

Focusing on pronouns: Consequences of subjecthood, pronominalisation, and contrastive focus

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We report two visual-world eye-tracking experiments that investigated the effects of subjecthood, pronominalisation, and contrastive focus on the interpretation of pronouns in subsequent discourse. By probing the effects of these factors on real-time pronoun interpretation, we aim to contribute to our understanding of how topicality-related factors (subjecthood, givenness) interact with contrastive focus effects, and to investigate whether the seemingly mixed results obtained in prior work on topicality and focusing could be related to effects of subjecthood. Our results indicate that structural and semantic prominence (specifically, agentive subjects) influence pronoun interpretation even when separated from information-structural notions, and thus need to be taken into account when investigating topicality and focusing. We discuss how our results allow us to reconcile the distinct findings of prior studies. More generally, this research contributes to our understanding of how the language comprehension system integrates different kinds of information during real-time reference resolution.

Keywords: Pronoun resolution; Visual-world eye tracking; Pragmatics/semantics.

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I gratefully acknowledge funding from the James H. Zumberge Faculty Research and Innovation Fund at the University of Southern California. Many thanks to Edward Holsinger and Emily Nava for help with the experiments. I would also like to thank three reviewers for their insightful and useful comments. Thank you also to Christine Gunlogson, Jeffrey Runner, and Michael Tanenhaus for feedback on earlier incarnations of this line of research.

INTRODUCTION

The seeming ease and rapidity with which the human language processing system interprets pronouns (e.g., *she*, *him*, *it*) appears to be at odds with the fact that pronouns are informationally impoverished and do not carry enough semantic information to specify the intended antecedent. This raises the question of how we are nevertheless able to comprehend pronouns so quickly and efficiently. It is often assumed that reduced referring expressions like pronouns refer to highly salient entities, i.e., entities that are prominently represented in the interlocutors' mental models of the discourse (e.g., Ariel, 1990; Givón, 1983; see also Gundel, Hedberg, & Zacharski, 1993 for related work). The factors that have been claimed to increase the prominence of an entity (and thereby increase the likelihood of that entity being interpreted as the antecedent of a subsequent pronoun) include syntactic, semantic, and discourse-level properties (see e.g., Arnold, 1998; Garnham, 2001; see also Kehler, 2002 for research on discourse coherence).

Many of the factors associated with an increase in prominence are also commonly associated with the notion of *topic*, i.e., the entity that a sentence is about (e.g., Lambrecht, 1994; Reinhart, 1982). This suggests that perhaps salience effects could be derived from topicality. However, other research has found that *focused* entities—which convey new and unexpected information and tell us something about the topic—also have a privileged cognitive status (e.g., Almor, 1999; Birch, Albrecht, & Myers, 2000). Thus, although the notions of topic and focus are commonly regarded as complementary (e.g., Gundel & Fretheim, 2004 and references therein, but see Buring, 2003), they both seem to have the effect of boosting referent salience. This observation is relevant for models of pronoun interpretation and also has potentially important consequences for our understanding of the nature of “topic” and “focus”, as it suggests that despite information-structural differences, these notions may share psychological commonalities (see Arnold, 1998, 1999; Cowles, Walenski, & Kluender, 2007 for related discussion).

However, these studies—which collectively suggest that topic and focus have similar effects—were not designed to directly compare the effects of these two phenomena on the real-time process of pronoun interpretation. Thus, on the basis of those results, we do not yet know how topics and foci interact: in a situation where an utterance contains both a topical entity and a focused entity, will one property trump the other, or will we see effects of both? A finding that both factors are at play during on-line processing would be informative because it would indicate that they do indeed have the same kind of effect on referent salience, i.e., that they both impact the level of representation that pronoun interpretation processes refer to. In summary, a better understanding of the relationship between topicality and focusing is

necessary before firm conclusions can be drawn regarding the presence of potential similarities linking the cognitive consequences of these concepts.

These questions also have the potential to contribute to our understanding of the notion of salience—a concept central to virtually all accounts of reference resolution but not yet fully understood—by providing information about the diversity of the factors that contribute to referent salience, including the extent to which it is related to or reducible to topicality.

Important steps to answer these questions have been taken by Arnold (1998, 1999), Cowles (2003), and Cowles et al. (2007), who conducted experiments designed to directly compare effects of topicality and focusing. However, their studies led to divergent conclusions and thus the consequences of topicality and focusing are not yet clear.

This paper presents data from two eye-tracking studies which show that a referent's grammatical/thematic roles need to be taken into account to better understand how topicality and focusing influence pronoun interpretation, and in fact allows us reconcile the seemingly conflicting results of earlier research. The first experiment suggests that givenness—correlated here with pronominalisation—and subjecthood have separable effects on pronoun interpretation and that subjecthood matters regardless of whether the subject is discourse-old or discourse-new. The second experiment builds on these findings and shows that when subjecthood is taken into consideration, we find effects of contrastive focus boosting referent salience, even in the presence of discourse-old, pronominalised referents. In fact, our data suggest that, at least in the discourse contexts we investigated, the consequences of being contrastively focused vs. being discourse-old and pronominalised are fairly evenly weighted. As a whole, our results point to salience being a multidimensional concept and support the idea that—despite their information-structural differences—contrastive focus and topicality-related factors can have similar effects on referents' cognitive prominence.

EXISTING WORK ON SALIENCE

To see why a connection has been drawn between topicality and salience, it is sufficient to review some of the key factors that have been identified in prior work as contributing to referent salience. One of the most heavily researched and robustly supported factors is *grammatical role*. A sizeable body of research suggests that entities realised in subject position are more likely to be interpreted as the antecedent for a subsequent (subject position) pronoun than are entities realised in nonsubject positions (e.g., Brennan, Friedman, & Pollard, 1987; Chafe, 1976; Crawley & Stevenson, 1990). This claim has received support from both corpus evidence and psycholinguistic research

(e.g., Gordon, Grosz, & Gilliom, 1993). Given that subjects tend to be agentive (e.g., Ferreira, 1994) and the results on the effects of subjecthood are more mixed for nonagentive subjects (e.g., DiEugenio, 1998; Järvikivi, van Gompel, & Hyönä, 2006; Turan, 1998), the subjecthood preference is probably related to a preference for antecedents that are syntactically and semantically prominent.

Existing work also suggests that discourse-level factors guide pronoun interpretation. Effects of the *given/new distinction* were observed in English and German corpora by Strube and Hahn (1996, 1999). Their findings suggest that discourse-old/given entities are more likely antecedents for subsequent pronouns than new referents (see also Ballantyne, 2004; Givón, 1983; see also Ariel, 1990 for a related discussion of topicality effects). In the present paper, the terms “given” and “discourse-old” are used synonymously to mean entities already mentioned in preceding discourse. Related to effects of givenness, it has been suggested that the *referential form* with which a particular entity is realised has an effect on how a following pronoun is interpreted. Preliminary off-line data from Kameyama (1996; one sentence per condition) suggest that the presence of a *pronominalised*, discourse-old object weakens the subject preference exhibited by a subsequent pronoun (see also Beaver, 2004; Grosz, Joshi, & Weinstein, 1986, 1995).

The factors considered so far—subjecthood, givenness, and pronominalisation—have all been argued to be correlated with the notion of *topic*. Although a detailed characterisation of topicality or aboutness is beyond the scope of this paper, it is worth noting that (1) many researchers have noted that topical entities tend to be realised in subject position (e.g., Chafe, 1994; Lambrecht, 1994; Reinhart, 1982) and (2) it has also been argued that there exists a connection between topicality and givenness/pronominalisation (e.g., Beaver, 2004; Prince, 2003; see also Ariel, 1990). This suggests a connection between being a good antecedent for a subsequent pronoun and being topical. Thus, one might be tempted to conclude that topicality is the overarching umbrella that influences referent salience and guides pronoun interpretation by narrowing down the set of potential antecedents (see Cowles et al., 2007 for related discussion).

These claims that a special cognitive status is accorded to topical entities provide an interesting counterpart to another body of research suggesting that entities which are *contrastively focused* also occupy a privileged cognitive status. Consider, for example, *it*-clefts, such as “It was *Lisa* that John called”. Here, *Lisa* is the clefted constituent which is in contrastive focus—in other words, the sentence provides the new information that *Lisa* was the one who John called, rather than someone else. A cleft like this is commonly uttered in a context where the nonfocused part is already known/presupposed information (i.e., John called someone), and *Lisa* contrasts with other potential alternative referents (see Halliday, 1967; Rochemont, 1986; Rooth,

1992). Existing research suggests that people attend more to the contrastively focused part of clefts (e.g., Hornby, 1974; Sturt, Sanford, Stewart, & Dawydiak, 2004; Ward & Sturt, 2007; Zimmer & Engelkamp, 1981; see also Cutler & Fodor, 1979 for related work). For example, Hornby found that when participants were presented with cleft sentences (e.g., “It is the girl who is riding the bicycle”), they were better at detecting mismatches when the mismatching information was focused (the girl) than when it was presupposed (the bicycle). More recently, Sturt et al. (2004) used a change-detection paradigm to show that focusing—especially when encoded by clefting—results in more semantically detailed representations. Other work has found that the focused/clefted referent is remembered better than nonfocused information (e.g., Birch & Garnsey, 1995; Birch & Rayner, 1997; Singer, 1976).

Looking more specifically at reference resolution, Almor (1999) found that definite NPs that refer to clefted antecedents are read faster (i.e., presumably processed more easily) than definite NPs referring to nonclefted/nonfocused antecedents. Furthermore, on the basis of pronoun resolution patterns, Birch et al. (2000) argued that focused concepts are more salient and have a “stronger memory trace” (Birch et al., 2000, p. 302) than nonfocused concepts. Foraker and McElree (2007) suggest that clefting makes referents “more distinctive” in memory but does not cause them to be actively maintained in the focus of attention.

In summary, these studies suggest that contrastive focus, as well as topicality-related factors like subjecthood, givenness, and pronominalisation, increases entities’ prominence, but this work did not directly assess how topicality and focusing interact during the process of pronoun interpretation. A closer look at the relationship between these factors is provided by Arnold (1998, 1999), Cowles (2003), and Cowles et al. (2007).

In one experiment, Arnold (1999) used a story-continuation task to compare the salience of discourse-old, pronominalised referents in subject position (what she calls established discourse topics) and discourse-new contrastively focused referents. The discourse-old entities were in subject position—to make them maximally topical—and all focused entities were in object position. The results showed that when the prompt sentence (Example 1c, 1c’) contained a discourse-old, pronominalised subject and a discourse-new, focused object, pronouns produced by the participants in their continuation sentences were most likely to refer to the *preceding subject* (e.g., Ron in Example 1):

- (1) a. Ron was looking through his address book, trying to make up his mind.
- b. He had an extra ticket to the opera, but he didn’t know which friend to invite.

