

Indirect anaphora in English and French: A cross-linguistic study of pronoun resolution

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Abstract

There is disagreement within both linguistics and psycholinguistics concerning the use of unaccented third person pronouns to refer to implicit referents. Some researchers (e.g., Erkü & Gundel, 1987) argue that it is impossible or highly marked, while others (e.g., Yule, 1982) maintain that it is not only acceptable but commonly used in normal discourse. However, both sides in the debate may be correct: while peripheral implicit referents (which evoke the means or the instrument by which a given state of affairs is established) are not easily referred to using pronouns, central or 'nuclear' implicit referents are. We tested this hypothesis in two experiments, involving different languages (English and French). The results of both experiments show that pronominal reference to implicit referents caused slower reading times compared to explicit referents for peripheral referents only. We discuss these results with respect to Gundel, Hedberg, and Zacharski's (1993, 2000) Givenness Hierarchy.

Keywords: Indirect anaphora; Pronoun resolution; Conceptual centrality

Coherent discourse makes frequent use of reference to previously mentioned or otherwise evoked referents. In many cases this anaphoric reference can be direct, in the sense that it refers to an explicitly mentioned or con-

textually given referent in previous discourse (as in (1) below). In these cases, the speaker can assume that an addressee already has access to a discourse representation of the intended referent within the memory model

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of the discourse under construction (or that it can easily be instantiated via the context at hand); and moreover, that that representation is highly activated at the point of the utterance.

- (1) a A young goat suddenly entered by the half-open front door; but no-one could guess exactly what *it* was looking for.
 b [Context: a young goat suddenly enters by the half-open front door. Speaker, observing the scene with fascination:]
 What do you think *it's* looking for, exactly?

However, when an anaphor does not retrieve a referent that is directly evoked via previous linguistic mention or salient presence within the surrounding situation, but instead is associated with a referent by virtue of a “part-whole,” “token-type,” or metonymic relation of some kind, then such anaphoric reference is indirect (Erkū & Gundel, 1987). Attested examples of indirect reference have been discussed in the literature for a number of languages, including French (Cornish, to appear-a; Reichler-Béguelin, 1993), Spanish (Cornish, to appear-a), English (Gundel, Hedberg, & Zacharski, 2000; Ziv, 1996), German (Consten, 2003), and Hebrew (Ziv, 1996). One attested example of indirect anaphora, taken from Cornish (to appear-a), is given in (2).

- (2) *Woman*: “Why didn’t you write to me?”
Man: “I did . . . , started to, but I always tore ’em up.”
 (Extract from the film *Summer Holiday*)

Here, it is the illocutionary point of the woman’s initial question, which bears on the non-existence of one or more letter(s) which she was expecting the man to write to her, in conjunction with the lexical-semantic structure of the verbal predicate *write* (in the sense of ‘engage in correspondence’), which provide an interpretation for the clitic pronoun *’em* (italicized) in the man’s reply.

Indirect anaphora is thus any use of an anaphor that is not simply the continuation of a prior linguistic mention, nor of a referent which is visible and salient within the utterance situation. One could consider the kinds of stimuli typically used to study bridging inferences to be cases of indirect *full NP* anaphora (e.g., Haviland & Clark, 1974), which can cause some increase in processing times even when stimuli appear easy to understand. In this paper we shall focus on indirect *pronominal* anaphora, whose status (linguistically and psycholinguistically) is less clear. While the balance of opinion appears to accept that indirect pronominal anaphora is possible, its precise nature is still the subject of some controversy. Some previous work has argued that it is actually quite common in everyday speech (e.g., Consten,

2003; Reichler-Béguelin, 1993; Yule, 1979, 1982; & Ziv, 1996) and there is other work that suggests that it should not be more difficult to process, given the proper discourse conditions (Cornish, 1999, to appear-a; Sanford, Garrod, Lucas, & Henderson, 1983: Experiment 1; Sproat & Ward, 1987; Ward, Sproat, & McKoon, 1991). However, there are also claims that indirect pronominal anaphora is marked or marginal in comparison to direct anaphora (Dik, 1978; Sanford & Garrod, 1981; Sanford et al., 1983: Experiment 2, Erkū & Gundel, 1987; Gundel et al., 2000).

Such diverse claims suggest that there are limits or conditions on the circumstances under which indirect pronominal anaphora is acceptable, and the discrepancy between different empirical findings indicates that we have not yet accounted for these conditions. Further, it remains unclear from attested examples alone whether indirect anaphora, and in particular unstressed pronominal anaphora, is genuinely more marginal in usage (and thus more difficult to process) than direct anaphora. It could well be that even when indirect anaphors are deemed acceptable, they are still more difficult to process. The work presented in this paper examines these issues by addressing two questions: first, whether indirect pronominal anaphors are more difficult to process than their direct anaphor counterparts, and second, to what degree the conceptual centrality of the antecedent referent within a context aids indirect anaphoric processing. The results of two experiments lead us to argue that it is not indirect pronominal anaphora per se that is marginal or impossible, but rather indirect anaphora to referents that are peripheral to the events that evoke them, and further, that our results along with previous linguistic evidence suggest that there is a scale of conceptual centrality that is relevant to indirect anaphor processing.

Background

Intuitively, it seems sensible that indirect anaphora should be more difficult than direct anaphora generally, and that in particular for unaccented pronouns, direct anaphora should be considerably easier. There is linguistic and empirical evidence to support this intuition. Erkū and Gundel (1987) argued that indirect anaphora may not be realized via unstressed pronouns after considering examples such as those in (3) and (4) below, in which the anaphors are italicized.

- (3) I couldn’t use the box you gave me. *The bottoml #it* fell out.
 (4) The ant daubs part of her burden onto a cocoon and passes *the restl#it* to a thirsty larva.

