Interpreting pronouns and connectives: Interactions among focusing, thematic roles and coherence relations

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This paper investigates the relationship between focusing and coherence relations in pronoun comprehension. In their focusing model of pronoun comprehension, Stevenson, Crawley and Kleinman (1994) proposed a default focus on the thematic role associated with the consequences of a described event, a focus that may be modified by the attention-directing properties of a subsequent connective. In this paper we examine a second function of connectives: that of signalling the coherence relations between two clauses (e.g., a NARRATIVE relation or a RESULT relation). In three studies, we identified the coherence relations between sentence fragments ending in pronouns and participants' continuations to the fragments. We then examined the relationship between the coherence relation, the preferred referent of the pronoun and the referent's thematic role. The results of studies 1 and 2 showed that people aim to keep the focused entity, the

coherence relation and the referent of the pronoun in alignment. Study 3 included the connective *next*, which enabled us to generate different predictions for the roles of focusing and coherence relations in pronoun resolution. The results favoured the focusing view. The preferred referent of the pronoun was the focused, first mentioned, individual, whereas the coherence relation was consistent with the thematic role of the pronominal referent. If the pronoun referred to an Agent, a NARRATIVE relation was preferred, if the pronoun referred to a Patient, a RESULT relation was preferred. Discussion of these and other results led to the following conclusions. First, pronoun resolution is primarily determined by focusing, either semantic or structural, although a range of other features, including coherence relations and verb semantics, may also act as pressures on pronoun resolution. Second, the consistent link we observed between thematic roles and coherence relations may provide a mapping between a represented entity and a represented event. Third, the connectives we used have three distinct functions: an attention directing function, a function for constraining the possible coherence relation between two events, and a function for interpreting a clause as having either a causal or a temporal structure.

INTRODUCTION

A recurrent finding in research on the comprehension of pronouns is that some antecedents are more accessible than others. The prevalent explanation of such effects is that features of the discourse direct the comprehender's attention to a specific element in the discourse model. This element then becomes the focus of the comprehender's attention so that when a pronoun is encountered, the pronoun is interpreted as referring to this most highly focused element. As long as the interpretation is compatible with subsequent content, then comprehension flows smoothly; if the interpretation is incompatible with subsequent content, then comprehension is impaired because an alternative referent for the pronoun has to be found. According to this view, pronoun comprehension is primarily a top-down process, and the most focused entity in the discourse is assumed to be the pronoun's referent. We refer to this explanation as the *focusing* hypothesis. An alternative possibility is that the accessibility of a referent for a pronoun is influenced not by focusing but by the relationship between the events described in the discourse (Hobbs, 1979). That is, when comprehending a pronoun, in a sentence such as *John telephoned Bill because he needed some information*, the comprehender first identifies the relation between the two clauses and then interprets the pronoun as referring to the individual most likely to be involved in that relation. We refer to this explanation as the *relational* hypothesis. The relational hypothesis states that when two referents are introduced in one clause and a pronoun refers to one of them in a second clause, then the perceived relationship between the two described events

determines the interpretation of the pronoun. The aim of our paper is to examine these two hypotheses.

In what follows, we first review the focusing hypothesis, according to which connectives have focusing properties, and we show how focusing explains pronoun resolution. We then review the relational hypothesis, according to which the connective identifies the coherence relation between two clauses, and we show how the perceived coherence relation can explain pronoun resolution. Then we place our work in the context of other research on discourse and pronoun resolution, after which we outline the methods we use and spell out our predictions according to each hypothesis. We then report three studies and discuss their results in the light of our hypotheses.

The focusing hypothesis

Focusing models differ in what they regard as the underlying mechanism. Some researchers have argued for structural focusing (Grosz, Joshi, & Weinstein, 1983), whereas others have argued for semantic focusing (Stevenson et al., 1994) or focusing based on background knowledge of the topic of the discourse (Sanford & Garrod, 1981). Yet others propose that many different factors interact to determine what is in focus (McKoon, Greene, & Ratcliff, 1993; Marslen-Wilson et al., 1993). In this paper, we are primarily concerned with semantic focusing.