- c. The one he decided on at last was Fred. (Clefted) *or*
- c'. At last he decided on Fred. (SVO)
- d. *Participant provides a continuation sentence.*

In contrast, participants tended to use a full name when referring to the object (e.g., Fred in Example 1), regardless of whether or not the sentence was clefted. Thus, these results show that discourse-old, pronominalised subjects, which Arnold defines as established discourse topics, are more salient than focused objects. (As shown in Example 1a, Arnold used *the one*-clefts, a type of cleft referred to by Prince (1978) as a “cleft with a lexical head”.) On the basis of these results as well as the outcomes of a rating study, Arnold concluded that topicality is more important than focus.

In related work, Cowles (2003; later published as Cowles et al., 2007) used a naming task to investigate the referential properties of three kinds of antecedents: (1) contrastively focused names in subject position (e.g., Anne in Example 2); (2) discourse-old names in subject position (what they define as discourse topics, Anne in Example 3); and (3) discourse-new names in subject position (what they define as sentence topics, Anne in Example 4). The object in each case was a full name (Sarah in Examples 2–4). In Cowles’ design, the critical referent was always the subject/agent of the sentence (Anne in Examples 2–4). (Cowles also included an order-of-mention manipulation where the critical referent was in matrix subject position and the other referent was the subject of a preceding subordinate clause; the results showed no effects of order-of-mention.)

(2) *Focused subject:*

- a. A new movie opened in town.
- b. It was Anne who called Sarah.
- c. But later that night, she couldn’t go to the movie after all.

(3) *Already-mentioned subject (discourse topic):*

- a. Anne wanted to see the new movie with Sarah.
- b. So, Anne called Sarah.
- c. But later that night, she couldn’t go to the movie after all.

(4) *Discourse-new subject (sentence topic):*

- a. A new movie opened in town.
- b. So, Anne called Sarah.
- c. But later that night, she couldn’t go to the movie after all.

Cowles et al. tested naming latencies for visual words (e.g., *Anne* or *Sarah* for Examples 2–4) presented right after the critical pronoun in the third sentence, and found that latencies were numerically faster for subjects (e.g.,

Anne) than for objects (e.g., *Sarah*), regardless of whether the subjects were in focus, discourse-old or discourse-new information. Cowles concluded that “[a]ll three information statuses appear to make their referent more likely to be interpreted as the antecedent of a subsequent pronoun” (Cowles, 2003, p. 93). In contrast to Arnold who found that established discourse topics (pronominalised subjects) are more salient than contrastively focused objects, Cowles’ results lead her to conclude that “two information structure types that are considered distinct . . . appear to have the same psychological effect” (Cowles, 2003, p. 94).

The differences in Arnold’s and Cowles’ findings may stem from methodological differences. However, the disparity could also result from differences in grammatical role and pronominalisation. Arnold’s finding that pronominalised subjects that have been established as discourse topics are more prominent than discourse-new focused objects could be related to their respective grammatical roles or their referential forms. In Cowles’ experiments, both topics and foci were full names in subject position, which may have meant that Cowles’ foci (in subject position) were more prominent than Arnold’s foci (in object position) due to the difference in grammatical role (see also related research by Colonna, Schmike, Hemforth, Konieczny, & Pynte, 2005).

Thus, there is no agreement on how topicality and focus interact with respect to the interpretation of subsequent pronouns, and the divergent conclusions may in fact be attributable to effects of grammatical role or pronominalisation.

Furthermore, it is important to note that Cowles’ data could be recast in terms of (matrix) subjecthood and/or agentivity boosting referent salience, with no need to evoke effects of contrastive focus. This is because the topical or focused referent was in matrix subject position in her experiments. This observation, combined with Arnold’s finding that topics “win” over foci, means that it is not yet known whether the presence of focus can boost referent salience in a context that also contains a discourse-old or pronominalised referent. In general, we do not yet have direct evidence of both of these factors interacting (competing) together in the same situation, especially during on-line processing.

Thus, although Arnold (1998, 1999) showed in another study that in contexts with no discourse-old referents, focused discourse-new objects are more salient than nonfocused discourse-new objects, the question of whether we can detect effects of contrastive focus boosting referent salience in the presence of a *discourse-old, pronominalised referent*—regarded as topical by researchers such as Beaver (2004) and Prince (2003)—needs further investigation. These questions are important for our understanding of the potential similarities between topicality and focusing, because finding that

both factors are at play, especially during real-time processing, would suggest that they do indeed have the same kind of effect on salience, i.e., that they both impact the level of representation that the process of pronoun interpretation refers to.

OVERVIEW OF EXPERIMENTS

To clarify our understanding of how topicality and focusing influence pronoun interpretation, the two experiments reported here used visual-world eye tracking to look at how manipulating *subjecthood* impacts the effects of *pronominalisation/givenness* and *contrastive focus*. Looking at the behaviour of focused entities in both subject and object position allows us to explore whether the conflicting outcomes of prior studies could be due to differences in the grammatical roles of the focused referents. Importantly, by manipulating grammatical role, we aim to get a better sense of whether we can detect effects of contrastive focus on referent salience even in the presence of a discourse-old, pronominalised referent (i.e., a referent with topical properties), and to investigate how the magnitude of potential contrastive focus effects compares to the effects of factors typically associated with topicality, namely givenness and pronominalisation. In our experiments, discourse-old/given referents were always pronominalised, in order to emphasise their discourse-old status.

Crucially, in order to be able to investigate how contrastively focused referents in different grammatical positions compare to discourse-old, pronominalised referents, we first need to gain a better understanding of the effects of grammatical role in the absence of contrastive focus. Thus, *Experiment 1* used visual-world eye tracking to investigate how subjecthood and givenness/pronominalisation guide pronoun interpretation, in the absence of contrastive focus. In particular, this study investigated whether we can detect effects of subjecthood even when it does not coincide with discourse-oldness or pronominalisation, and if so, how it is weighted relative to these other properties (e.g., what happens when they are pitted against each other). Thus, in contrast to the prior studies by Arnold and Cowles, we intentionally separate subjecthood from pronominalisation and include pronominalised objects as well as discourse-new subjects.

Then, having gained a better understanding of how these topicality-related factors influence the interpretation of subsequent pronouns, in *Experiment 2* we consider effects of contrastive focus, to see what happens in a situation involving a contrastively focused referent as well as a pronominalised referent in subject or object position (i.e., a referent with

topicality-related characteristics). Can we find simultaneous effects of contrastive focus and topicality-related factors? In testing how contrastive focus reacts to grammatical role and how it is weighted relative to pronominalisation, this study will also help us to understand whether the mixed results of previous research on the relative effects of topicality and focus can be clarified once we take subjecthood into consideration.

In addition to manipulating the grammatical roles of the given/pronominalised and focused entities (subject vs. object), Experiment 2 included both *it*-clefts and SVO sentences in which the focused constituent is in its regular position. This allows us to test whether the strength of any potential effects of contrastive focus depends on the linguistic packaging used to encode it, a question not fully resolved in existing work (see Arnold, 1999).

As a whole, the outcomes of these experiments have implications not only for our understanding of salience but also the notions of “topic” and “focus”. The results will help to shed light on currently open questions regarding the presence and extent of potential similarities between topicality and focusing. This will allow us to see whether these concepts, traditionally regarded as complementary or even opposed to each other, may in fact be highly similar in some respects.

EXPERIMENT 1: PRONOMINALISATION AND SUBJECTHOOD

Experiment 1 is a visual-world eye-tracking study that investigates how two topicality-related factors—subjecthood and pronominalisation—guide pronoun interpretation. We manipulated whether the subject, object, or neither was discourse-old and pronominalised. The design of this experiment allows us to see whether subjecthood and pronominalisation have effects even when they do not coincide and if so, what their relative strengths are. This information is important for understanding the results of Experiment 2.

Experiment 1 used the visual-world eye-tracking paradigm, combined with a picture verification task. This method provides us with information about on-line processing and about participants’ final referential decisions (see Kaiser & Trueswell, 2008 for a similar paradigm). Existing research has demonstrated that eye movements to objects in a display are closely time-locked to the potential referents that a listener is considering as language unfolds over time (Cooper, 1974; Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995; for a review see Tanenhaus & Trueswell, 2006). Thus we can use fixations on different characters to shed light on what entities participants are considering as potential referents for an ambiguous pronoun as the sentence unfolds in real time.

Method

Participants

Twenty-four adult native English speakers from the University of Southern California community participated in this experiment in exchange for US\$10.

Materials

Sixteen target images and 32 filler images were constructed, along with brief verbal narratives for each item. The images were generated from a large repository of purchased clip-art images and arranged and edited using Adobe Photoshop. The sound files that participants heard while viewing the visual displays were recorded with a PC using Praat speech software (Boersma & Weenink, Institute of Phonetics Sciences, University of Amsterdam).

There were 16 critical items (scene-narrative pairs) in the experiment. The scenes of all critical items contained two human characters. Both characters were approximately the same size and positioned on opposite sides of the scene; one on the left and other on the right. In the entire experiment, four male and four female characters were used. Participants were familiarised with the characters' names before the main experiment began, and each picture also provided both characters' names (for a similar familiarisation procedure, see Kaiser, Runner, Sussman, & Tanenhaus, 2009). Figure 1 presents two sample scenes, and sample narratives are given in Examples 5–6. The location of the characters was counter-balanced, such that on half the trials, the pronominalised/discourse-old referent occurred on the left and on the other half of the trials, it occurred on the right.



Figure 1. Sample pictures. The left image corresponds to Example 5, and the right image corresponds to Example 6.

Each narrative (see Appendix 1 for full list) consisted of four or five clauses. In the *critical sentence* of each narrative, the subject, the object or neither was discourse-old and pronominalised. This resulted in three conditions: (1) [S = pro/O = name]; (2) [S = name/O = pro]; and (3) [S = name/O = name]. We first describe the first two conditions (with one pronominalised argument) and then the third condition (no pronominalised arguments).

In this experiment, as in Experiment 2, discourse-old entities were always pronominalised for two main reasons: (1) to avoid creating infelicitous sentences by excessive repetition of the name (see Gordon et al., 1993, and others on the repeated name penalty) and (2) to mark their discourse-old status as strongly as possible. Thus, we do not separate givenness/discourse-oldness from pronominalisation. In the following discussion, we mostly use the term “effects of pronominalisation”, but because pronominalised referents are by necessity also given/discourse-old, this term should be understood as also making reference to effects of givenness/discourse-oldness. (These studies do not investigate effects of givenness in the absence of pronominalisation; an important question for future work.)

In the [S = pro/O = name] and the [S = name/O = pro] conditions, the nonpronominalised argument was a *discourse-new* name, i.e., it hadn't been mentioned in the mini-story before. (The new entity could be regarded as being in informational focus, e.g., Kiss, 1998; Rochemont, 1986. However, because there is no evidence of information focus guiding pronoun interpretation, we will not discuss it further.) The other argument was a pronoun that referred back to the subject of the preceding sentence. This entity could be regarded as being the topical character, i.e., the person that the narrative is about. In the critical sentence, we manipulated the position of the discourse-new argument and the pronominalised argument, such that the pronoun was located in either subject position (Example 5b) or object position (Example 6b):

(5) *Sample item [S = pro/O = name]*

- a. *Greg* is always very supportive of others.
- b. *He* congratulated *John* enthusiastically yesterday. (Critical sentence)
- c. The prizes for the best-ranked tennis players were about to be announced, and
- d. *he* was holding a new yellow tennis racket. (Test sentence)
- e. Everyone was in a good mood that day.