Table 1
Stimuli from Sanford et al. (1983), Experiment 1

		Explicit antecedent	Implicit antecedent
Matching gender/number	Sentence 1	Roland parted his long hair with a comb	Ronald parted his long hair
	Sentence 2 (Target)		It was twisted with many teeth missing
	Sentence 3		He had had it since childhood
	Question		Did Ronald part his hair with a brush? (No)
No match	Sentence 1	Being arrested by the police was embarrassing for Andy	Being arrested was embarrassing for Andy
	Sentence 2 (Target)		They took him to the station in a van
	Sentence 3		He was charged with breach of the peace
	Question		Was Andy embarrassed by his arrest (Yes)

The authors distinguish three sub-types of indirect anaphora, two of which are relevant for our purposes here: inclusive anaphora and exclusive anaphora. Inclusive anaphora, shown in (3), appears to correspond to what is often termed associative anaphora, in which the introducing element (the antecedent-trigger) evokes a frame within which the anaphor will find its interpretation and reference. In (3), it is a “part-whole” relation that is involved. Exclusive anaphora, shown in (4), refers in terms of a partition within a larger set of entities (in this case, this is a mass), of which the antecedent-trigger’s referent is a part, and another sub-set which includes the anaphor’s referent.

Our intuitions match those of Erkü and Gundel (1987) for (3) and (4), and it seems clear that no unaccented third person pronoun could realize these two examples of indirect anaphora. Indeed, given that the use of this type of indexical expression is reserved for the retrieval of highly activated referents, the indirect (or implicit) referents involved in (3) and (4) could never have such a status: for by definition, entities which are “part of a whole” or are “associated with that whole” in some way, will ipso facto fall outside of the attention focus at the point where the whole at issue is evoked (the case of ‘the box’ in (3)). Moreover, those entities which form the residue of a set or a mass of which only a part has been previously evoked (the case of ‘the burden borne by the ant’ in (4)) will not be in the attention focus in the same way as the part directly evoked at the time of utterance. For it is the part detached which will be in psychological focus via the mention, and certainly not the part which remains. Thus it would be impossible for an unaccented pronoun to felicitously retrieve it. Significantly, it would appear that the indirect referents illustrated by (3) and (4) are not potential topics at the points where the relevant antecedent-triggers occur (there is no potential “aboutness” relation between these referents

and the pragmatically structured proposition, in Lambrecht’s, 1994 terminology¹). It is therefore not surprising that they cannot be retrieved by means of unaccented third person pronouns.

Thus, there are certainly cases in which indirect anaphora is unable to be realized via unaccented pronouns. Before examining those cases in which it seems equally clear that it can be thus realized, we shall turn now to some empirical evidence that also supports the idea that pronouns are not suited to indirect anaphora.

Sanford et al. (1983) investigated pronominal reference to implicit arguments in several studies. They were especially interested in whether the presence of an explicit referent that matched the pronoun in number and gender would interfere with the processing of that pronoun when it was obvious from surrounding context that it should refer to an implicit argument instead. The design of their studies was built principally on arguments from Sanford and Garrod (1981), who argued that fuller forms of reference (for example, definite, lexically headed NPs) are required for referents evoked only by virtue of being part of the scenario retrieved from long-term memory. In their main experiment, Sanford et al. (1983) recorded reading times to target sentences containing a pronoun that referred back to either an explicit or implicit referent and that either matched in number and gender with another explicitly mentioned referent or did not. An example of their materials is given in Table 1.

¹ Lambrecht (1994, p. 131) gives the following definition of the topic function: “A referent is interpreted as the topic of a proposition if in a given situation the proposition is construed as being about this referent, i.e., as expressing information which is relevant to and which increases the addressee’s knowledge of this referent.” He further defines potential topics as being discourse referents that are both *identifiable* and *activated* for the addressee at the point of use.

In the matching gender/number condition, the pronoun *it* in the target sentence could refer, in principle, to the referent ‘Roland’s long hair’ explicitly mentioned in Sentence 1, and thus in the implicit condition it could be the case that readers would try to initially have the pronoun refer to the explicit referent ‘Roland’s long hair’ rather than to the implicit ‘the comb with which Roland parted his long hair.’ In the “non-matching” condition, the pronoun *they* did not agree in number with any explicitly mentioned referent in Sentence 1, and readers would thus not have the option of incorrectly picking an explicitly mentioned referent. Sanford et al. predicted that in those cases in which the pronoun agreed in gender and number with an explicitly mentioned referent, readers would take longer to read the target sentence because the pronoun would first be “bonded” to the incorrect referent. They found that this was indeed the case, and that in those cases where the pronoun was intended to refer to an implicit argument, but matched in gender and number with another explicit argument, reading times were significantly longer (3163 ms) than when the intended referent was explicitly mentioned (2259 ms). While they found an overall effect of whether the intended referent was explicitly mentioned or not, it would appear that this effect was driven by the “bonding” conditions, because there was no significant difference in reading time found when the pronoun did not match in gender or number with an alternate explicitly mentioned referent (explicit mention: 2317 ms vs. implicit mention: 2456 ms).

While Sanford et al. argued that their data showed that indirect anaphora was more difficult than direct anaphora overall, their evidence is not conclusive, in large part because of their lack of a significant difference (139 ms) in the non-matching conditions. Additionally, their results could have been affected by the fact that the pronouns that they tested were all subject pronouns. This means that the pronoun preceded the predicative segment of the sentence (the verb and its dependents), which could encourage it to be interpreted before the rest of the sentence is encountered, thus independently of the influence of the contribution of potentially disambiguating information represented by the predicative part of the sentence. We attempted to avoid this problem in our experiments by using non-subject pronouns so that in the French Experiment 1, the target utterance contained an unaccented clitic pronoun which, while it precedes the verb, is not independent of it, either accentually or semantically (unlike English subject or object pronouns, these do not correspond to NPs in syntactic terms). In Experiment 2, the English version, the target sentences contained an object pronoun that followed the verb without being interpretable independently of the information contributed by it.

The issue of processing indirect anaphora is complicated by the fact that there is also evidence that suggests that under certain circumstances it is not marginal, or significantly more difficult to process indirect pronomi-

nal anaphors (Yule, 1979, 1982). This work suggests that under the right discourse-cognitive conditions indirect anaphora is in fact perfectly acceptable and no more difficult to process than direct anaphora (see (2) above as an illustration). In a study of natural speech, Yule (1979, 1982) found that speakers use pronouns to refer to implicit (i.e., indirect) referents quite frequently. He also laid emphasis on the disambiguating, facilitatory role of the predicative component of the anaphoric clause.