Semantic focusing assumes that both verbs and connectives have focusing properties. The focusing properties of the verb direct attention to the endpoint or consequence of the described event. The focusing properties of the connective depend upon its meaning. Connectives such as *because* direct attention to the cause of the previously described event, connectives such as *so* direct attention to the consequences of the event. Thus, in a sentence such as, *John criticised Bill so he tried to correct the fault*, verb focusing highlights Bill, since Bill is the person associated with the endpoint of the event of criticising. The connective, *so*, directs attention to the consequences, and hence reinforces the focus on Bill. The preferred interpretation of the pronoun *he*, therefore, is that it refers to Bill. Now consider the case where the connective is *because*, as in *John criticised Bill because he failed to correct his faults*. In this second example, the verb *criticise* once again brings Bill into focus, but now the connective directs attention to the cause of the event. Thus the effect of the connective is to shift attention away from the consequence and towards the cause. Hence the pronoun *he* is less likely to be interpreted as referring to Bill. Semantic focusing, therefore, sees the focus of an utterance as changing dynamically as new input is encountered (Stevenson, 1996; Stevenson, Crawley, & Kleinman, 1994; Stevenson & Urbanowicz, submitted).

Early work on the above kind of focusing attributed all the effects to the verb (e.g., Garvey & Caramazza, 1974). According to Garvey and Caramazza (1974), the implicit causality of a verb determines who is the causal instigator of the described event and the causal instigator is the preferred referent of a subsequent pronoun. This emphasis on the verb and neglect of the role of the connective was a result of only using materials containing the connective *because*. Once studies included other connectives in addition to *because*, the importance of the connective became apparent (Au, 1986; Ehrlich, 1980; Stevenson et al., 1994). Stevenson et al. (1994) examined three kinds of verbs (transfer, actions and states) and four connectives (*so*, *because*, *and* and a full stop (the null connective)). The protagonists in an event described by an action verb (e.g., *John hit Bill / Bill was hit by John*) fill Agent (e.g., John) and Patient (Bill) thematic roles. The protagonists in an event described by a transfer (e.g., *John gave the book to Bill / Bill took the book from John*) fill Goal (Bill) and Source (John) thematic roles. The protagonists in a state, described by a state verb, (e.g., *John liked Bill / Bill pleased John*) fill Experiencer (John) and Stimulus (Bill) thematic roles. Stevenson et al. (1994) used sentence continuation tasks in which participants were presented with sentence fragments ending in a connective followed by a pronoun (e.g., *John criticised Bill and he* …). Participants wrote continuations to the fragments and the continuations were examined to determine how the pronouns had been interpreted.

Stevenson et al.'s results are summarised in Table 1. In the table, it can be seen that the Goal and the Patient are always preferred in transfer and action sentences, whereas the preferred thematic role in state sentences depends on the connective: the Experiencer is preferred with *and* and *so*, the Stimulus is preferred with a full stop and *because*. It can also be seen that in

TABLE 1
Summary of the Results of Stevenson et al.'s (1994) Sentence Continuation Studies Showing which Thematic Roles were Preferred as the Referents for Pronouns

	Type of verb					
	Transfer e.g., John passed the comic to Bill	%	*Action* e.g., Joseph hit Patrick	%	*State* e.g., Ken impressed Geoff	%
Type of Connective	*Preferred role*		*Preferred role*		*Preferred role*	
And	Goal (Bill)	78	Patient (Patrick)	78	Experiencer (Geoff)	76
So	Goal	77	Patient	80	Experiencer	89
Full Stop	Goal	67	Patient	59	Stimulus (Ken)	73
Because	Goal	57	Patient	64	Stimulus	87

Note: % = percentage of pronouns referring to the preferred thematic role.

transfer and action sentences, the preferences for Goal and Patient are reduced (but not eliminated) with the full stop and *because*, whereas in state sentences the preference for the Stimulus with the full stop and *because* eliminates the preference for the Experiencer found with *and* and *so*.

