predicted by semantic theories.

Items	Two alternative formulations of a search query	Default order
Shoes	brown suede shoes	✓
	suede brown shoes	
Table	large oak table	✓
	oak large table	
Scarf	long wool scarf	✓
	wool long scarf	
Bike	red aluminum bike	✓
	aluminum red bike	
Watch	silver quartz watch	✓
	quartz silver watch	
Cat	short-haired white cat	✓
	white short-haired cat	
Restaurant	Indian vegetarian restaurant	✓
	vegetarian Indian restaurant	

Results To analyze whether the order of adjectives depended on the importance of a particular attribute to the speaker, we used the following coding scheme: When the participants chose the query in which the most important attribute in a given context was mentioned first, their answer was coded as 1. The answer in which the less important attribute was mentioned first was coded as 0. For example, if the context specified that the color of the shoes was more

important than their material, and the participant chose the query in which the color preceded the material (*brown suede shoes*), the answer was coded as 1. If in the same context the participants chose the reverse order (*suede brown shoes*), the answer was coded as 0.

If adjective ordering is not dependent on the subjective importance of the attribute, and the same (default) word order is preferred across different conditions, then the participants' answers will be at the chance level. Specifically, if a participant in Condition A chose *brown suede shoes*, her answer is coded as 1; and if the participant in the B condition chose the same query, her answer is coded as 0. The mean of the two answers is 0.5. If, however, adjective ordering is affected by the subjective importance of the attribute, then the answers for each condition will be higher than the chance level.

Collapsing across items, there was a strong tendency for mentioning the most important attribute first (m=.80, SD=.21). The choices were significantly higher than the chance level, which was .5 ($t(20)$=6.63, $p < .001$, one-tailed). The results are shown in Figure 1. These results support our hypothesis that adjective order is dependent on the subjective preferences of the speaker.[4]
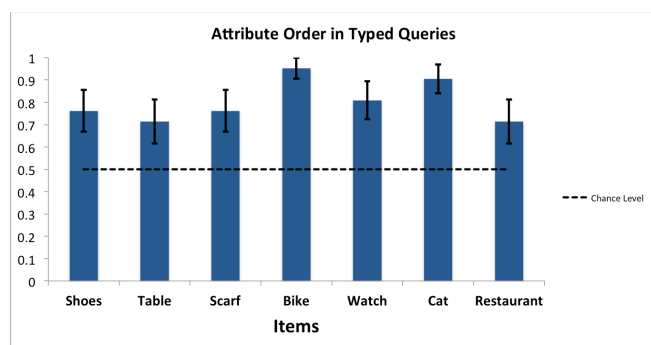
Figure 1: The proportion of times word order preferences are driven by the subjective importance of attributes in written language (typed queries). Higher numbers on the y-axis show greater association between adjectival order and the subjective distance. Values at the chance level would show that participants disregard subjective importance and chose the same word order in both conditions. Error bars represent +/-1SE.

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[4] A reviewer raised the point that the inclusion of the congruent condition (canonical order and importance) is not informative. In our design, the congruent condition serves as a control for the incongruent condition. It might be the case that the canonical order expected by the researcher is incorrect, or that there is a substantial variance in the preference for canonical order among subjects. By averaging across the congruent and incongruent choices we control for that risk, so that the deviation of mean choices higher than .5 could safely be interpreted as importance preference, and mean choices lower than .5 would indicate reversed importance preference.

While the results from Study 1 provide support for the hypothesis that the subjective preferences of the speakers affect word order of adjectives, they are limited to a particular modality – written language. In Study 2 we test whether the same principle holds for spoken language. This question becomes particularly important in light of the criticism of the early pragmatic approaches about the role of intonation.

Study 2: Adjective Order in Spoken Language

Participants Thirty participants were recruited from Amazon Mechanical Turk web service. All participants indicated that they were native speakers of English. The average age was 32 years old (the youngest 23, and the oldest 53). 67% were male, and 33% were female. The participants were compensated for their participation.

Stimuli We used the same adjectives and nouns as in Study 1. Unlike Study 1, all stimuli were presented in audio format. The stimuli were read by a male native speaker of English. Each attribute within a query was read with even intonation, and there were no contrastive stress or juncture between attributes. This design intentionally separates intonation from word order, and thus can help us to assess the criticism that the inverted word order alone is not sufficient to convey the importance of the attribute in a given context (Richards, 1975).

Design and Procedure The study had the same design as Study 1, except that this time participants had to click on a button to hear a search query. As in Study 1, the order of the conditions and the order of the stimuli were randomized. Each participant saw only one condition per item.