But, the question remains: what are the “right discourse-cognitive conditions” that allow indirect pronominal anaphora? Cornish (to appear-b) provides evidence from English and French that suggests an important relationship between the conceptual centrality of an implicit argument and pronominal reference. To illustrate this, we will compare the verbal predicate *cut* with the adjectival predicate *pregnant*. Verbs of *cutting* imply the presence of a knife or other cutting instrument. As this instrumental object acts only as the means by which the activity described by the verb is manifested, and thus is peripheral to the event, it is not highly activated psychologically when the verb in question occurs in a text (cf. Lucas, Tanenhaus, & Carlson, 1990). In (5), we see that pronominal reference to an instrumental object is unacceptable.²

- (5) Martha tried to cut the sucking pigs into pieces, but *#it/the knife* wasn’t sharp enough.

However, if we choose a verb or adjective such as *pregnant* with a lexical-semantic structure that includes a potentially implicit entity that is *nuclear*, a direct argument of the general functor defining its lexical-semantic structure, then the retrieval of the implicit entity using an unaccented pronoun is possible, as seen in (6).

- (6) Barbara is six months’ pregnant, and she’s already knitted a bonnet and gloves for *it*.

According to Cornish (to appear-b), what enables the unaccented pronoun *it* in (6) to retrieve the argument ‘Barbara’s baby’ is the fact that the adjective *pregnant* means “to have conceived a baby”, where ‘a baby’ is a nuclear argument in relation to the predicate “conceived” [CONCEIVED x, y: (BABY y)] (see Cote, 1998 for a similar ‘lexical-conceptual’ approach to implicit reference).

² One possible test of internal argumenthood, vs. peripheral ‘satellite’ status, is the *do so* test. Using this test, in (i)–(iii) we see that ‘the sucking pigs’ is a central participant in the act of cutting and that ‘the knife’ is a more peripheral one.

- (i) *Martha cut the sucking pigs into pieces: she also did so the pheasants.
 (ii) ?Martha cut the sucking pigs into pieces: she did so with a knife.
 (iii) Martha cut the sucking pigs into pieces: she did so with a carving knife.

What distinguishes cases like *pregnant* in (6) and cases like *cut* in (5) is that it is only the latter type of predicate that cannot occur with a null complement that designates a specific, unidentified referent (even though this referent may be contextually highly salient). After all, one can cut all manner of physical objects, though when one (inevitably a woman) is ‘pregnant’, it is necessarily with a human baby, a much more specific kind of entity.

Work by Walker and Yekovitch (1987) suggests that the conceptual centrality of the referent may be a crucial missing piece in understanding why pronominal indirect anaphora is acceptable in some circumstances but not in others. They found evidence that the conceptual centrality of the referent with respect to a larger discourse context plays an important role in indirect anaphora for noun–phrase (NP) anaphors. They carried out a series of experiments in which the conceptual centrality of the intended referent was manipulated in addition to the means by which it was introduced. In one experiment, texts were written on several topics, and a referent could be either central to the text (e.g., *table* in a text with the topic of “Going to a Restaurant”) or peripheral, and could be either explicitly mentioned (*The hostess seated Jack and Chris at the table* implied *The hostess seated Jack and Chris*), or not introduced at all (*Jack and Chris walked into the dining room*). Walker and Yekovitch were interested in the reading time for a following sentence that contained a full NP anaphor referring back to this referent (‘the table at which Jack and Chris were seated’). They found that for central concepts, there was virtually no difference between how the referent had been introduced (explicit, implicit, no referent). However, when the referent was peripheral, the manner of introduction mattered, with explicit mention triggering faster reading times than implicit mention, which was in turn faster than when there was no referent at all.

While Walker and Yekovitch were concerned with centrality as it related to the number of connections to concepts within a text, the notion of centrality can be applied to the concepts introduced in a single sentence. To examine this idea further, let us take three cases from Walker and Yekovitch, (7)–(9), and discuss them with respect to referent centrality.³

³ Although Walker and Yekovitch do not test for pronouns, to achieve a comparison with our own materials, if we replace the underlined definite NP anaphors in each of the examples (7)–(9), it is clear that the relevant pronoun could felicitously substitute for the definite NP in (7) and (8) (respectively, the central-explicit and central-implicit conditions), but not in (9) (the “no referent” condition):

- (7') Alison fed the dog chow to Duffy. *It* tasted good.
 (8') Alison fed Duffy. *It* tasted good.
 (9') Duffy barked at the cabinet door. *#It* tasted good.

- (7) Alison fed the dog chow to Duffy. *The dog chow* tasted good.
 (8) Alison fed Duffy. *The dog chow* tasted good.
 (9) Duffy barked at the cabinet door. *The dog chow* tasted good.

In (7), it is clear that subjects would have no difficulty in integrating the contents of the two sentences, the antecedent-trigger being explicit, and the anaphor a complete repetition of it. In (8), the antecedent-trigger is implicit, the non-realized second internal argument of *fed* being construed as ⟨food⟩ of some kind via the selection restriction imposed on this argument position by the predicate *feed*. This referent would then presumably be narrowed down to ‘dog food’ via the explicit realization of the recipient argument *Duffy* (prototypically denoting a dog, in American culture). As such, this referent can be considered a nuclear one, in the same way as the explicitly realized referent ‘the dog chow which Alison fed to Duffy’ in (7). However, in (9), no referent ‘dog chow’ is evoked at all in the initial sentence. Hence, a chain of inferences must be invoked by the reader to integrate the anaphoric sentence with the situation s/he will have constructed in processing the initial one. Thus, the connection between the explicit reference to Duffy’s barking at the cabinet door and the existence of dog food is highly indirect in (9). Compared to the scenarios in (7) and (8), that in (9) is predicted to require a considerably longer time to construct.

In our view, the evidence supporting the position that indirect pronominal anaphora is marginal or impossible is somewhat problematic because it appears to be based on cases in which the anaphoric referent is peripheral to the event which evokes it or in which the issue of referent centrality is not controlled for (cf. example (9) as well as examples (3) and (4) above from Erkü & Gundel, 1987). Importantly, Sanford et al.’s (1983) study is one such case, where at least the intended referent in the matching condition illustrated in Table 1 is conceptually peripheral and not central, a ‘comb’ being a means by which one can part hair. Thus, our hypothesis is that in many cases these referents tested were not central, nuclear participants or objects in the state of affairs evoked in each case, even though they are cognitively involved in it (as instruments or means); and that this fact could well have had an effect on the time taken by the subjects tested to integrate the content of the utterances referring, via a pronoun, to the implicit referents involved, in relation to the explicit referents. Since these instrumental objects only act as the means by which the activity described by the verb is manifested, they are not highly activated psychologically when the verb at issue occurs in a text (Lucas et al., 1990). It is possible that the absence of any systematic differentiation between central and peripheral implicit referents in this experiment could have led especially to the non-significant difference in reading times obtained in the “no alternate match” condition.