Stevenson et al. (1994) explained these results by proposing that when people encounter an event verb, they construct a tripartite mental representation of the action. This representation consists of a pre-condition (which may be the cause), the action itself, and the endpoint (which may be a consequence) of the action (Moens & Steedman, 1988). Stevenson et al. claim that the default focus in clauses describing events is on the thematic role associated with the endpoint of the event, a focus that is attenuated when the connective directs attention to the cause. Thematic roles associated with the endpoint of the described event are Patient in action sentences and Goal in transfer sentences. On the other hand, a state has no tripartite representation since it has no pre-condition and no endpoint (Moens & Steedman, 1988). According to Stevenson et al. (1994), therefore, there is no default focus in state sentences. A preferred focus only appears when a subsequent connective *converts* the state into an event having a pre-condition and an endpoint. If the connective directs attention to the pre-condition, as with *because* or a full stop (an implicit causal connective), then the Stimulus is preferred. If the connective directs attention to the consequences, as with *and* or *so*, then the Experiencer is preferred. These proposals are supported by both the sentence continuation studies (Stevenson et al., 1994) and reading time studies (Stevenson & Urbanowicz, 1995, submitted).

The relational hypothesis

An alternative candidate account of pronoun resolution is one that emphasises the relation between eventualities[1] rather than the focusing of a particular individual participating in an eventuality (Hobbs, 1979). This alternative account exploits a theory of discourse structure that attributes the coherence of a discourse to the relations that hold between different parts of the text. There have been several such theories; see Hobbs (1985) and Mann and Thompson (1988) for two influential ones. These theories characterise the structure of discourse in terms of relations that hold between the eventualities described by adjacent spans of text. Such relations include the CAUSE relation, the RESULT relation, the NARRATIVE relation and so on. As we saw in the discussion of focusing,

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[1] Following Bach (1986) we take the term *event* to include actions (including transfers), and the term *eventuality* to cover both states and events.

Stevenson et al. (1994) have already identified a role for connectives in pronoun resolution. However, they emphasised the attention directing function of connectives, which contributes to the focusing of discourse entities; they did not consider the function of connectives that specifies the coherence relation[2] between two described eventualities.

According to the relational view, the referent of the pronoun is determined by the choice of coherence relation and not by what is in focus. For example, since a RESULT relation concerns the person who fills the thematic role associated with the endpoint of an eventuality, it is the choice of a RESULT continuation that leads participants to interpret the pronoun in the fragment as referring to the individual associated with the endpoint. Our initial motivation for the relational hypothesis as an alternative to the focusing hypothesis for an understanding of pronoun comprehension, came from the observation that two of the connectives used by Stevenson et al. (1994) were ambiguous. These connectives were *so* and *and*, which each admit two possible coherence relations. We therefore wished to examine the proposition that the two possible interpretations of each ambiguous connective coincided with two different interpretations of the pronoun.

According to the taxonomy of connectives given in Knott (1996), the ambiguity of *so* arises because *so* can signal either a RESULT relation, where one event is described as the result of another (see Example 1), or a PURPOSE relation, where an *intended result* is characterised as an Agent's rationale for acting (see Example 2). *And so* is specific to the first type of relation, while *so that* is specific to the second.[3] (The PURPOSE relation in (2) is faintly possible with *and so* as well as with *so that*, but it seems to trigger a slightly different interpretation of the relation than *so that*.) Note that in (1), the pronominal referent is Bob, whereas in (2) it is Bill. Our relational hypothesis is that each coherence relation will be associated with a different pronominal referent, RESULT relations favouring the thematic role associated with the consequences, the PURPOSE relation favouring the Agent of an event. (Hence states, which have no Agent, should have no PURPOSE continuations.) We test this proposition in Study 1.

(1)   Bill handed the plate to Bob { so } { and so } he (Bob) balanced his glass on it. { #so that }

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(2)   Bill handed the plate to Bob   { so }
                                         { #and so } he (Bill) could refill his
                                                    glass.
                                         { so that }

And can signal many different relations; among them, RESULT, which can be made explicit with *whereupon* (see Example 3) and NARRATIVE, which can be made explicit with *next* (see Example 4). Note that though each phrase can be substituted by *and*, they are not very suitable as substitutes for each other. In other words, they seem to be making explicit slightly different relations. Once again, our two examples show that each pronominal referent can be associated with a different coherence relation, the Patient with RESULT and the Agent with NARRATIVE. We examine these proposed relations between pronominal reference and coherence relation in Studies 2 and 3.