(6) *Sample item [S = name/O = pro]*

- a. *Mike* did very well in last month's tennis tournament.
- b. *John* congratulated *him* enthusiastically yesterday. (Critical sentence)

- c. The prizes for the best-ranked tennis players were about to be announced, and
- d. *he* was holding a new yellow tennis racket. (Test sentence)
- e. Everyone was in a good mood that day.

In the [S = pro/O = name] condition, the subject in the critical sentence has two (topicality-related) factors in its favour: it is pronominalised (and refers back to the topical entity) and it is the subject. In contrast, the critical sentence in the [S = name/O = pro] condition pulls these two factors apart, because now the object is what's pronominalised and discourse-old. If one regards the pronominalised object as referring to the topic (see e.g., Beaver, 2004; Prince, 2003), then this condition can be regarded as pitting subjecthood against topicality.

As Examples 5 and 6 illustrate, the discourse-old/topical character's identity is different in the [S = name/O = pro] condition and the [S = pro/O = name] condition. This is because these items were constructed to parallel the targets in Experiment 2. In that study, due to the nature of the contrastive/corrective focus, the identity of the focused character depended on whether the subject or the object was focused. Importantly, because the characters are similar in size and style, and because their occurrence in the different roles and positions was counterbalanced, we do not expect the individual identity of the characters to impact our results.

The *test sentence with the ambiguous pronoun* (sentence d) is separated from the critical sentence (sentence b) by an intervening clause (sentence c) which serves as a "look-away". The purpose of the look-away clause is to encourage participants to look away from both characters before encountering the ambiguous pronoun in the test sentence (sentence d). The stimuli were constructed such that the entities mentioned in the look-away clause are not potential referents for the third-person pronoun due to number and/or animacy. The test sentence with the ambiguous pronoun was spoken with normal intonation, without any special accenting of the pronoun, and it was the same sound file for all conditions. Crucially, this sentence is incorrect with respect to both characters in the picture: although *both are holding something*, neither one is holding a yellow tennis racket (one is red and the other is blue). The test sentence is followed by a wrap-up sentence e.

The third condition (Example 7) differs from the [S = pro/O = name] and [O = pro/S = name] conditions in that it does not have any pronominalised arguments: [S = name/O = name]. It serves as a baseline that allows us to assess the subjecthood preference without effects of pronominalisation or discourse-oldness. Thus, this condition lacks the introductory sentence shown in Examples 5 and 6. Instead, both characters are introduced using full names in the first sentence of the narrative (see Example 7), i.e., both are

discourse-new information when they are mentioned in sentence b. The remaining three sentences, including the test sentence with the ambiguous pronoun, are identical to the last three sentences of the [S = pro/O = name] and the [S = name/O = pro] conditions:

- (7) *Sample item [S = name/O = name]*
- b. *Greg* congratulated *John* enthusiastically yesterday. (Critical sentence)
 - c. The prizes for the best-ranked tennis players were about to be announced, and
 - d. *he* was holding a new yellow tennis racket. (Test sentence)
 - e. Everyone was in a good mood that day.

For counterbalancing reasons and to keep Experiment 1 maximally comparable to Experiment 2, each [S = pro/O = name] narrative and each [S = name/O = pro] narrative had a corresponding [S = name/O = name] narrative. Example 7 corresponds to Example 5, because in both Greg congratulates John. We also included a [S = name/O = name] version which is just like Example 7 except the first sentence was “John congratulated Mike enthusiastically yesterday”, which corresponds to Example 6. Because the two versions of the [S = name/O = name] narratives are the same except for the characters, we collapsed the two [S = name/O = name] versions in the subsequent analyses. (Furthermore, as expected, the two versions of the [S = name/O = name] narratives do not differ significantly in the proportions of fixations to the preceding subject or preceding object. There are also no significant differences in participants’ off-line responses.)

In all conditions, the sound files for sentences a, c, d, and e were exactly the same for all four versions of an item. One of the four versions of sentence b was spliced into each dialogue, corresponding to the item’s condition. Thus, the critical pronoun-initial test sentence d was kept constant for all four versions of an item. When questioned after the experiment, participants said they did not notice any splicing in the sound files.

The verbs used in the critical sentences were agent–patient verbs (as defined by Stevenson, Crawley, & Kleinman, 1994). All subjects were agentive. Existing research suggests that there is a connection between agentivity and subject position (e.g., Ferreira, 1994), and thus the situation tested here (subjects = agentive) represents the default configuration, one which comprehenders are likely to encounter frequently when processing naturally-occurring language.

Some of the critical verbs used in Experiment 1 (and Experiment 2) can be categorised as implicit causality verbs which, when followed by an explanation continuation (X verbed Y *because* she...), show a preference for the pronoun to be interpreted as referring to the preceding object (Noun 2). Out

of the 16 critical verbs, 10 exhibit a Noun2 preference in implicit causality contexts (*congratulate, criticise, accuse, scold, praise, hit, kick, insult, push, and help*; categorisation based on published papers and a norming study by Joshua Hartshorne, Harvard University). The other six have not been analysed as either Noun1 or Noun2 implicit causality verbs, but on the basis of their semantic similarity to the other verbs, might have a Noun2 bias in implicit causality contexts as well. However, pre-empting the results section somewhat, we emphasise that the outcomes of Experiments 1 and 2 do not provide any indication of a general object preference, indicating that our results cannot be attributed to an implicit causality confound. (See also recent work by Rohde, 2008, showing that the behaviour of implicit causality verbs changes when the coherence relation between the two clauses is changed, e.g., when there is no “because” relation).

In addition to the 16 target items, we constructed 32 filler items. The filler pictures depicted one, two, or three characters (using the same characters as the targets) and resembled the targets in having another object or set of objects elsewhere in the scene. The auditory stimuli for the fillers resembled the targets in style and length, and some fillers contained singular and plural pronouns (*s/he, they*) in subject or object position. Twenty-four fillers were correct and eight fillers contained mismatches that the participants were expected to correct. For example, one filler described a character being startled by the sound of a police car whereas the picture showed a fire truck. Over the course of the entire experiment, half the trials were correct and half contained mismatches/mistakes. The 16 target items were combined with the 32 fillers, such that all target items were separated by at least one filler. Four presentation lists were created using a Latin Square design, and each list was also reversed to control for trial order.

Procedure

Participants were seated at a comfortable distance from the computer screen. Eye-gaze was recorded with an Eyelink II eye-tracker (SR Research, sampling rate 500 Hz). Participants listened to the pre-recorded narratives and viewed large colour pictures displayed on the computer screen. Participants were told that in some cases, some of the statements made in the narratives might not match the picture. They were instructed to use the computer mouse to click on the region of the picture containing the error, if they notice a picture-narrative mismatch. If a picture-narrative pairing contained no error, participants were instructed to click on a box at the bottom centre of the computer screen marked “No error”. This error-detection paradigm has two benefits: (1) it allows the experiment to be as neutral as possible, since participants are not biased to interpret the pronoun as referring to a particular referent on the basis of preceding items and (2) it

allows us to collect information regarding participants' final interpretation of the pronouns.

The visual and auditory stimuli were presented on a PC with a 22-inch CRT monitor, using ExperimentBuilder software (SR Research). Auditory stimuli were played over headphones. Participants completed four practice items at the start of the experiment and were then calibrated on the eye-tracker using a nine-point calibration stimulus. After a training phase during which participants were familiarised with the names of the characters, the main experiment began. Each picture appeared on the screen 1,000 ms before the corresponding narrative started. Drift corrections were performed every three trials. For all participants, three fillers preceded the first target item. Viewing was binocular and the positions of both eyes were tracked, but following common practice, only the position of the right eye was analysed, using the algorithm provided in the EyeLink software.

Predictions

Off-line responses. The [S = name/O = name] condition acts as a baseline, as it allows us to see how strong the subject preference is in the absence of pronominalisation. On the basis of previous research, we expect a subject preference in this condition.¹ For our purposes of learning about the relationship between pronominalisation and subjecthood, the most important condition is [S = name/O = pro], where pronominalisation and subjecthood are disentangled: the subject is a full name (and new information) and the object is a pronoun that refers back to an already-mentioned entity. By comparing [S = name/O = pro] with [S = name/O = name], we can see whether a pronominalised object is a more likely antecedent than a full-name object. If pronominalisation has an effect even when it does not coincide with subjecthood, we expect more object choices in [S = name/O = pro] than [S = name/O = name]. Furthermore, if pronominalisation and subjecthood are equally influential in guiding the pronoun interpretation process, the [S = name/O = pro] condition is predicted to exhibit no overarching subject advantage, because the pronominalised object will compete with the subject. However, if pronominalisation is weighted less heavily than subjecthood, we expect to see a subject preference in this condition; if

¹ The experiments in this paper mainly used narration-style discourse contexts (embedded in dialogues in Experiment 2). As noted by Kehler (2002) and Venditti, Stone, Nanda, and Tepper (2001), pronouns in narration sequences tend to prefer subjects. Thus, roughly speaking, both coherence-based approaches (see e.g. Hobbs, 1979; Kehler, 2002; Kehler, Kertz, Rohde, & Elman, 2008; Kertz, Kehler, & Elman, 2006; Rohde, Kehler, & Elman, 2007) and grammatical role effects lead us to expect some level of subjecthood preference for the contexts investigated here.

pronominalisation matters more than subjecthood, we should see an object preference.

By comparing [S = pro/O = name] and [S = name/O = name], we can see whether pronominalisation further strengthens the hypothesised subject preference. Finally, our expectation is that the [S = pro/O = name] condition will exhibit a stronger subject preference than the [S = name/O = pro] condition, given that both subjecthood and pronominalisation coincide in the former and are pitted against each other in the latter.

Eye movements. By looking at participants' eye movements during the test sentence with the ambiguous pronoun (sentence d), we can learn about when different factors influence reference resolution, and whether there are any weak and/or transient effects that are not detected by the off-line responses. The logic of the predictions is essentially the same as for the off-line responses. However, with eye movements we can see not only how strongly a particular referent is preferred, but can also see when this preference begins to emerge. This can give us more fine-grained information about the strength of different factors, as one might expect a more influential factor to have a stronger effect or, perhaps, for its effect to emerge earlier during processing.

Results

Off-line responses

Participants' picture verification responses exhibit an overall subject preference in all conditions. In the [S = pro/O = name] condition, participants clicked on the subject 83% of the time, showing that they prefer to interpret the ambiguous pronoun as referring to the subject. The [S = name/O = name] condition also shows a clear subject preference (72%), as does the [S = name/O = pro] condition (62%). One-group *t* tests show that the proportion of subject choices is significantly above chance (50%) in all conditions both by subjects and by items, except for the [S = name/O = pro] condition where the items analysis is only marginally significant [S = pro/O = name]: $t_1(23) = 10.25$, $p < .0001$, $t_2(15) = 6.08$, $p < .0001$; [S = name/O = pro]: $t_1(23) = 2.79$, $p = .01$, $t_2(15) = 2.04$, $p = .056$; [S = name/O = name]: $t_1(23) = 6.27$, $p < .0001$, $t_2(15) = 3.63$, $p < .005$.