Thus, the different results for indirect anaphors could well be explained by a failure to take into account the conceptual centrality of the antecedent referent. To examine whether such a consideration could unify what appear to be conflicting results, we conducted two experiments, first in French, and then in English, which were designed to see whether conceptual centrality is a factor in the processing of indirect anaphora.

Experiment 1: French

Experiment 1 was designed to test the hypothesis that indirect anaphoric reference to central (nuclear) referents should be easier than reference to peripheral referents, and that direct vs. indirect reference should make a greater difference during processing when referring to peripheral referents compared to central ones. To do this, two-part dialogues were created. We chose to use dialogues because it has been argued that indirect anaphora is more common in natural speech as opposed to written texts (e.g., Gundel et al., 2000; Yule, 1979, 1982). The second dialogue turn (i.e., the target utterance) contained an unaccented non-subject pronoun (a clitic) that referred to a critical referent evoked in the first, prior utterance. The status of this referent was manipulated via two factors: it could be either a central, nuclear concept within the discourse representation targeted by the pronoun (by virtue of the lexical meaning (predicate-argument structure⁴) of the trigger involved—(e.g., ‘a baby’ for *being pregnant*), or as a function of general or culturally specific knowledge), or it could be peripheral within the representation (i.e., the prototypical means or instrument by which the situation denoted by the predicate was established, or an expected accompaniment to it (e.g., ‘a midwife’)). We will refer to this as the centrality factor. The second factor was whether this antecedent referent was explicitly mentioned in the previous utterance, a factor of explicitness. An example of our materials is given in Table 2, with English glosses provided.

Subjects were asked to read each speaker’s turn in the dialogue (presented separately on a computer screen) and then answer a question about the dialogue as a whole. The logic of the design is this: if it is more difficult to resolve the pronoun when it is oriented towards a ref-

erent that is not introduced explicitly into the discourse (and not inferable in terms of a morphological connection between the antecedent trigger and the expression in terms of which the anaphor would receive its interpretation (for example, *a guitarist ... the guitarlit*)) than when it is, then reading times for the sentence containing the pronoun should take longer when it does not refer to an explicitly mentioned referent, and, further, this effect should be largest when the intended referent is peripheral rather than central in the situation evoked.

Method

Subjects

Twenty undergraduate students of the University of Poitiers participated. All were native speakers of French with no known reading disorders, with vision normal or corrected-to-normal. They took part in the experiment voluntarily.

Design and materials

We crossed two factors: explicitness (implicit vs. explicit) and centrality (nuclear vs. peripheral), giving the experiment a 2×2 design with both factors within participants and items. Twenty-four dialogues were constructed in the following way: predicates were chosen that had both clear central arguments and peripheral arguments. These were then used to structure the first turn (Speaker 1) of the dialogue. The first sentence of Speaker 1 was the same for all four conditions, and introduced the referent-evoking predicate. In the explicit conditions, a second sentence was used that explicitly mentioned the critical argument of the predicate, either the central or the peripheral argument—in subject position in each case. The second turn of the dialogue, uttered by Speaker 2, consisted of an utterance that referred back to the target argument from Speaker 1’s turn using a non-subject clitic pronoun and whose other content supported the intended interpretation of the pronoun.

To ensure that subjects read the texts for understanding, each dialogue was followed by a true/false statement bearing either on the target utterance (in the case of the “implicit” Conditions 1 and 3), or on the initial utterances (in the case of the “explicit” Conditions 2 and 4). The statements oriented towards the target (pronominal) utterances in Conditions 1 and 3 were always “true,” while those directed towards the initial utterances in Conditions 2 and 4 were always “false.” This was to ensure that the subjects understood the referent targeted by the pronouns in the two “implicit” conditions. The subjects had to react as quickly as possible by judging whether the statements were true or false with respect to the situation evoked. Additionally, 24 filler texts were created to prevent subjects from developing strategies for processing the experimental materials.

⁴ See Cote (1998) and Cornish (to appear-a, to appear-b) for analyses of potentially referent-evoking arguments within the lexical-semantic structure of given predicates. In a processing context, Mauener and Tanenhaus (1995) and Mauener, Melinger, Koenig, and Bienvenue (2002) have shown experimentally that subjects have access to information concerning participants as soon as they encounter a given verbal predicate in an incoming utterance—whether the participants in question have been syntactically realized or not.

Table 2
Experiment 1: Example stimuli

	Speaker 1	Speaker 2 (Target)	Statement	Explicit antecedent	Implicit antecedent
Nuclear				<p>Cet artiste a peint toute la journée en plein air hier. Ses tableaux ont vivement impressionné une passante très riche <i>That artist painted all day in the open air yesterday. His pictures greatly impressed a very wealthy lady passing by</i></p>	<p>Cet artiste a peint toute la journée en plein air hier <i>That artist painted all day in the open air yesterday</i></p>
Peripheral				<p>Oui, et il les a vendus à bon prix en plus <i>Yes, he sold them for a good price as well</i></p> <p>L'artiste a peint des tableaux dans l'atelier. (FAUX) <i>The artist painted pictures in the studio. (FALSE)</i></p>	<p>L'artiste a pu vendre ses tableaux. (VRAI) <i>The artist was able to sell his pictures. (TRUE)</i></p>
	Speaker 1	Speaker 2 (Target)	Statement	<p>Cet artiste a peint toute la journée en plein air hier. Ses pinceaux taient nombreux et de tailles différentes <i>That artist painted all day in the open air yesterday. His brushes were numerous and of different sizes</i></p>	<p>Cet artiste a peint toute la journée en plein air hier <i>That artist painted all day in the open air yesterday</i></p>
				<p>Oui, et il les a tous utilisés, du plus fin au plus épais <i>Yes, and he used them all, from the finest to the thickest</i></p>	
	Speaker 2 (Target)	Statement		<p>L'artiste a peint juste une partie de la journée. (FAUX) <i>The artist only painted for part of the day. (FALSE)</i></p>	<p>L'artiste a bien utilisé tous ses pinceaux. (VRAI) <i>The artist did use all his brushes. (TRUE)</i></p>

Four lists of experimental items were created such that each experimental item appeared exactly once in each list and every list had the same numbers of items from each condition. Thus, no participant saw any item more than once, and each item appeared in each list in a different condition. All the filler items were included in each list. All the items in a list were presented in random order for each participant.