(3)   Bill called Bob a liar   { and }
                                   { whereupon } he (Bob) challenged him to
                                                a duel.
                                   { #next }

(4)   Bill called Bob a liar   { and }
                                   { #whereupon } he (Bill) accused him of
                                                 cheating.[4]
                                   { next }

Relationship to other research

One way of thinking about the difference between our two hypotheses is to say that the focusing hypothesis concerns the status of entities in the discourse whereas the relational hypothesis concerns events and their inter-relationships. A number of other researchers have discussed the distinction between entities and eventualities or relations. Grosz and Sidner (1986) distinguish between a theory of local focus, known as centering theory, which is a theory of the prominence of the entities in individual utterances, and a theory of global structure, which is a theory concerning the discourse purposes underlying the structure of the discourse as a whole. Local focus is concerned with the coreferential relationships between utterances and is said to be responsible for the interpretation of pronouns. Global focus is concerned with the intentional relations between events and is said to be responsible for the interpretation

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[4] It should be borne in mind that although the additional connectives introduced in this section do seem to be more specific than those on which the experiments were carried out, they are not necessarily unambiguous themselves.

of definite descriptions. Sanford and Garrod (1981; Garrod, Freudenthal, & Boyle, 1994) distinguish between entities and events in their scenario-mapping model, although they do not explicitly discuss the relations between events. According to Sanford and Garrod, entities are ranked according to their accessibility to a subsequent pronoun, whereas the roles they occupy in the events described by the discourse are available as referents for definite descriptions.

Our approach differs from the work of Grosz and her colleagues in three main respects. First, whereas Grosz et al. (1983, 1995) concentrate on structural focusing in their centering theory, we concentrate on semantic focusing. Second, Grosz and Sidner's (1986) global focus concentrates on the intentional structure of the discourse in terms of a task to be accomplished. They thus characterise the relations between discourse segments in terms of the structural relations of dominance, and satisfaction-precedence. By contrast, we concentrate on the rhetorical structure of the discourse and describe the relations between events in terms of more, and finer-grained, categories. Finally, Grosz and Sidner suggest that pronouns of the kind that we study in this paper are resolved in local focus rather than global focus, that is, pronoun resolution is affected by structural focusing but not by the intentional structure of the discourse. Although this view is consistent with the focusing hypothesis, it is not consistent with the relational hypothesis.

Our approach also differs from Sanford and Garrod's work in three main respects. First, they emphasise the focusing function of general background knowledge whereas we concentrate on semantic focusing. Second, Sanford and Garrod's notion of role is defined by the use of definite descriptions (e.g., an individual may fill the role of waiter or customer etc.) as opposed to referring to the same individual by a proper name; in contrast, we believe that thematic role is the relevant notion of role since thematic roles explicitly encode the semantic role of an entity in an event but a definite description may not. These thematic roles are susceptible to semantic focusing. Third, we specifically propose that pronoun comprehension is also affected by the relations between the events described in the discourse, an aspect of discourse that is not considered by Sanford and Garrod.

The present study

In order to see if the relational hypothesis is a feasible alternative interpretation of Stevenson et al.'s (1994) data, we used data from sentence continuation studies, either those we conducted ourselves or those conducted by Stevenson et al. (1994). In these studies, a subject is presented with sentence fragments like the following:

John liked Bill and he ...

and asked to write a continuation to the fragment. The continuations are then scrutinised to determine who the pronoun refers to. In the present study we also classified each continuation according to its relationship to the event described in the fragment. This meant that we could determine whether or not the interpretation of the pronoun was consistent with the coherence relation between the two clauses. A consistent response would be one in which the RESULT relation co-occurred with an interpretation of the pronoun as referring to the thematic role associated with the endpoint of the described eventuality. An inconsistent response would be one in which the RESULT relation co-occurred with an interpretation of the pronoun as referring to the thematic role associated with the pre-condition of the eventuality.