However, as Figure 2 suggests, the subject preference is not equally strong in all conditions. To investigate whether the magnitude of subject preference is significantly modulated by the different pronominalisation patterns, we used mixed effects logistic regression models (e.g., Baayen, 2008). (Subject and object choices were analysed separately, because on some trials participants clicked on neither the subject nor the object (10.67%), and

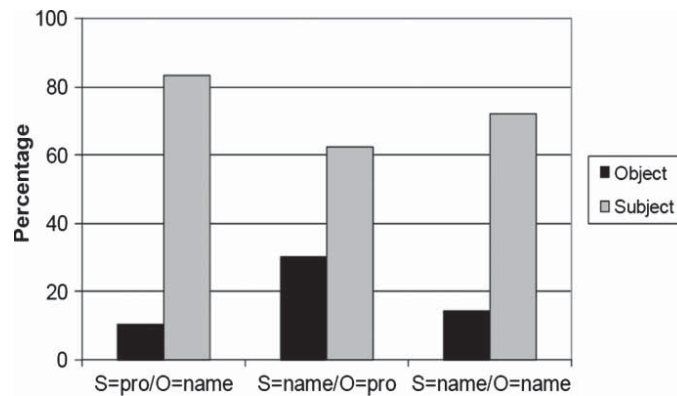


Figure 2. Picture verification data: proportions of subject and object choices in Experiment 1.

thus the subject and object choices are not the exact inverse of each other.) Participant and item were included as random effects in all analyses.²

To see whether a pronominalised object is a more likely antecedent than a full-name object, we compared [S = name/O = pro] and [S = name/O = name]. The analysis showed that a pronominalised object resulted in a significant increase in the rate of object choices ($\beta = .98$, Wald's $Z = 3.21$, $p < .002$) and decrease in the rate of subject choices ($\beta = -.57$, Wald's $Z = -2.01$, $p < .05$). Thus, the subject preference is *weakened when the object is pronominalised*. Here and in the rest of the paper, β is used to denote the estimated regression coefficient. Wald's Z -score (Wald, 1943) is calculated by dividing β by the estimate for its standard error and is a measure of how far the estimated regression coefficient is from zero in terms of its standard error. If this distance is great enough—i.e., the coefficient is judged to be significantly different from zero—the factor is considered to contribute significantly to the model (see Jaeger, 2008 for further details).

To see whether the subject preference is *strengthened when the subject is pronominalised*, we looked at the [S = pro/O = name] and [S = name/O = name] conditions. The analyses showed that a pronominalised subject led to a significant increase in the proportion of subject choices ($\beta = .86$, Wald's $Z = 2.41$, $p < .02$), but had no significant effect on the proportion of object choices ($\beta = -.37$, Wald's $Z = -0.9$, $p = .37$).

Finally, as expected, an analysis of the [S = name/O = pro] and [S = pro/O = name] conditions showed that a pronominalised subject resulted in a

² When specifying the structure of random effects, we started with fully crossed and fully specified random effects, tested whether the model converges, and reduced random effects (starting with item effects) until the model converged (see Jaeger at <http://hlplab.wordpress.com>, 14 May 2009). Then, we used model comparison to test each random effect; only those that were found to contribute significantly to the model were included in the final analyses. However, all models contained random intercepts for subjects and items.

significantly greater number of subject choices ($\beta = 1.72$, Wald's $Z = 3.88$, $p < .0001$) and fewer object choices ($\beta = -1.36$, Wald's $Z = -3.31$, $p < .001$) than a pronominalised object.

Overall, the subject preference is weakened when the object is pronominalised and strengthened when the subject is pronominalised.

Eye-movement data

Figure 3 shows the proportion of fixations to the subject character and to the object character in the three conditions. The 0 ms mark is the onset of the ambiguous pronoun. As shown in Figure 3, there is a sharp asymmetry in the eye-movement patterns triggered by the three conditions. Whereas [S = name/O = name] and [S = pro/O = name] both result in more looks to the subject than the object, [S = name/O = pro] shows close competition between the two, in fact with marginal hints of an object preference. To see whether and when the subject preference reaches significance, paired t tests were used to compare the proportion of subject and object looks during four time slices, starting at the onset of the pronoun and continuing for 2,000 ms. (Recall that the critical sentences were incorrect with respect to both characters, e.g., in Example 7, neither character was holding a yellow tennis racket. The “disambiguating” information that revealed that the sentence was incorrect with respect to both characters occurred 1,273 ms after pronoun onset, on average. The average duration of the disambiguating word was 279 ms.)

Table 1 shows that in the [S = name/O = name] and [S = pro/O = name] conditions, the preference for the subject over the object reaches significance in the 502–1,000 ms time slice, whereas in the [S = name/O = pro] condition there is no significant difference between the proportion of looks to the subject and the proportion of looks to the object at any point in time. In fact, in this condition we find a marginal object preference during all time slices in the analysis by subjects, but the patterns are less clear in the items analysis.

To compare the strength of the preference for the subject over the object in the three conditions, paired t tests were used to compare their *subject advantage scores*. The subject advantage scores were calculated by subtracting the proportion of looks to the object from the proportion of looks to the subject (see also Arnold, Brown-Schmidt, & Trueswell, 2007; Arnold, Eisenband, Brown-Schmidt, & Trueswell, 2000; Kaiser et al., 2009 on advantage scores with eye-movement data). Paired t tests were conducted on subject and items means during four time slices, starting at the onset of the pronoun and continuing for 2,000 ms. The analyses (summarised in Table 2) show that the [S = name/O = name] and [S = pro/O = name] conditions do not differ significantly from each other during the first three time slices by subjects or by items. However, during the final time slice (1,502–2,000 ms),

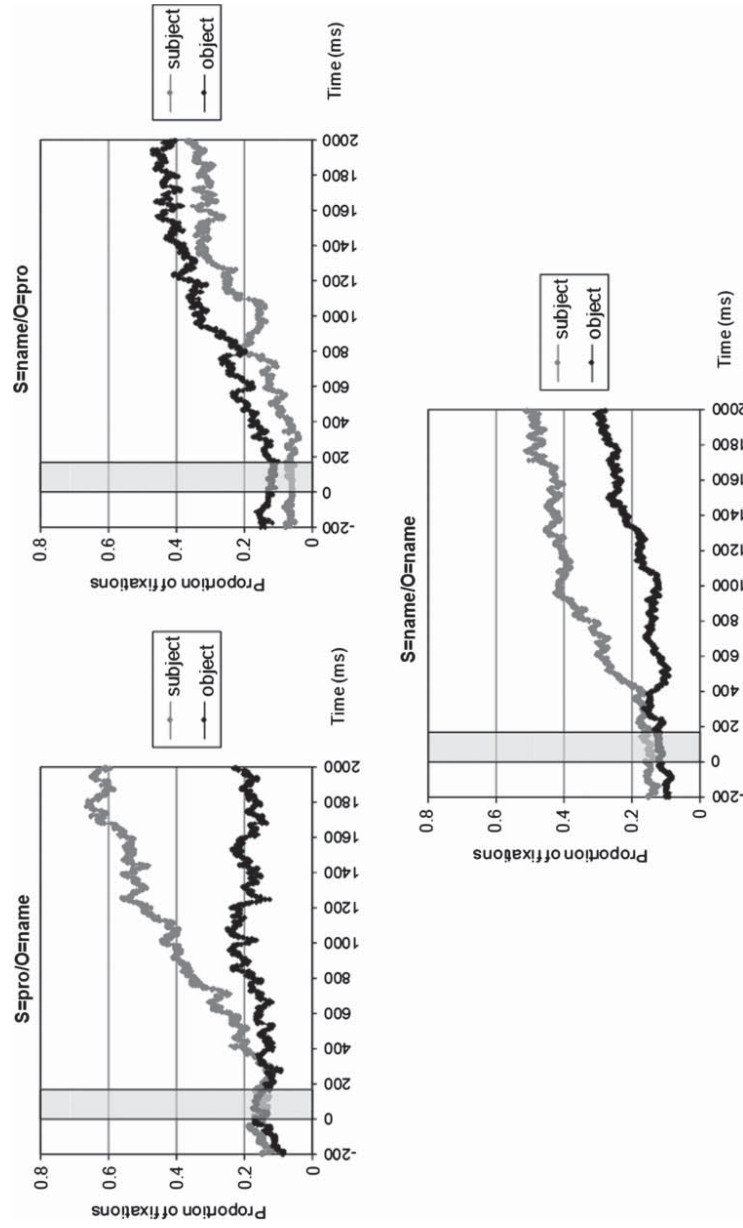


Figure 3. Proportion of fixations to the preceding subject and the preceding object during sentence (d) in Experiment 1. The grey box shows the average duration of the pronoun.

TABLE 1
Comparing proportion of looks to the subject vs. proportion of looks to the object, Experiment 1

	$[S = name/O = pro]$		$[S = name/O = name]$		$[S = pro/O = name]$	
	By subjects $t_1(23)$	By items $t_2(15)$	By subjects $t_1(23)$	By items $t_2(15)$	By subjects $t_1(23)$	By items $t_2(15)$
0-500 ms	$t = -2, p = .057$	$t = -1.91, p = .075$	$t = 1.41, p > .1$	$t = 1.24, p > .2$	$t = 0.63, p > .5$	$t = 0.45, p > .6$
502-1,000 ms	$t = -1.83, p = .08$	$t = -1.44, p = .17$	$t = 4.57, p = .0001$	$t = 3.32, p < .005$	$t = 2.38, p < .05$	$t = 2.56, p < .05$
1,002-1,500 ms	$t = -1.75, p = .09$	$t = -1.03, p = .32$	$t = 3.44, p < .005$	$t = 3.65, p < .005$	$t = 4.91, p < .0001$	$t = 3.46, p < .005$
1,502-2,000 ms	$t = -1.77, p = .09$	$t = -1.61, p = .13$	$t = 2.99, p < .01$	$t = 4.35, p < .001$	$t = 6.69, p < .0001$	$t = 5.24, p = .0001$

TABLE 2
Comparing the strength of the subject advantage scores in the different conditions, Experiment 1

	$[S = name/O = name]$ vs. $[S = name/O = pro]$		$[S = name/O = name]$ vs. $[S = pro/O = name]$		$[S = pro/O = name]$ vs. $[S = name/O = pro]$	
	By subjects $t_1(23)$	By items $t_2(15)$	By subjects $t_1(23)$	By items $t_2(15)$	By subjects $t_1(23)$	By items $t_2(15)$
0-500 ms	$t = -3.18, p < .005$	$t = -2.49, p < .05$	$t = -0.32, p > .7$	$t = -0.17, p > .8$	$t = 1.76, p = .09$	$t = 1.32, p > .2$
502-1,000 ms	$t = -3.63, p < .005$	$t = -4.04, p < .005$	$t = -0.53, p > .6$	$t = -1.35, p > .19$	$t = 2.94, p < .01$	$t = 3.23, p < .01$
1,002-1,500 ms	$t = -3.73, p < .005$	$t = -3.2, p < .01$	$t = 0.71, p > .4$	$t = 0.77, p > .4$	$t = 4.98, p < .0001$	$t = 3.26, p < .01$
1,502-2,000 ms	$t = -3.36, p < .005$	$t = -4.37, p = .0005$	$t = 2.55, p < .05$	$t = 2.75, p < .05$	$t = 5.72, p < .0001$	$t = 5.01, p < .001$

we find a significantly stronger subject advantage in [S = pro/O = name] than [S = name/O = name]. In addition, except for the first time slice, both of these conditions differ significantly from [S = name/O = pro]. Thus, as in the off-line data, the [S = name/O = pro] condition clearly differs from the other two, which show more similar eye-movement patterns.