Procedure

Participants were seated in front of a computer screen in a quiet room. They were made aware before starting the experiment that the texts they were about to read fell within the genre of spontaneous spoken discourse, so that they would expect to encounter a type of unplanned language which does not correspond to normative written prose. They were told that each turn in the dialogue between two speakers would be presented by itself on the screen and were asked to read each turn silently and press a button to indicate when they were finished. They were also instructed to press the button corresponding to their judgement (true or false) when they saw the true/false statement after each dialogue.

Stimuli were presented and data were collected in a PsyScope script (Cohen, MacWhinney, Flatt, & Provost, 1993). The dialogues were presented in black characters on a white background using 18-point Times bold font. Each experimental trial proceeded in the following way. First, a screen with the text “Next Trial” appeared. Participants pressed the middle (yellow) button on a button box to proceed to the appearance of Speaker 1’s utterance. A second press on the same button made this text disappear and be replaced by Speaker 2’s utterance. A third press on the button made this text disappear, and then the true/false statement appeared in red, 24-point Times font. The participant responded to the true/false statement by using the right-hand green button for “true” or the left-hand green button for “false” (an inversion of the buttons was applied if participants were left-handed). The statement remained on the screen until the participant responded. Their answer was followed by feedback on the correct answer (red 24-point Chicago underlined font). The time from the onset of each utterance to the following button press was recorded as well as the response and response time to the statements.

Predictions

We expected, contrary to Dik (1978) and Erkö and Gundel (1987), that non-subject unaccented pronouns would retrieve implicit referents (and hence “indirect” ones, in the terminology used by the latter authors), on the condition that the referents were nuclear and not peripheral. Similarly, contrary to Sanford and Garrod

(1981) and Koenig and Mauner (2000), we predicted that a pronoun can in fact felicitously retrieve an implicit referent without undue increased processing cost on the condition that it is “nuclear” in terms of the situation which is evoked. Any such increase in processing cost should be small and on the same kind of scale (i.e., 100–200 ms) as the kind of increase seen for bridging inferences, which are unproblematic in terms of comprehension, but still result in a small increase in processing time (e.g., Haviland & Clark, 1974). In contrast, reference to an implicit referent should be more difficult than explicit reference when the referent is peripheral, leading to longer reading times in the implicit condition. A related prediction is that while centrality should make no difference when the referent is explicitly mentioned, for implicit conditions, nuclear referents should cause faster reading times than peripheral ones.

Results

The average percentage of correctly answered true/false statements was 93%, with no significant difference in response accuracy between conditions. Importantly, this suggests that in the implicit conditions, questions about peripheral referents did not induce a higher error rate than their nuclear counterpart.

The reading times for the critical, second dialogue turn are shown in Fig. 1, broken down by condition. The results show that overall the utterances with anaphoric reference to implicit referents were read more slowly than those with explicit referents, and that utterances with anaphoric reference to peripheral referents were read more slowly than those with central referents. These factors appear to interact, however, because in the implicit conditions, the peripheral target utterance was read much more slowly than the nuclear one. Furthermore, when the target referent was implicit, the peripheral one was read more slowly than when it was explicitly mentioned. Critically, there does not appear to be a major difference in reading time when the nuclear referent was implicit compared to when it was explicitly mentioned.

To examine these observations statistically, reading times were submitted to two-way repeated-measures analyses of variance (ANOVAs) using both participants (F_1) and items (F_2) as random factors. The fixed factors entered into the ANOVAs were explicitness (implicit vs. explicit) and centrality (nuclear vs. peripheral). Variability is reported with 95% confidence-interval half-widths based on single degree-of-freedom comparisons (Loftus & Masson, 1994). The results of this analysis support the observations above. There were main effects of both explicitness ($F_1(1, 19) = 22.8$, $p < .001$, $CI = \pm 211$; $F_2(1, 23) = 24.4$, $p < .001$, $CI = \pm 194$) and centrality ($F_1(1, 19) = 11.5$, $p < .005$, $CI = \pm 203$;

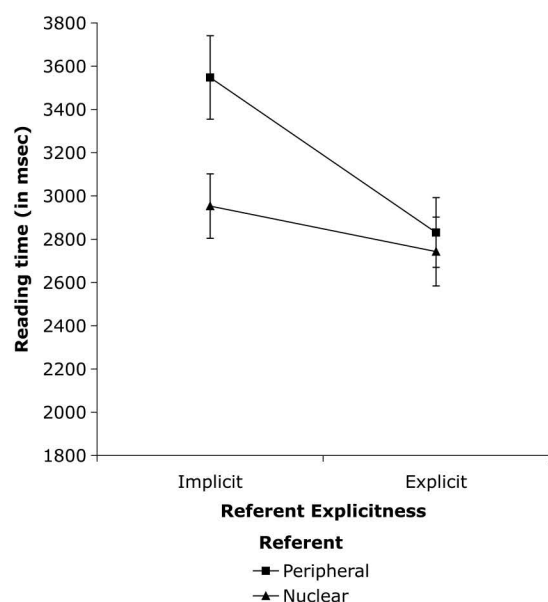


Fig. 1. Experiment 1: Reading times for target dialogue turn (Speaker 2).