In a sentence continuation task, the subject is engaged in two overlapping processes: a comprehension process, involving the interpretation of the fragment, including the pronoun; and a production process, involving the choice of coherence relation and its expression in the continuation. Thus, although the task is to produce a continuation, it requires participants to understand the fragment before doing so. In particular, participants' responses are made on the basis of the mental representations they have developed while reading the fragment. In this paper, we are specifically concerned with the processes of comprehension rather than production, since we aim to discover which hypothesis best explains how the pronoun at the end of the fragment is interpreted. The continuation itself is used to inform us about that interpretation.

According to the focusing hypothesis, the mental model of the fragment contains two entities that differ in their accessibility, with the degree of focusing depending on whether the initial focus on the endpoint of the represented event is reinforced or reduced by the connective. If there is a strongly focused entity, as is the case when the connective reinforces the focus on the endpoint, then the pronoun in the fragment is most likely to be interpreted as referring to this entity. If there is no strongly focused entity, as is the case when the connective shifts attention towards the cause, then the likelihood of the pronoun being interpreted as referring to the entity associated with the endpoint will be reduced. According to the relational hypothesis, the mental model of the fragment represents an event that will have a specified relation to the event described in the continuation. The nature of this relation depends on how the connective is interpreted and the interpreted relation then determines the interpretation of the pronoun. For example, if the interpretation of the connective favours a RESULT relation, then the thematic role associated with the consequences of the event described in the initial fragment will be the preferred pronominal

referent, whereas if the interpretation favours a NARRATIVE relation, the Agent will be the preferred pronominal referent.

It is likely, however, that in natural discourse the most focused referent is also the referent of the pronoun as determined by the relational hypothesis and that the two predictions are more closely related than was implied in the descriptions above. This possibility poses problems for distinguishing empirically between the two hypotheses. The basic strategy we followed, therefore, was to assume the focusing hypothesis was true and then look to see whether or not the referent of the pronoun was also compatible with the relational hypothesis. If it was not, then we would have evidence against the relational view and in favour of the focusing view. We followed this strategy in our first two studies. However, in our third study, we used the connective, *next*, for which we were able to generate differential predictions for the two hypotheses.

STUDY 1

In this study, we re-ran Stevenson et al.'s Experiment 3, in which the connectives *because* and *so* were used. In their experiment, Stevenson et al. did not include a pronoun at the end of the fragment, since they were primarily interested in the focusing properties of thematic roles rather than the role of focusing in pronoun comprehension. However, in this paper, we wish to examine how the pronoun is interpreted, hence we re-ran the experiment, but included the pronoun at the end of each sentence fragment.

The experiment included sentence fragments containing both *because* and *so*; however, we only examined the continuations to *so*. We expect the coherence relations expressed in these continuations will be either RESULTs or PURPOSEs, in agreement with the two possible meanings of *so*. The focusing hypothesis predicts that the pronouns will be consistently interpreted as referring to the thematic role associated with the endpoint of the eventuality described in the fragment. The relational hypothesis predicts that when the continuations are RESULTs, the pronoun will refer to the person affected by the eventuality, that is, to the Patient. But when the continuations contain PURPOSEs, the pronoun will refer to the Agent of both transfers[5] and actions. There should be no PURPOSEs in state continuations because states do not have Agents.

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[5] The Agent in a transfer sentence can be either the Goal or the Source, depending on which is the subject of the sentence. There are problems, therefore, with this analysis because it assumes that two thematic roles are associated with the subject of transfer verbs. However, Jackendoff (1972) has argued that an NP in a single sentence can bear more than one thematic role (see also Cowper, 1992) and our results and those of Stevenson et al. (1994) are hard to explain in the absence of such a claim.

However, we fully expect that Stevenson et al.'s (1994) findings will be replicated and that the thematic role associated with the endpoint of the eventuality will be preferred pronominal referent. Hence, there should be very few continuations expressing PURPOSEs. The relational hypothesis, therefore, predicts that the continuations should predominantly express RESULTs, consistent with the pronoun referring to the thematic role affected by the eventuality.