Discussion

As a whole, participants' picture verification responses and eye-movement patterns indicate that both pronominalisation and subjecthood guide the interpretation of subsequent pronouns. Participants' *off-line picture verification responses* show an overarching subject preference in all conditions, indicating that subjecthood has a stronger effect on participants' final interpretations than pronominalisation. However, we also found that the presence of a pronominalised object decreases the number of subject choices ([S = name/O = pro] vs. [S = name/O = name] and [S = pro/O = name]). This shows that although subjecthood may play a greater role than pronominalisation in guiding participants' final choices, there is competition from the pronominalised object. In line with these results, a pronominalised subject boosts the rate of subject interpretations ([S = pro/O = name] vs. [S = name/O = name].)

The *eye-movement patterns* reveal even more clearly the consequences of pronominalising the object. Although the two [O = name] conditions ([S = pro/O = name] and [S = name/O = name]) exhibit a significant preference for the subject over the object beginning around 500 ms after pronoun onset, the [S = name/O = pro] condition does not exhibit a significant subject preference at any point during the first 2,000 ms after pronoun onset. In fact, we find a marginal object preference. Thus, the eye movements reveal close competition between a potential antecedent that is pronominalised (in object position) and a potential antecedent in subject position, indicating that at least early on during real-time language comprehension, the effects of object pronominalisation and subjecthood seem to be roughly equal in strength. (The competition is less symmetrical in the off-line data, although even there the rate of subject choices is lowest in the [S = name/O = pro]. The off-line data may be indicative of later strategic processing: when experiencing competition between two referents, participants may default to the subject. The possibility of such strategic effects highlights the usefulness of on-line data.)

What about pronominalising the subject? Both off-line choices and eye-movement patterns suggest that pronominalising the subject leads to a strengthening of the subject preference. There are more subject responses in the [S = pro/O = name] condition than in the [S = name/O = name] condition, and the eye-movement patterns in these two conditions differ in the last

time slice, when [S = pro/O = name] has a stronger subject advantage than [S = name/O = name]. The fact that this difference is present but delayed suggests that for entities that are already prominent due to being in subject position, pronominalisation results in a late—but nevertheless detectable—boost.

On the basis of Experiment 1, we can conclude that both subjecthood and pronominalisation—two factors that are traditionally regarded as being related to topicality—influence pronoun interpretation during real-time processing, even when they do not coincide. Our findings fit with Arnold's (1998, 1999) view of salience as a *competitive phenomenon*: it seems that a pronominalised object is better able to compete with the subject than a discourse-new, nonpronominalised object. More generally, the separable effects of subjecthood and pronominalisation show that subjects have a special status even when they are new and do not fit the “standard” definition of topic. The importance of subjecthood is also relevant in Experiment 2, where we investigate how contrastive focus reacts to differences in grammatical role.

EXPERIMENT 2: EFFECTS OF CONTRASTIVE FOCUS

Experiment 2 used visual-world eye tracking to investigate whether contrastive focus influences pronoun interpretation in the presence of discourse-old, pronominalised referents—which have been argued to be topics even if not located in subject position (see e.g., Beaver, 2004)—and to assess their strength relative to pronominalisation effects. Testing whether focus and topic-related factors can have simultaneous effects will contribute to the question of whether topicality and focusing, traditionally regarded as complementary, might nevertheless have similar effects on referent salience. The design of this experiment also allows us to see whether the mixed results of previous research (Arnold, 1999; Cowles, 2003; Cowles et al., 2007) can be clarified once we take subjecthood into consideration.

In Experiment 2, we manipulate the grammatical roles of the given/pronominalised and focused entities (subject vs. object), which allow us to detect whether contrastive focus has an effect on the interpretation of subsequent pronouns. Furthermore, pitting contrastive focus against pronominalisation while manipulating grammatical role allows us to assess how potential effects of contrastive focus compare to effects of pronominalisation. In addition, Experiment 2 included both *it*-clefts and SVO sentences in which the focused constituent is left *in situ*, i.e., in its regular position. This allows us to test whether the strength of any potential effects of contrastive focus depends on the linguistic packaging used to encode it, a question not fully resolved in existing work (see Arnold, 1999). Using clefts also allows us

to address concerns regarding potential effects of structural parallelism, as discussed below.

Method

Participants

Twenty-four adult native English speakers from the University of Southern California community participated in this experiment in exchange for US\$10.

Materials

Given that corrective focus is a type of contrastive focus (see e.g., Gussenhoven, 2007; Halliday, 1967), in Experiment 2 we used contexts in which one speaker corrects another speaker. Use of a felicitous context is important because (1) existing work suggests that informationally marked constructions (e.g., clefts) presented out of context can induce higher processing loads than they would if presented in a supportive context (e.g., Kaiser & Trueswell, 2004) and (2) use of a context ensures that comprehenders interpret both SVO sentences and clefts as having the intended kind of contrastive focus structure.

The visual materials (pictures displayed on the computer screen) for the 16 targets and the 32 fillers were the same as in Experiment 1. However, because Experiment 2 involves contrastive focus, the auditory stimuli were changed slightly and made into two-person dialogues (Example 8). Each verbal narrative had the form of a dialogue between a male speaker (Speaker A) and a female speaker (Speaker B). The last three sentences of each item, beginning with the pronoun-initial test sentence, were the same as in Experiment 1.

The first sentence of each dialogue (uttered by Speaker A) mentions two characters in a transitive sentence using an agent–patient verb. (As in Experiment 1, we do not separate effects of grammatical role from effects of thematic role, and focus on the default situation in which subjects are agents—i.e., syntactically and semantically prominent.) The subsequent five clauses (a through e) are uttered by Speaker B.

Sentence b is the *critical sentence*, in which we manipulated (1) syntactic form (cleft vs. SVO) and (2) the grammatical role of the contrastively focused constituent and the given constituent, as illustrated in Example 8. Thus, we investigate both focused subjects and focused objects. There were four conditions, shown in (i) through (iv) in Example 8: [Cleft.Object = focus], [Cleft.Subject = focus], [SVO.Object = focus], and [SVO.Subject = focus]. Looking at both SVO sentences and *it*-clefts allows us to test whether any potential focus effects are stronger when the focus status of an entity is

indicated not only by the discourse context but also by a special syntactic construction—an issue which has not been resolved in previous work. In earlier corpus-based and psycholinguistic work, Arnold (1999) obtained mixed results for the cleft vs. SVO distinction. Clefts also allow us to eliminate potential concerns regarding structural parallelism (Smyth, 1994), because clefts are not syntactically parallel to the test sentences. For example, the pronoun in the test sentence (Example 8) is in subject position, but in clefts, “it” occupies the subject position and the agentive subject occurs later (see also, Kaiser, 2010). In Experiment 2, both the subject and object in the target sentences were human and had the same gender:

(8) *Speaker A: I heard that Greg congratulated Mike enthusiastically yesterday.*

Speaker B:

- a. No, that’s not quite right.
- b. (i) He congratulated John. (Critical sentence: [SVO.Object = focus])
 (ii) John congratulated him. [SVO.Subject = focus]
 (iii) It was John that he congratulated. [Cleft.Object = focus]
 (iv) It was John who congratulated him. [Cleft.Subject = focus]
- c. The prizes for the best-ranked tennis players were about to be announced, and
- d. *he* was holding a new yellow tennis racket. (Test sentence)
- e. Everyone was in a good mood that day.

In the clefted conditions, the preceding context and the syntactic construction marked one of the arguments as being in contrastive focus; the rest of the sentence was presupposed (cf. Hedberg, 2000, topic-clause clefts). In the SVO conditions, the focus/presupposition division is not encoded by a particular syntactic construction but follows clearly from the preceding context. In all conditions, the argument in the presupposed part of the sentence is discourse-old and pronominalised (the subject in “i” and “iii” and the object in “ii” and “iv”). In all target items, the contrastively focused entity was discourse-new (i.e., mentioned for the first time), following Arnold (1998, 1999), Cowles (2003), and Cowles et al. (2007). As in Experiment 1, the given/discourse-old entity was pronominalised.

The *visual scenes* that participants saw depicted the two characters mentioned in sentence b, see Figure 1 (same pictures as in Experiment 1). In the critical pictures, the position of the characters was counter-balanced such that the referent in contrastive focus (e.g., John in Example 8) was on

the left side in half of the items and on the right side in the other half of the items.

As in Experiment 1, the critical sentence (sentence b) is separated from the pronoun-initial test sentence (sentence d) by an intervening clause (sentence c) which serves as a “look-away”. The test sentence is followed by a wrap-up sentence (sentence e). The test sentence d was spoken with normal intonation, without any special accenting of the pronoun. (Contrastive pitch accents occurred in the critical sentences in b.) As in Experiment 1, the test sentence was incorrect with respect to both of the characters, and participants were instructed to click on any errors they notice in the picture, which provides us with information regarding their final interpretation of the ambiguous pronoun.

As in Experiment 1, the sound files for all sentences within a mini-narrative—other than the critical sentences which were spliced in—were the same across different versions of an item. Thus, the pronoun-initial test sentence was the same sound file in all versions of an item. When questioned after the experiment, participants said they did not notice any splicing in the sound files. Like Experiment 1, Experiment 2 contained 32 fillers. The filler pictures were the same as in the first experiment. The auditory stimuli for the fillers in Experiment 2 resembled the targets, and as in Experiment 1, 24 fillers were correct and eight fillers contained mismatches. As in Experiment 1, target items were separated from each other by at least one filler. Within a presentation list, eight targets had SVO order and eight targets were clefted. Within each sentence type (SVO/cleft), half of the items contained a focused subject and a pronominalised object, and half contained a pronominalised subject and a focused object. Four presentation lists were created, and each list was also reversed to control for trial order.

Procedure

The procedure was as in Experiment 1.

Predictions

Off-line responses. By comparing the [Subject = focus] and [Object = focus] conditions, we can see whether contrastive focus influences the interpretation of subsequent pronouns in the presence of a pronominalised, discourse-old argument. If contrastive focus does not influence the interpretation of subsequent pronouns, then the expectation is that the [Subject = focus] conditions, where the object is pronominalised, will show competition between the subject (since it occupies a position of syntactic and semantic prominence) and the pronominalised object (since it is discourse-old and pronominalised).