$F_2(1, 23) = 9.55, p < .01, CI = \pm 229$) as well as a significant interaction between these two factors ($F_1(1, 19) = 6.52, p < .02, CI = \pm 294; F_2(1, 23) = 4.75, p < .05, CI = \pm 340$). Planned pairwise comparisons within both factors reveal that when the referent was implicit, the target utterance was read significantly slower when the referent was peripheral compared to when it was nuclear ($t_1(1, 19) = 3.4, p < .01, t_2(1, 23) = 3.2, p < .01$) but that there was no such difference when the referent was explicitly mentioned ($t_s < 1$). However, importantly, while the peripheral referent caused slower reading times when it was implicit compared to explicitly mentioned ($t_1(1, 19) = 5.8, p < .001, t_2(1, 23) = 4.62, p < .01$), there was no such difference between the explicitly and implicitly mentioned referent when it was nuclear ($t_1(1, 19) = 1.4, ns, t_2(1, 23) = 1.5, ns$). It is clear from a comparison of the error rates in response to the statements following the dialogues in the implicit conditions (where these were oriented towards the referents of the pronouns in the target utterances), that subjects understood the peripheral referents correctly—just as well, in fact, as the nuclear referents, since the difference in error rates regarding these two types of referents was not significant (5.8% for the nuclear implicit referents and 7.5% for the peripheral ones).

Discussion

Our predictions are largely borne out by the results of Experiment 1: while there is an overall main effect of explicitness, in which having an explicit referent causes faster reading times than an implicit referent, this inter-

acts with centrality, with peripheral referents showing a much larger effect and central referents showing a smaller effect. This suggests that the overall effect may have been driven by the peripheral conditions, and supports the idea that central referents are more easily referred to via unaccented pronouns than peripheral referents.

Because the notion of conceptual centrality is semantic and pragmatic rather than relating to linguistic form, it should be applicable in different languages, and thus these results should be replicable when tested in another language. To test this prediction, we adapted our materials to English and conducted a second experiment. If our results are due to conceptual centrality and not something specific to how French anaphors are processed, then the results from Experiment 1 should be replicated. One difference between English and French in relation to our study could concern the position of object pronouns relative to the verb: in French, these are pro-clitic, and thus precede the verb (which performs a significant orienting, and hence disambiguating function in connection with the establishment of reference), but are nevertheless highly dependent upon it, being clitic pronouns. In English, on the other hand, the relevant pronoun follows the verb which governs it. Such a purely linguistic difference between the two languages might therefore have a measurable effect on relative reading times in the case of the target utterances. However, because the notion of “referent centrality” is semantic and pragmatic and not directly connected to the specific form of utterances, we did not predict a clear processing difference with respect to the target utterances.

Experiment 2: English

The materials from Experiment 1 were translated (with modifications as necessary) into English and tested with native British English speakers. An example of the English version of the materials is given in Table 3.

As in Experiment 1, subjects were asked to read each speaker’s turn in the dialogue and then react to a statement about the dialogue as a whole, with the logic being the same as in Experiment 1.

Method

Subjects

Twenty undergraduate students at the University of Sussex participated in exchange for £3.00. All were native speakers of English with no known reading disorders, with vision normal or corrected-to-normal.

Design and materials

The design of the experiment was identical to that of Experiment 1. All dialogues from Experiment 1 were carefully translated into English. For several items, the

Table 3
Experiment 2: Example stimuli

		Explicit antecedent	Implicit antecedent
Nuclear	Speaker 1	Have you noticed that Mark isn't shaving? His straggly beard makes him look like a tramp	Have you noticed that Mark isn't shaving?
	Speaker 2 (Target)	Yes, in fact he's really allowing it to grow now	
	Statement	Mark is sharply reducing the length of his beard. (FALSE)	Mark does seem to be growing a beard. (TRUE)
Peripheral	Speaker 1	Have you noticed that Mark isn't shaving? His disposable razors have all completely disappeared	Have you noticed that Mark isn't shaving?
	Speaker 2 (Target)	Yes, he tells everyone he's thrown them all away	
	Statement	Mark always uses an electric razor for shaving. (FALSE)	Mark has clearly decided to get rid of his razors. (TRUE)

English translation was somewhat awkward, or in the case of critical dialogues, had an unavoidably ambiguous target pronoun. In these cases, new English dialogues were constructed according to the same criteria as in Experiment 1.

Also as in Experiment 1, four lists of experimental items were created such that each experimental item appeared exactly once in each list and every list had the same numbers of items from each condition. Thus, no participant saw any item more than once, and each item appeared in each list in a different condition. All the filler items were included in each list. All the items in a list were presented in random order for each participant.

Procedure

The instructions and ancillary terms (i.e., the “ready” between dialogues, “true” and “false”) were translated into English. The procedure was otherwise identical to Experiment 1.

Predictions

The predictions for Experiment 2 are the same as those for Experiment 1, as we expect the difference in language to have no effect on the pattern of results: when the antecedent referent is nuclear, there should only be a small difference in reading time between the explicit and the implicit conditions. However, when the referent is peripheral, reading times in the explicit conditions should be faster than those in the implicit ones.

Results

The average percentage of correctly answered true/false statements was 91%, with no significant difference in response accuracy between conditions.

The reading times for the critical, second dialogue turn are shown in Fig. 2, broken down by condition. While the overall reading times were somewhat faster than those in Experiment 1, the pattern of results is identical to that found there.

To examine the data statistically, as before, reading times were submitted to two-way repeated-measures analyses of variance (ANOVAs) using both participants (F_1) and items (F_2) as random factors. The fixed factors entered into the ANOVAs were explicitness (implicit vs. explicit) and centrality (nuclear vs. peripheral). Variability is reported with 95% confidence-interval halfwidths

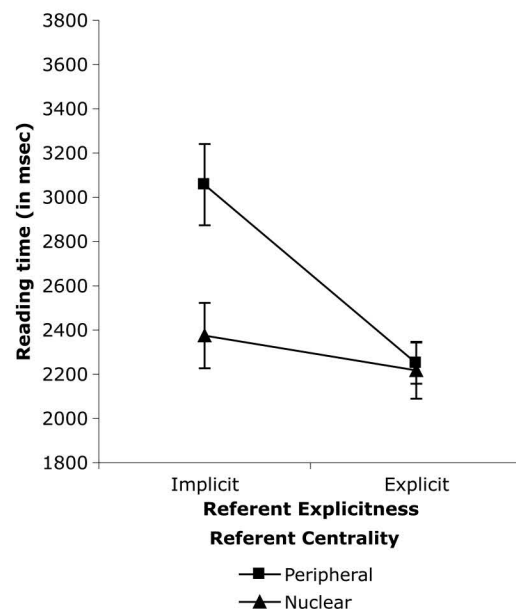


Fig. 2. Experiment 2: Reading times for target dialogue turn (Speaker 2).