Method

Participants.   Thirty-two undergraduate volunteers served as participants and their ages ranged from 18 to 32.

Design and materials.   The connectives *so* or *because* were used to connect a clause containing a pronoun to a clause introducing two individuals who were both potential antecedents for the pronoun. For example, *Ken admired Geoff so/because he . . . .* The materials were the same as those used in Stevenson et al. (1994). There were three kinds of sentences: those containing transfer verbs with Goal and Source thematic roles; those containing action verbs with Agent and Patient thematic roles; and those containing state verbs with Experiencer and Stimulus thematic roles. Definitions of the roles used by Stevenson et al. are given in Table 2. The definitions in the table were gleaned from Andrews (1985), Fillmore (1968), Jackendoff (1985) and Radford (1988). Each sentence occurred in two versions, one in which one thematic role was mentioned first, the other in which the alternative thematic role was mentioned first. An example of each kind of sentence and each version is shown in Table 3. The participants wrote continuations to 48 sentence fragments, 16 containing each verb type. Hence for each verb type, there were four fragments in each of the four conditions defined by sentence version and connective.

TABLE 2
Definitions of Thematic Roles used in Stevenson et al. (1994)

a.	**Goal**: someone or something towards which something moves. Examples: **Mary** in **John gave the the book to Mary. Peter** in **Peter took the book from Susan**.
b.	**Source**: someone or something from which something moves. Examples: **John** in **John gave the book to Mary. Susan** in **Peter took the book from Susan**.
c.	**Agent**: the instigator of an action. Examples: subjects of **smash**, **kick**, **criticise**, **reproach**.
d.	**Patient**: someone or something affected by an action. Examples: objects of **kill**, **eat**, **smash**, but not those of **watch**, **hear**, and **love**.
e.	**Experiencer**: someone or something having a given experience. Examples: subject of **love**, object of **annoy**.
f.	**Stimulus**: someone or something giving rise to a certain experience. Examples: object of **love**, subject of **annoy**.

TABLE 3
Examples of Sentence Fragments Used in the *So/Because* Study
(Experiment 3 of Stevenson et al. 1994)

	Version one	**Version two**
Transfer Sentences	*Goal-Source* John seized the comic from Bill so/because . . .	*Source-Goal* John passed the comic to Bill so/because . . .
Action Sentences	*Agent-Patient* Joseph hit Patrick so/because . . .	*Patient-Agent* Patrick was hit by Joseph so/because . . .
State Sentences	*Experiencer-Stimulus* Ken admired Geoff so/because . . .	*Stimulus-Experiencer* Ken impressed Geoff so/because . . .

Categorising the continuations. The continuations were categorised according to the coherence relations they expressed. The basic procedure for categorising the continuations was the same for all the data examined in this paper. In all three studies, two judges categorised half each of the continuations produced for one sentence type. The judges were all undergraduate volunteers who were paid for their services and who were blind to the experimental hypothesis and theoretical framework. Before starting the categorisations, all the judges were given the information shown in Table 4 and had the categories explained to them. It was also pointed out to them that some continuations could be interpreted as either RESULTs or NARRATIVEs. For example.

Colin threw the ball to Gary and he dropped it as usual.

The judges were instructed that, in these circumstances, they should assign the continuations to the RESULT category. RESULTs were chosen to take precedence over NARRATIVEs because it was thought that RESULTs expressed a stronger relation between the two events than did NARRATIVEs and so judges were instructed to opt for the stronger of the two relations in these ambiguous cases. In an initial reliability check, the two judges first categorised the continuations from the same three participants after which they checked their degree of agreement and discussed any disagreements until they reached a consensus view. The judges were told that if they disagreed on 20% or more of the continuations, they were to seek advice from the first author. This situation did not arise in any of the categorisations in the study. After agreeing the initial disagreements, each judge then categorised half of the remaining continuations. At the end of this categorisation task, each judge then categorised the continuations of three participants selected at random (but not including those used in the initial reliability check) from those