Furthermore, the [Object = focus] conditions are expected to show a preference for the referent in subject position (since it is both in subject position and pronominalised). In other words, if contrastive focus does not have an effect, we expect the results of Experiment 2 to be similar to the outcomes of Experiment 1.

However, *if contrastive focus increases referent salience in a situation where a topical referent is also present*, the prediction is that in the [Subject = focus] conditions, the boost from contrastive focus will resolve the “tie” between the subject and the pronominalised object in favour of the *contrastively focused* subject. In that case, we would expect to see a subject preference in the [Subject = focus] conditions.

Furthermore, if we find effects of contrastive focus, then by comparing the [Subject = focus] and the [Object = focus] conditions, we can assess *the relative weights of pronominalisation and contrastive focus* to test more directly whether we can find an indication of them having simultaneous effects (i.e., both being at play in the same sentence). If contrastive focus is more heavily weighted than pronominalisation, we expect to see more subject choices (and fewer object choices) in the [Subject = focus] conditions than in the [Object = focus] conditions. However, if pronominalisation is weighted more heavily than focus, there should be more subject choices (and fewer object choices) in [Object = focus] conditions than in [Subject = focus] conditions, because in the former the subject is pronominalised. In summary, if pronominalisation and contrastive focus *differ* in their relative contributions, we expect to see *an effect of focus position*, with the direction of the effect dependent on which factor is weighted more heavily. (This effect could equally well be described as an effect of pronoun position, but for consistency, the term “effect of focus position” will be used here). Importantly, finding no effect of focus position would also be very informative, as it would suggest that the two factors are both at play but similarly weighted.

Effects of syntactic form (SVO vs. cleft). If contrastive focus boosts referent salience and if its effects are strengthened when it is syntactically marked, we expect that, out of the two [Subject = focus] conditions, we will see more subject choices in the [Cleft.Subject = focus] condition than in the [SVO.Subject = focus] condition. For the two [Object = focus] conditions the opposite effect is expected, namely more object choices in the [Cleft.Object = focus] condition than in the [SVO.Object = focus] condition.

Eye movements. The predictions for the eye-movement data parallel those for the off-line responses. Furthermore, because eye movements provide a more sensitive and fine-grained temporal measure of what referents participants consider as the sentence unfolds over time, they offer the

possibility for (1) detecting weak or transient effects that may not be apparent in off-line responses and (2) gaining insights into when preferences begin to emerge. Thus, we can see how strongly a particular antecedent is considered and when this preference emerges during real-time comprehension.

Results

Off-line responses

Overall subject preference. Participants' mouse-click responses revealed a clear subject preference in all four conditions (Figure 4). In the [SVO.Subject = focus] condition, participants clicked on the subject 77% of the time, indicating that they prefer to interpret the pronoun as referring to the subject. The numbers are similar for the other three conditions: [SVO.Object = focus] triggered 72% subject choices, and [Cleft.Subject = focus] and [Cleft.Object = focus] resulted in 78 and 82% subject choices, respectively. One-group *t* tests show that the proportion of subject choices is significantly above chance in all conditions both by subjects and by items [Cleft.Subject = focus]: $t_1(23) = 5.33$, $p < .0001$, $t_2(15) = 6.65$, $p < .0001$; [SVO.Subject = focus]: $t_1(23) = 5.72$, $p < .0001$, $t_2(15) = 4.96$, $p < .001$; [Cleft.Object = focus]: $t_1(23) = 10.14$, $p < .0001$, $t_2(15) = 6.9$, $p < .0001$; [SVO.Object = focus]: $t_1(23) = 4.76$, $p < .0001$, $t_2(15) = 3.63$, $p < .005$. (See Kaiser, 2010, for discussion of a related sentence-completion study—conducted as part of an investigation looking at the discourse status of focus-induced alternatives, comparing production and comprehension—which also revealed a subject advantage in a similar situation, showing that this effect is replicated in a different experimental paradigm. (See also Kaiser, 2009 for discussion of the completion study.)

Mixed effects logistic regression models were used to analyse the proportion of subject choices and object choices as a function of structure (SVO vs. cleft), focus position (subject vs. object), and the interaction of

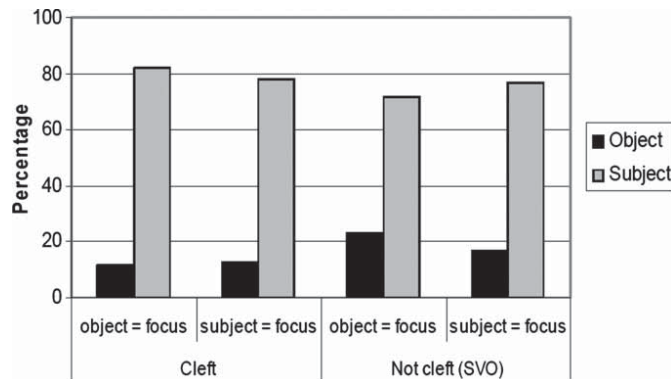


Figure 4. Picture verification data: proportions of subject and object choices in Experiment 2.

these two factors. The independent variables were centred in order to avoid collinearity in the interaction terms (see Jaeger, 2008 and others). Participant and item were included as random effects (see Footnote 2). As in Experiment 1, the rate of subject choices and the rate of object choices were analysed separately, because there is a small number of trials (6.77%) where participants clicked on neither the subject nor the object, and thus the subject and object choices are not the exact inverse of each other.

We found no main effects of *focus position* ($ps > .5$) and no *focus position* \times *syntactic form* interaction ($ps > .24$) on the rate of subject or object choices. Thus, the strength of the subject preference is not influenced by whether the subject is focused. We found a main effect of *syntactic form* on the proportion of object choices ($\beta = -.0664$, Wald's $Z = -2.158$, $p < .05$), but no significant effect on the proportion of subject choices ($p > .16$). There are more object choices in the SVO conditions than in the clefted conditions.

On the whole, the main pattern that emerges from participants' off-line responses is the overarching subject preference in all conditions, regardless of whether the subject is pronominalised or contrastively focused.

Eye-movement data

Overall subject preference. We focused on eye movements during sentence d, the test sentence that starts with the ambiguous pronoun. (Recall that, as in Experiment 1, the critical sentences were incorrect with respect to both characters. In Experiment 2, the "disambiguating" information that revealed that the sentence was incorrect with respect to both characters occurred 1,266 ms after pronoun onset, on average. The average duration of the disambiguating word was 278 ms.) Figure 5 shows the proportion of fixations to the preceding subject and to the preceding object in the four conditions. As shown in Figure 5, all conditions triggered more looks to the subject than to the object. As in Experiment 1, paired t tests were used to compare the proportion of subject looks to the proportion of object looks during four time slices, starting at the onset of the pronoun and continuing for 2,000 ms. In general, as Table 3 shows, all four conditions show a significant subject preference during the last two time slices.

To assess how the magnitude of the subject preference is affected by focus position (subject focus vs. object focus) and syntactic form (SVO vs. cleft), ANOVAs were conducted on the subject advantage scores, calculated by subtracting the proportion of looks to the object from the proportion of looks to the subject (as in Experiment 1).

The analyses reveal no significant main effects of *syntactic form* during any time slice ($F_s < 2.2$, $ps > .15$), except for the 502–1,000 ms segment, where we find that the cleft conditions result in a stronger subject advantage

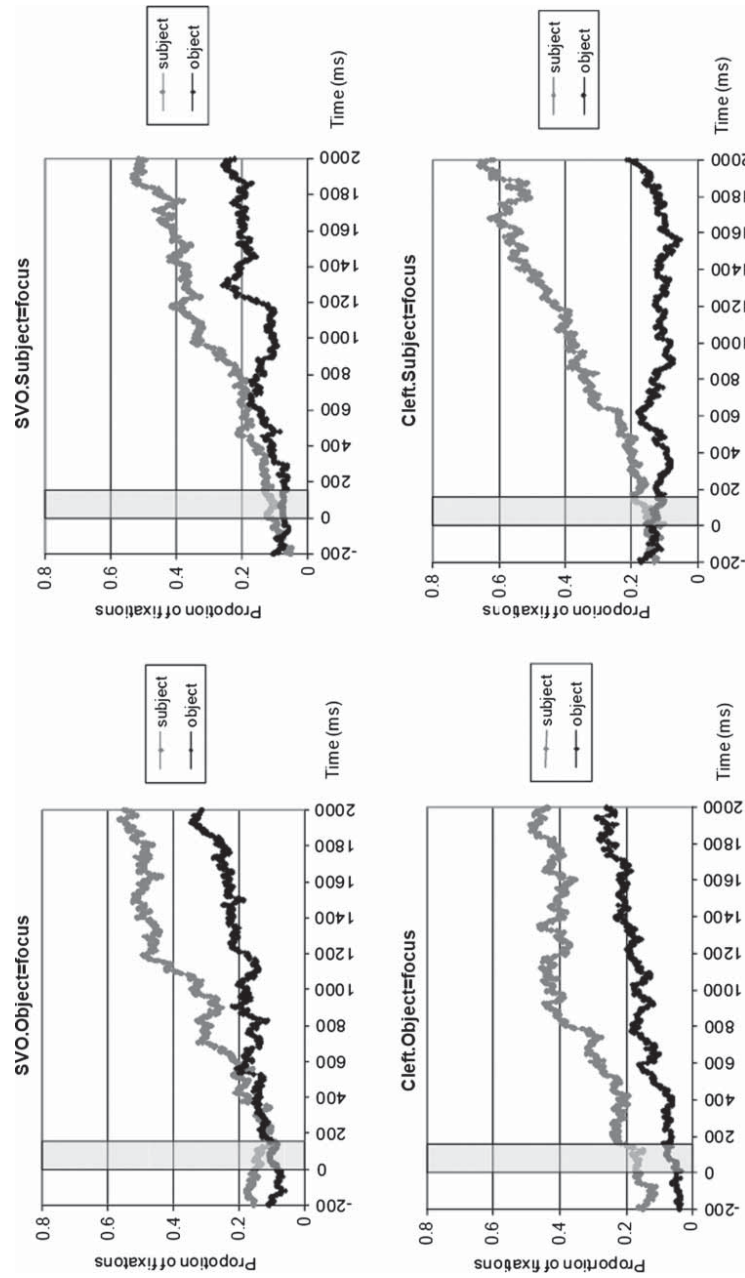


Figure 5. Proportion of fixations to the preceding subject and the preceding object during sentence (d) in the four conditions of Experiment 2. The grey box shows the average duration of the pronoun.