based on single degree-of-freedom comparisons (Loftus & Masson, 1994). The results of this analysis support the observations above. There were main effects of both explicitness ($F_1(1,19)=21.1$, $p<.001$, $CI=\pm 220$; $F_2(1,23)=30.2$, $p<.001$, $CI=\pm 181$) and centrality ($F_1(1,19)=10.8$, $p<.005$, $CI=\pm 228$; $F_2(1,23)=9.5$, $p<.005$, $CI=\pm 240$) as well as a significant interaction between these two factors ($F_1(1,19)=10.0$; $p<.005$, $CI=\pm 304$; $F_2(1,23)=11.1$ $p<.005$, $CI=\pm 286$). Planned pairwise comparisons within both factors reveal that when the referent was implicit, the target utterance was read significantly slower when the referent was peripheral compared to when it was nuclear ($t_1(1,19)=3.89$, $p<.001$, $t_2(1,23)=3.6$, $p<.001$) but that there was no such difference when the referent was explicitly mentioned ($ts < 1$). However, importantly, while the peripheral referent caused slower reading times when it was implicit compared to explicitly mentioned ($t_1(1,19)=5.13$, $p<.001$, $t_2(1,23)=5.53$, $p<.001$), there was no such difference between the explicitly and implicitly mentioned referent when it was nuclear ($t_1(1,19)=1.16$, ns; $t_2(1,23)=1.37$, ns).

Discussion

This experiment replicated the results found in Experiment 1, showing that the results were not due to something specific to French anaphor resolution, and supporting the idea that the critical manipulation of antecedent reference centrality was indeed conceptual in nature.

General discussion

These results appear to account for why there appears to be evidence both for and against the use of unaccented pronouns in indirect anaphora. We see that, contrary to what is claimed by Dik (1978); Erkü and Gundel (1987); Gundel et al. (2000); Sanford and Garrod (1981); and Sanford et al. (1983), non-subject unaccented pronouns in French and English are capable of retrieving an implicit referent; however, this is only true when the referent is nuclear in relation to the predicate that evokes it, and not peripheral.

This result may be compared with recent work by Greene, Gerrig, McKoon, and Ratcliff (1994) on the processing of what they call “unheralded pronouns” (see also Gerrig & McKoon, 2001; McKoon, Gerrig, & Greene, 1996). These authors reported several probe recognition experiments using texts where a pronoun was very distant (more than eight sentences) from its antecedent. They found that the long distance did not cause processing difficulty for the pronoun when the sentence in which the pronoun occurred was immediately preceded by a sentence that re-evoked certain entities

related to the antecedent referent (thus making the referent highly accessible).

Our results are consistent with theirs in that we, too, found that the explicit mention of the target referent in the vicinity of a pronoun is not a *sine qua non* condition for rapid and efficient processing of that pronoun. Like Greene et al. (1994), we emphasize that a pronoun can be readily understood if certain elements of the context enhance the accessibility of its target referent. However, we believe that our results can be seen as a stronger argument, for three reasons. First, contrary to Greene et al., we used materials where the target referent was not explicitly mentioned in the texts at all. Second, the probe-recognition task used by Greene et al. required participants to decide whether the antecedent-trigger was present in the text. Recently, Gordon, Hendrick, and Ledoux Foster (2000) have shown that such probe recognition tasks can cause participants to strategically maintain in working memory certain words which are probable probes in the experimental texts. This strategy was also possible in the experiments reported by Greene et al. (1994), since the filler texts could be distinguished from the experimental texts: for the filler texts were the only texts where more than one probe appeared.

Finally, Greene et al. did not compare different conditions where the antecedent should be more or less accessible *before* the pronoun was read. In other words, they could not show that their “unheralded pronouns” were easy to process, since all their conditions were a priori similar regarding the accessibility of the antecedent referent at the point when the pronoun was read. In our experiments, we constructed a condition (the “peripheral antecedent” one) where we predicted a longer reading time for the pronoun. This prediction was confirmed.

When our results are considered in combination with previous linguistic and experimental evidence, it suggests that there is a scale of conceptual centrality for a referent, with nuclear referents at one end and associative or complementary referents at the other, with peripheral referents somewhere in between (for “associative” and “complementary” referents, see the occurrences of the full NPs *the bottom* and *the rest* in examples (3) and (4), respectively). This scale, which includes the various possibilities of retrieval of these referent types via pronouns and definite lexical NPs, is shown in Table 4.

Starting from the bottom, right-side of this scale, we have associative referents which form part(s) of an object (as illustrated by Erkü and Gundel in example (3) above) or the residue of a mass of which a part is removed (seen in (4)). These entities, although inferable, are in the background of attention at the point where the whole of which they are a part is evoked—or when a subdivision is indicated within it, as in the case of example (4). We predict that it is these referents that cannot be retrieved via a simple unaccented pronoun

(whether subject or non-subject), although further work is needed to test this experimentally.

Next, there are the referents involved in the evocation of a situation which are peripheral: semi-active, but not central in the mental representation of this situation. These are the instrumental or “means” entities which contribute to the setting up of that situation: these referents are only retrievable with difficulty via unaccented pronouns, but this difficulty is not as absolute as in the case of the associative background referents illustrated by (3) and (4) (see as an illustration the referent ‘the comb’ in the target implicit utterance in Table 1, in the “matching” condition). Finally, we find that implicit “nuclear” referents are easily retrievable via non-subject unaccented pronouns, almost as easily in fact as their “explicit” counterparts” (see the pronoun ‘em in the man’s turn in (2) for an attested example, as well as the results of Walker and Yekovitch’s, (1987)) Experiment 1 in terms of the average reading time differences for the implicit and ‘no-referent’ target sentences in the ‘central’ conditions, compared with that of the same sentences in the ‘explicit central’ condition (see also footnote 3 for parallel examples to the ones the authors used where (subject) pronouns occur in place of definite NPs in the anaphoric sentences).

The three-way distinction in terms of degrees of centrality of potential indirect referents retrievable via 3rd person pronouns displayed in the scale given in Table 4 is predictable, given what we know of the referring potential of this type of indexical expression. According to Gundel et al. (1993, 2000), third person ordinary pronouns canonically target referents bearing the most restrictive type of cognitive status on their six-point scale of referent statuses targetable by a range of indexical forms, as shown in their Givenness Hierarchy in Table 5.