Results We used the same coding scheme as in Study 1: all answers in which the order of the attributes matched the context, i.e. the most important attribute in a given context was mentioned first, were coded as 1. The answers in which the most important attribute was mentioned second were coded as 0. As in Study 1, we found strong preference for the most important attribute to be mentioned first (m=.68, SD=.35). The answers differed significantly from the chance level ($t(29)$=2.77, p=.004). The results of Study 2 are shown in Figure 2.

The results of Study 2 confirmed our findings in Study 1. We controlled for intonation and prosodic features and found that word order of adjectival modifiers reflects subjective preferences of the speaker, which is seen as manifestation of the subjective distance principle. The subjective distance principle extends to both written and spoken domains.

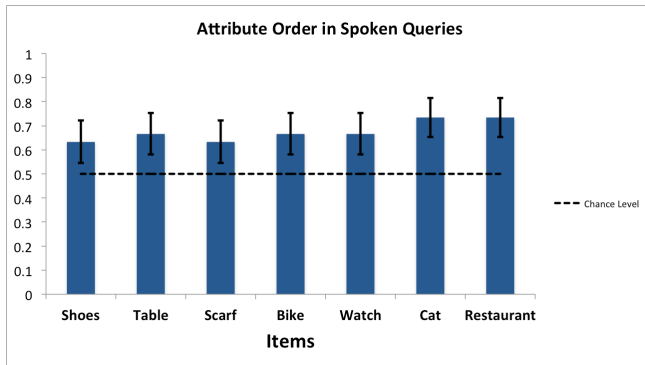**Attribute Order in Spoken Queries**

Figure 2: The proportion of times word order preferences are driven by the subjective importance of attributes in spoken stimuli. Error bars represent +/-1SE.

General Discussion

Our paper makes empirical and theoretical contributions to research on adjectival word order, and inverted order, specifically. First, our study shows that inverted word order is not limited to contexts with previously established salient referents, as in the original studies by Danks and co-authors. Second, we demonstrate that the inverted word order is manifested in both spoken and written domains. Our experimental design in Study 2 divorces intonation from word order, and we find that word order alone is meaningful and can convey the value of a particular attribute to the speaker, contra Richards (1975). Third, we propose that the inverted word order can be accounted for by the same psychological principle that explains word order in binomials. If a particular attribute, e.g. material, is more important to the speaker than color, this attribute would be mentioned first and would be positioned further away from the noun. Our explanation connects two previously unrelated research domains: binomials and adjectival modifiers.

One important question raised by a reviewer pertains to the applicability of the subjective distance principle to languages with post-nominal adjectives. It is worth to point out that the default ordering preferences based on a semantic principle are reversed in such languages. Specifically, the adjectives that tend to be mentioned first in languages with pre-nominal modifiers are usually mentioned last in languages with post-nominal modifiers. Despite the differences in word order, the distance between the head noun and the adjectival modifier remains more or less the same (Hetzron 1989; Scontras et al. 2017). Whether the subjective distance principle is also reversed in languages with post-nominal adjectives, is a question for future research.

Unlike Danks and his co-authors, we do not assume that the default and inverted word order should be explained by the same principle. It is plausible that the default word order can be explained with the semantic principle, such as adjective's subjectivity, as Scontras et al. (2017) argue. On the other hand, the inverted word order, at least in some cases, can be explained by the subjective distance principle, and the importance of a particular attribute to the speaker, specifically, as we show here. That the default and inverted word orders are explained by different principles is not surprising and is consistent with a more general observation in the literature that one principle, phonological, semantic, or pragmatic, is not sufficient to explain word order phenomena (Benor & Levy, 2006; Cooper & Ross, 1975 on binomials, Wulff, 2003 on adjective ordering).

Appendix: Stimuli

Study 1: General Instructions

Jim has just moved to a new city and is now in the process of settling down. He looks to buy several items online, and he also plans to use online information to find certain places in his new hometown. However, Jim is not sure how exactly to formulate his queries, and he needs your help deciding which query would be more effective. In what follows, you will see the description of the items that Jim is looking for. You need to help him choose which of two alternative queries he should use.

Specific Instructions: Shoes – Condition A

Jim is looking for a pair of shoes. He would prefer a pair that is made of suede and is brown. He is firm about the material – he wants suede and not leather – but he can compromise on the color. If he finds a pair he likes, and it's in black instead of brown, he might still take it. If he can enter only one query in the search box, which query should he choose? (The participants were then presented with two alternative formulations of a query).

Specific Instructions: Shoes – Condition B

Jim is looking for a pair of shoes. He would prefer a pair that is made of suede and is brown. He is firm about the color – he wants brown and not black shoes – but he can compromise on the material. If he finds a pair he likes, and it's in leather instead of suede, he might still take it. If he can enter only one query in the search box, which query should he choose? (The participants were then presented with two alternative formulations of a query).

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