TABLE 3
 Outcomes of paired *t* tests (two-tailed) comparing the proportion of subject looks to the proportion of object looks for four time slices from 0 to 2,000 ms post-pronoun in Experiment 2

	[SVO.O = focus]			[Cleft.O = focus]			[Cleft.S = focus]		
	By subjects <i>t</i> ₁ (23)	By items <i>t</i> ₂ (15)	By subjects <i>t</i> ₁ (23)	By items <i>t</i> ₂ (15)	By subjects <i>t</i> ₁ (23)	By items <i>t</i> ₂ (15)	By subjects <i>t</i> ₁ (23)	By items <i>t</i> ₂ (15)	By items <i>t</i> ₂ (15)
0-500 ms	<i>t</i> = 0.61, <i>p</i> > .5	<i>t</i> = 0.52, <i>p</i> > .6	<i>t</i> = 0.74, <i>p</i> > .4	<i>t</i> = 2.21, <i>p</i> = .04	<i>t</i> = 3.30, <i>p</i> < .01	<i>t</i> = 2.4, <i>p</i> < .05	<i>t</i> = 1.54, <i>p</i> > .1	<i>t</i> = 1.64, <i>p</i> > .1	
502-1,000 ms	<i>t</i> = 1.41, <i>p</i> > .1	<i>t</i> = 1.64, <i>p</i> > .1	<i>t</i> = 1.47, <i>p</i> > .1	<i>t</i> = 1.71, <i>p</i> > .1	<i>t</i> = 3.17, <i>p</i> < .01	<i>t</i> = 3, <i>p</i> < .01	<i>t</i> = 3.16, <i>p</i> < .01	<i>t</i> = 2.8, <i>p</i> < .05	
1,002-1,500 ms	<i>t</i> = 3.67, <i>p</i> < .01	<i>t</i> = 4.31, <i>p</i> < .001	<i>t</i> = 3.023, <i>p</i> < .01	<i>t</i> = 3.57, <i>p</i> < .01	<i>t</i> = 3.75, <i>p</i> = .001	<i>t</i> = 4.1, <i>p</i> = .001	<i>t</i> = 4.64, <i>p</i> = .0001	<i>t</i> = 5.17, <i>p</i> = .0001	
1,502-2,000 ms	<i>t</i> = 3.06, <i>p</i> < .01	<i>t</i> = 2.62, <i>p</i> < .05	<i>t</i> = 3.21, <i>p</i> < .005	<i>t</i> = 3.64, <i>p</i> < .005	<i>t</i> = 2.5, <i>p</i> < .05	<i>t</i> = 2.83, <i>p</i> < .05	<i>t</i> = 7.23, <i>p</i> < .0001	<i>t</i> = 8.99, <i>p</i> < .0001	

than the SVO conditions [significant by subjects, marginal by items: $F_1(1, 23) = 4.38, p < .05, F_2(1, 15) = 3.85, p = .069$]. This finding fits with the off-line data which indicate that the object receives more consideration in the SVO conditions than in the clefted conditions.

There are no significant main effects of *focus position* during any time slice ($F_s < 2.15, p_s > .47$), except for a marginal effect (by subjects) in the final 1,502–2,000 ms time slice [$F_1(1, 23) = 3.36, p = .08, F_2(1, 15) = 2.15, p = .16$], with the [Subject = focus] conditions triggering a numerically stronger subject advantage than the [Object = focus] conditions. This effect is modulated by a marginal *structure* \times *focus interaction* [$F_1(1, 23) = 2.55, p = .12; F_2(1, 15) = 3.91, p = .067$] in the 1,502–2,000 ms time slice: as shown in Figure 5, it is the [Cleft.Subject = focus] condition that results in a slightly stronger subject advantage score than the other three conditions.

Discussion

The clearest pattern that emerges from Experiment 2 is an overarching subject preference, regardless of whether the subject or object is contrastively focused; both off-line responses and eye-movement patterns reveal a clear subject preference in all conditions. The eye-movement patterns show that although there are some differences in when the preference for the subject over the object becomes significant, it reaches significance in all four conditions by 1,002–1,500 ms after pronoun onset. (We consider the reasons underlying the slight differences in timing between conditions below.)

Let us first discuss the off-line data. The finding that not only the [Object = focus] conditions but also the [Subject = focus] conditions show a significant subject preference indicates that contrastive focus does indeed boost referent salience, even in the presence of a discourse-old, pronominalised referent. Thus, instead of a situation like Experiment 1, where the [S = name/O = pro] condition resulted in competition between the pronominalised, discourse-old object and discourse-new subject, we now find that when the discourse-new subject is also contrastively focused (i.e., has two things in its favour: subjecthood and contrastive focus), it is preferred over the pronominalised object.

Furthermore, the finding that off-line responses show no main effects of focus position (the subject preference is equally strong regardless of whether the subject or object is contrastively focused or pronominalised) suggests that when pronominalisation and contrastive focus are pitted against each other, neither one is more influential than the other. Thus, we have evidence for both factors having an effect at the same time. It is worth noting that although we talking about the *absence* of an effect of focus position (a null effect), we can nevertheless infer that it is the result of pronominalisation and

contrastive focus being pitted against each other, because we have seen effects of both of these factors in other conditions in Experiments 1 and 2.

Like the off-line data, the eye-movement patterns also indicate a general subject preference regardless of focus position. There are some weak interaction effects in the eye-movement data suggesting that clefting strengthens the effects of contrastive focus for subjects but not for objects, but the interaction is marginal at best. (The asymmetry between subjects and objects could be explained by the markedness of clefted subjects: subjects are often pronominalised and old information (e.g., Prince, 1992), and clefting a subject results in a more marked construction than clefting an object. Given that less frequent/more marked constructions are known to have stronger consequences on the human language processing system than more frequent/canonical constructions, e.g., Jaeger & Snider, 2008), it is not surprising that using a cleft construction to put into focus a constituent which is not normally focused (i.e., a subject) could have a stronger effect than clefting an object. If this explanation is on the right track, it also helps to explain why Arnold (1999), who used object clefts, did not find clear effects of SVO vs. clefts in her story-continuation task.) In the end, the overarching effect that we find is a subject preference regardless of focus position/pronominalisation. The finding that all four conditions exhibit a subject preference, with no overarching effects of focus position, echoes the conclusions drawn from the off-line data that (1) contrastive focus does indeed boost reference salience and (2) both pronominalisation and contrastive focus are at play, with comparably weighted effects. In the Section “General Discussion”, we consider the implications of these findings for Arnold and Cowles’ results.

An interesting question for future work concerns the effects of givenness in the absence of pronominalisation; if a noun is given but not pronominalised, could contrastive focus outweigh givenness? One may also ask whether multiple occurrences of pronominalisation in preceding discourse could result in pronominalisation outweighing contrastive focus. Our conclusions concerning pronominalisation apply to the scenarios tested in Experiments 1 and 2, where the entity that is pronominalised in the critical sentence had been introduced as a full name in preceding discourse.

Timing of subject preference emergence

Although all four conditions exhibit a subject preference, the eye-movement patterns show that there are differences in when the subject advantage reaches significance: we found an unexpected main effect of syntactic form (significant by subjects, marginal by items) during the 502–1,000 ms segment, with the cleft conditions resulting in a stronger subject advantage than the SVO conditions. For the [Cleft.Subject = focus] condition, the relatively early emergence of the subject preference may be

related to the idea that clefting a subject results in a marked structure, such that focused subjects that are clefted may be more salient than focused subjects in canonical position. The reasons for the early subject preference in the [Cleft.Object = focus] condition are unclear. One possibility has to do with the fact that [Cleft.Object = focus] is the only condition in which the object linearly precedes the subject, i.e., the subject is the *last-mentioned entity*. Participants' eye movements are known to be time locked to entities mentioned in the speech stream (e.g., Cooper, 1974; Tanenhaus et al., 1995), and so a late mention of the subject in the [Cleft.Object = focus] may be what results in relatively more looks to the subject after the end of the sentence than in the other conditions. In other words, it could be that the subject preference emerges earlier in this condition due to a (theoretically uninteresting) side effect of the linear word order of the sentence.

GENERAL DISCUSSION

The two eye-tracking experiments reported here investigated the factors that guide how comprehenders resolve pronouns during auditory language comprehension, focusing especially on the interplay of contrastive focus, grammatical role, and pronominalisation. Existing research indicates that *topicality*-related factors, including pronominalisation, givenness, and subjecthood, boost referent salience. Other work suggests that *contrastive focus* can also make referents more prominent. Because “topic” and “focus” are commonly regarded as complementary notions, the idea that they have the same kind of effect on salience has implications for our understanding of these concepts, as it suggests that they may share similar cognitive underpinnings. However, existing studies which took steps to directly compare the effects of topicality and focusing (Arnold, 1998, 1999; Cowles, 2003; Cowles et al., 2007) led to divergent conclusions regarding the interaction of topicality and focusing and left open the question of whether contrastive focus effects would be detectable in contexts with “competing” referents that are topical by virtue of being discourse-old or pronominalised. In fact, a comparison of the sentences used in these earlier studies suggests that the picture is potentially obscured by effects of subjecthood. The two experiments presented in this paper manipulated the grammatical role of the discourse-old pronominalised referent and the focused referent in order to clarify our understanding of how topicality-related factors interact with contrastive focus effects.

Experiment 1 tested effects of subjecthood and pronominalisation/givenness. The results show that, first, when these two factors coincide—i.e., when a referent that is already structurally and semantically salient (a subject) is also discourse-old and pronominalised—we observe a further

salience boost compared to nonpronominalised, discourse-new subjects. Second, when subjecthood and givenness/pronominalisation are pitted against each other, there is competition between a full-name discourse-new subject and a pronominalised object. This indicates that effects of structural/semantic prominence and givenness/pronominalisation are separable: on one hand, referents in positions of structural and semantic prominence (agentive subjects) are salient even when they are discourse-new information and competing against a twice-mentioned pronominalised referent. This indicates that subjects have a special status even when they are new information and do not fit the “standard” definition of topic. On the other hand, being pronominalised and discourse-old grants a special status even to referents not in subject position.

The eye-movement patterns from Experiment 1 indicate that the effects of pronominalisation and subjecthood arise simultaneously during real-time processing, suggesting a reference resolution system capable of rapidly integrating different levels of linguistic representation. (Because these studies did not separate effects of pronominalisation from effects of givenness, as all pronominalised referents were also by necessity discourse-old, we should be careful not to attribute these effects directly to a particular linguistic form, as they could be also consequences of the discourse properties—including givenness—associated with that form.)

The insights from Experiment 1 provide an important foundation for *Experiment 2*, which investigated how contrastive focus interacts with subjecthood and pronominalisation. Experiment 2 shows that when grammatical role is taken into consideration, we can detect effects of contrastive focus on salience even in the presence of a discourse-old, pronominalised (topical) referent. Furthermore, when pronominalisation and contrastive focus are pitted against each other, the data suggest that both contribute towards pronoun interpretation during real-time processing, with comparably weighted effects. As a result, when contrastive focus and pronominalisation are pitted against each other, a subject preference emerges in all conditions.

As a whole, the findings of the two experiments reported here show that subjecthood, pronominalisation, and contrastive focus all influence pronoun resolution, and that effects of subjecthood can be observed regardless of the subject’s information structure (whether it is discourse-new and contrastively focused or discourse-old and pronominalised). The finding that subjecthood and pronominalisation have separable effects also fits with existing work indicating that topicality may be gradient (e.g., Givón, 1983).