This status is termed “in focus,” which corresponds to referents whose discourse representations are in the foreground of consciousness in psychological terms at the point where the pronoun in question occurs in a particular text. Clearly, however, unaccented pronouns may also

have as potential referents discourse entities that bear the next status down on the scale, namely “activated.” This is not predicted by the authors: for even though, unlike Ariel’s (1990) similar Accessibility Marking Scale, indexical expression tokens signalling statuses to the right of a given status on the hierarchy may be interpreted as having the latter status *as well as* all higher statuses (since statuses to the right on the Hierarchy entail all statuses to their left: cf. Gundel et al., 2000: 84), unstressed pronouns cannot assume a status to the right of “in-focus” on the GH. So the GH would not predict that unstressed pronouns may have statuses *lower* than “in-focus.” Byron (2000) gives a range of attested examples, a number of them corresponding to indirect anaphors, where unaccented 3rd person pronouns felicitously retrieve referents bearing the cognitive status “activated” but not “in focus,” according to Gundel et al. (1993).

The next position down the GH is “familiar.” Gundel et al. claim that this status is coded by the indexical expression type corresponding to demonstrative NPs introduced by the distal determiner *that* (as in *Do you remember that summer we spent together two years ago?*). Here, the intended referent is not necessarily already ‘in focus’ or ‘activated’ at the point where the pronoun occurs, but it is potentially ‘familiar’ to the addressee on the basis of his/her recognition of the stereotypical situation denoted via the antecedent-trigger predication. According to the results of our two experiments, peripheral referents (corresponding to instruments or means), which are only targetable with difficulty via unstressed pronouns, could well correspond to the status ‘familiar’ on the GH. With this status, we are approaching the limits of indirectness of potential referents targetable by pronouns, ones which are either stereotypical accompaniments to the situation being evoked, or which correspond to the means or instrument by which it is set up. We speculate that it is for this reason that subjects found it significantly more difficult to resolve the reference of object pronouns in this manner in our two experiments.

Table 4

Three types of indirect referent and their targetability via pronouns and definite lexical NPs

Type of anaphor	Type of referent		
	Nuclear >	Peripheral >	Associative/complementary
3rd Person pronoun	+	+/-	-
Definite lexical NP	+	+	+

Table 5

Gundel et al.’s (1993) Givenness Hierarchy

In focus > <i>it</i>	Activated > <i>that/this this N</i>	Familiar > <i>that N</i>	Uniquely identifiable > <i>the N</i>	Referential > indef. <i>this N</i>	Type identifiable <i>a N</i>
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Interestingly, this is also the cut-off point for candidate referents for topichood: potential referents which bear only the status ‘familiar’ will not be ‘activated’ to any degree (even though they are, by definition ‘cognitively available’). Thus, they could not lay claim to topichood (cf. Lambrecht, 1994: 76, who argues that the two conditions under which a discourse referent may lay claim to topichood are that it should be both *identifiable* by the addressee and *activated* psychologically. The latter condition would not seem to obtain in the case of peripheral implicit referents). Since ordinary definite third person pronouns are sensitive to the topical status of their potential referents, it is not surprising that they should only retrieve ‘peripheral’ indirect referents with difficulty.

It is clear, finally, that these distinctions in terms of cognitive statuses and degrees of indirectness are not absolute, categorical distinctions, but that they form a fluid continuum. The referential-anaphoric behaviour of third person object pronouns, as is evident from the results of our two experiments, clearly reflects this fuzziness.

Conclusions

Previous work on indirect pronominal anaphora has found somewhat conflicting results, with indirect anaphora sometimes appearing entirely natural and sometimes appearing marginal if not completely unacceptable. This suggests that there has been some previously unrecognized factor(s) influencing these results. In this paper, we have identified one such factor: the conceptual centrality of the antecedent. Primarily semantic/pragmatic in nature, this factor appears to be relevant to both French and English indirect anaphors, despite differences in how the two languages encode pronominal reference.

Considering our results with respect to Sanford and Garrod (1981), it appears that explicit focus within working memory should not be limited to representations of entities that have been explicitly introduced via lexical means into the discourse. We can nevertheless retain the division proposed by Sanford and Garrod between *explicit focus* and *implicit focus*,⁵ but place the dividing line elsewhere: central focus, which is equivalent to the cognitive statuses “in focus” and “activated” in Gundel et al.’s (1993, 2000) Givenness Hierarchy, would contain representations of referents (as well as the situations in which they are embedded) which are introduced linguistically via *nuclear* NPs and PPs (filling the subject, direct or indirect object functions), or via predicative phrases. Also within this workspace would be the (implicit) nuclear arguments forming part

⁵ However, these somewhat inappropriate terms might be more accurately replaced by the terms *central focus* and *peripheral focus*, respectively.

of the lexical-semantic structure of verbs and adjectives [see examples (2) and (8)], as well as the referents introduced perceptually via the interlocutors’ focussing on an object or a scene within the utterance situation [see example (1b)].

But the referents associated with embedded NPs or PPs would not reside within the central focus space, even if they have been introduced explicitly.⁶ Nor would the referents associated with modifying phrases (for example, those which perform an epithetic function). Like the “peripheral” implicit referents in the experiments reported on here, these latter referents would be located within the peripheral focus space (spanning the boundaries of the cognitive statuses “familiar” and “uniquely identifiable” in the Gundel et al. (1993, 2000) model): clearly, these are not easily retrievable or accessible via an unaccented pronoun or via a null anaphor.

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⁶ Blackwell (2003, pp. 118, 122–3) in her corpus-based study of discourse anaphora in spoken Spanish, presents several examples of spontaneous conversation where a previously evoked referent is subsequently referred to within a prepositional phrase via a full definite NP, but not via a pronoun. As she puts it (p. 118), “The speaker’s choice of a full NP in in this context is (...) influenced by the fact that *el gorro* (‘the hat’) [in Blackwell’s example (120)] occurs in a prepositional phrase, a syntactic position where reference to inanimate entities through the use of a more minimal pronoun is unacceptable, or at least highly improbable.”

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