The results presented in this paper help to resolve the apparent divergence between Arnold (1998, 1999), Cowles (2003), and Cowles et al. (2007). Whereas Arnold concluded that established discourse topics are more salient than contrastively focused entities, Cowles et al. concluded

that discourse topics and focused entities are equally salient. Our findings suggest that this disparity may have arisen from subjecthood effects: Arnold's foci were in object position and Cowles' foci were in subject position, and as we saw in Experiment 2, subjects are preferred antecedents regardless of the grammatical role of the contrastively focused entity.

Let us now turn to the broader question of how topic and focus affect referent salience. To start with, the finding that subjecthood and pronominalisation have separable effects means that discussions of topicality need to keep its multifactorial nature in mind. In addition, the eye-tracking data from Experiment 1 suggest that, at least in the kinds of discourse contexts investigated here, subjecthood and pronominalisation are similarly weighted, but off-line choices appear to be more guided by subjecthood. Experiment 2 suggests that contrastive focus can have a salience-boosting effect, even in the presence of pronominalised referents. Furthermore, in the contexts that we tested, it appears that effects of contrastive focus are of similar magnitude to the effects of pronominalisation (as we found no clear effects of either when they were pitted against each other). However, it is important to keep in mind that results regarding the relative weights of different factors may in fact fluctuate somewhat depending on the strength of the contextual manipulation (e.g., how many times a referent is pronominalised).

Nevertheless, even if we put aside for now questions regarding possible fluctuations, what we find is that all three factors influence pronoun interpretation. Thus, if we interpret pronoun interpretation patterns as indications of the referents' cognitive prominence, then two phenomena which are often regarded as complementary, namely topic and focus, do indeed appear to have a common consequence of boosting a referent's prominence (see also Arnold, 1998, 1999; Cowles et al., 2007). This idea, combined with the fact that topic and focus nevertheless differ in many informational-structural and pragmatic respects (e.g., Gundel & Fretheim, 2004), points towards a conceptualisation of salience as a phenomenon that emerges from a wealth of diverse ingredients. Broadly speaking, our results argue for a highly interactive system that smoothly integrates information from different linguistic levels during real-time language comprehension. Both our research and other work suggest that this system is flexible enough to be able to treat both established/expected referents and new, surprising referents as salient, while also exhibiting sensitivity to entities in positions of structural and semantic prominence.

Manuscript received 14 June 2009

Revised manuscript received 22 August 2010

First published online 3 March 2011

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APPENDIX 1

Target items for Experiment 1 (the texts included here show the [S=pro/O=name] condition)

1. Greg is always very supportive of others. He congratulated John enthusiastically yesterday. The prizes for the best-ranked tennis players were about to be announced, and he was holding a new yellow tennis racket. Everyone was in a good mood that day.
2. Mike was in a bad mood on Tuesday. He criticised Peter rather harshly at the business presentation. The computer projector wasn't working properly, and he had to put down his pens and interrupt the presentation in order to adjust it. Technical glitches can be rather annoying.
3. Lisa is happy to lend a hand to others if need be. She helped Kate assemble some furniture on Wednesday. The back and sides of the bookcase needed to be attached to the frame, and she was thinking of using a wrench for doing that. Fortunately that turned out to be exactly what was needed.
4. Anne didn't have a very good weekend. She scolded Mary in the back yard last Saturday. The pile of leaves in the middle of the yard was getting out of hand, and she was holding a rake and finally started clearing the leaves away. It's important to keep up with yard work in the fall.
5. John is a stickler for making sure things are done according to the rules. He accused Greg of tampering with the sports equipment at the high jump competition. The bar for the high-jump looked like it had been illegally lowered, and he had to put down his tape recorder to see if that was really the case. It's important to play fair in sports.
6. Lisa was getting very bored at work on Thursday. She pinched Mary surreptitiously during the long meeting. It was already 8 pm, and she was standing next to a man in a blue suit who seemed to be asleep in a chair. After everyone else noticed it as well, they found it rather amusing.
7. Peter made a clumsy mistake on Monday. He punched Mike by accident during boxing class. The class had already been going on for over 3 hours, and he was frustrated by his uncomfortable blue sneakers and not paying attention. In a sport such as boxing, it's important to always be attentive to your surroundings.
8. Anne is a bit uncoordinated sometimes. She scratched Kate accidentally over the weekend. The ferns growing behind the prickly rose bushes needed to be trimmed, and she was using a large pair of clippers to push aside the branches in the way. When working as a pair, it's important to pay attention to where the other person is so no one gets hurt.
9. Mary was in a good mood on Sunday. She praised Lisa at the neighbourhood association meeting. The city had finally responded to persistent petitioning and fixed the fence near the school, and she was holding a nice thank-you letter from the principal. It is good to see persistence paying off in such a nice way.
10. Mary did something pretty silly last week. She tickled Anne at the Halloween party on Friday. The sugar rush from the cake had put everyone in the mood for something silly and

spontaneous, and she was holding a bunch of yellow feathers. Those feathers were just perfect for tickling.

11. Kate is very perceptive and good at noticing things. She poked Anne in order to get her attention at the airport check-in counter. The flight information board showed the Paris flight as being “cancelled” and she was just about to lift her blue suitcase onto the check-in scale in order to check in for that very flight. Unexpected changes in travel arrangements can be rather annoying.
12. Mike caused a little accident on Sunday. He hit Peter by mistake at the go-kart track. A sudden gust of wind blew a branch onto the middle of the track, and he tried to steer his green go-kart around it. Fortunately the people at the track are used to dealing with minor accidents.
13. Peter lost his temper again recently. He slapped Mike on Friday. The Golden Retriever puppies had knocked the china cabinet over, and he was holding a broken coffee cup. One shouldn't leave puppies unattended around delicate objects.
14. John had some trouble on the sports field yesterday. He kicked Greg accidentally during soccer practice. A flock of geese had unexpectedly landed on the field, and he almost stumbled over his red ball in an attempt not to hit them. A sudden change in direction can result in players accidentally running into each other.
15. Kate has a rather sharp tongue at times. She insulted Lisa in the kitchen yesterday. The cookies started burning in the oven, and she had to interrupt her potato peeling to go take them out. Sometimes people have such poor kitchen skills that it's impossible to not say something.
16. Greg can be rather impatient about certain things. He pushed John out of line at the ticket office. The tickets for the Madonna concert were selling out very quickly, and he was wearing his lucky red shoes in the hopes they'd improve his chances. Pushing people out of line is not a very nice thing to do.

Target items for Experiment 2 (the texts included here show the [SVO.O = focus] condition)

1. A: I heard that Greg congratulated Mike enthusiastically yesterday.

B: No, that's not quite right. He congratulated John. The prizes for the best-ranked tennis players were about to be announced, and he was holding a new yellow tennis racket. Everyone was in a good mood that day.

2. A: I heard that Mike criticised John rather vehemently at the business presentation.

B: No, that's not quite right. He criticised Peter. The computer projector wasn't working properly, and he had to put down his pens and interrupt the presentation in order to adjust it. Technical glitches can be rather annoying.

3. A: I heard that Lisa helped Mary assemble some furniture on Wednesday.

B: No, that's not quite right. She helped Kate. The back and sides of the bookcase needed to be attached to the frame, and she was thinking of using a wrench for doing that. Fortunately that turned out to be exactly what was needed.

4. A: I heard that Anne scolded Kate in the back yard last Saturday.

B: No, that's not quite right. She scolded Mary. The pile of leaves in the middle of the yard was getting out of hand, and she was holding a rake and finally started clearing the leaves away. It's important to keep up with the yard work in the fall.

5. A: I heard that John accused Mike of tampering with the sports equipment at the high-jump competition.

B: No, that's not quite right. He accused Greg. The bar for the high-jump looked like it had been illegally lowered, and he had to put down his tape recorder to see if that was really the case. It's important to play fair in sports.

6. A: I heard that Lisa pinched Kate surreptitiously during the long meeting.

B: No, that's not quite right. She pinched Mary. It was already 8 pm, and she was standing next to a man in a blue suit who seemed to be asleep in a chair. After everyone else noticed it as well, they found it rather amusing.

7. A: I heard that Peter punched John by accident during boxing class.

B: No, that's not quite right. He punched Mike. The class had already been going on for over 3 hours, and he was frustrated by his uncomfortable blue sneakers and not paying attention. In a sport such as boxing, it's important to always be attentive to your surroundings.

8. A: I heard that Anne scratched Mary accidentally over the weekend.

B: No, that's not quite right. She scratched Kate. The ferns growing behind the prickly rose bushes needed to be trimmed, and she was using a large pair of clippers to push aside the branches in the way. When working as a pair, it's important to pay attention to where the other person is so no one gets hurt.

9. A: I heard that Mary praised Anne at the neighbourhood association meeting.

B: No, that's not quite right. She praised Lisa. The city had finally responded to persistent petitioning and fixed the fence near the school, and she was holding a nice thank-you letter from the principal. It is good to see persistence paying off in such a nice way.

10. A: I heard that Mary tickled Lisa at the Halloween party on Friday.

B: No, that's not quite right. She tickled Anne. The sugar rush from the cake had put everyone in the mood for something silly and spontaneous, and she was holding a bunch of yellow feathers. Those feathers were just perfect for tickling.

11. A: I heard that Kate poked Lisa in order to get her attention at the airport check-in counter.

B: No, that's not quite right. She poked Anne. The flight information board showed the Paris flight as being "cancelled" and she was just about to lift her blue suitcase onto the check-in scale in order to check in for that very flight. Unexpected changes in travel arrangements can be rather annoying.

12. A: I heard that Mike hit Greg by mistake at the go-kart track.

B: No, that's not quite right. He hit Peter. A sudden gust of wind blew a branch onto the middle of the track, and he tried to steer his green go-kart around it. Fortunately the people at the track are used to dealing with minor accidents.

13. A: I heard that Peter slapped Greg on Friday.

B: No, that's not quite right. He slapped Mike. The Golden Retriever puppies had knocked the china cabinet over, and he was holding a broken coffee cup. One shouldn't leave puppies unattended around delicate objects.

14. A: I heard that John kicked Peter accidentally during soccer practice.

B: No, that's not quite right. He kicked Greg. A flock of geese had unexpectedly landed on the field, and he almost stumbled over his red ball in an attempt to not hit them. A sudden change in direction can result in players accidentally running into each other.

15. A: I heard that Kate insulted Anne in the kitchen yesterday.

B: No, that's not quite right. She insulted Lisa. The cookies started burning in the oven, and she had to interrupt her potato peeling to go take them out. Sometimes people have such poor kitchen skills that it's impossible not to say something.

16. A: I heard that Greg pushed Peter out of line at the ticket office.

B: No, that's not quite right. He pushed John. The tickets for the Madonna concert were selling out very quickly and he was wearing his lucky red shoes in the hopes they'd improve his chances. Pushing people out of line is not a very nice thing to do.