TABLE 4

Criteria for Assigning Coherence Relations in the Completions to Categories and Examples of Each Category

Category of continuation	Description of Each Category	Criterion for deciding the category of the continuation	Examples
Result	The event described in the continuation happened as a consequence of what happened in the first clause.	The whole sentence makes sense when the connective is replaced with 'so' or with 'as a result'. Sometimes the whole sentence also fits the criterion for the Narrative Category. Always give preference to the Consequence category.	John seized the comic from Bill and he tried to seize it back. Ken admired Geoff and he gave him a job. Joseph hit Patrick and he ran off crying.
Narrative	The event described in the continuation is one that just happened next without being a consequence of the event described in the first clause.	The continuation makes sense when the connective is replaced by 'Then' or 'After that', but does not make sense when the connective is replaced by 'So' or 'As a result'.	John seized the comic from Bill and he began to read it. Clive angered Fred and he ignored him. Timothy helped Ian and he then went inside.
Background	The event described in the continuation happened at the same time as the event described in the first clause or the continuation gives the context of the event described in the first clause or sentence.	No obvious connective to replace the one in the continuation.	Malcolm gave some money to Stewart and he knew he wanted to spend it on booze. Andrew shocked Jeremy and he knew it. Joseph hit Patrick and he kept hitting him.
Purpose	The event described in the continuation describes what is now possible given the event described in the first clause. The event described in the continuation may not have taken place yet.	The continuation usually contains 'so that' and the verb contains 'could' or 'might'.	Julie rolled the ball to Rachel so she could score. Dick deceived Carl so that he could gain the upper hand. Joseph hit Patrick so he could be expelled from school.

categorised by the other judge. The degree of agreement between the two judges was then calculated to give an overall reliability measure. In this study, the two judges agreed in 93% of the cases.

Results

We first checked that the pronoun interpretation results were the same as those obtained by Stevenson et al. (1994). This turned out to be the case. When the sentence fragments contained transfer or action verbs, the preferences for Goal and Patient were reinforced with *so* and reduced by *because*; when the fragments contained state verbs, there was a preference for the Experiencer with *so* and for the Stimulus with *because*.

The percentage of PURPOSE and RESULT continuations to *so* fragments in which the pronoun referred to the preferred thematic role are shown in Table 5. Completions in which the pronoun referred to the non-preferred thematic role are not shown because the numbers were very small.

Since the frequency of continuation in a category was not independent of the frequencies in other categories, it was not possible to compare the frequencies of the different categories within each sentence type. Instead,

TABLE 5
Percentage of Result and Purpose Relations in the *So* Completions of Study 1 where the Pronoun Referred to the Preferred Thematic role

Type of verb	Sentence version	Type of completion	
		Result	*Purpose*
Transfer	**Goal**-Source	19	**42**
	John seized the comic from Bill so he	*read it.*	*could read it.*
	Source-**Goal**	22	**54**
	John passed the comic to Bill so he	*read it.*	*could read it.*
Action	**Patient**-Agent	**51**	06
	Patrick was hit by Joseph so he	*cried.*	*could show how brave he was.*
	Agent-**Patient**	**56**	10
	Joseph hit Patrick so he	*cried.*	*could show how brave he was.*
State	**Exper.**-Stimulus	**69**	0.0
	Ken admired Geoff so he	*gave him the prize.*	—
	Stimulus-**Exper.**	**65**	02
	Ken impressed Geoff so he	*gave him the prize.*	*became very big headed.*

Notes: The preferred thematic roles are in bold; the most frequent continuations are also in bold. Example fragments are shown in the Sentence Version column. Examples of completions are shown in the Result and Purpose columns.

we compared the results to chance by conducting one sample t-tests on the continuations that referred to the preferred thematic roles; the results were too sparse for continuations referring to the non-preferred thematic roles to be analysed. Because four comparisons were made on each verb type (two versions $\times$ two continuation types), we adopted an alpha level of .01 for each comparison. Two analyses were carried out on each comparison, in accordance with Clark's (1973) procedure, one treating participants as a random effect and the other treating sentences as a random effect. There were 31 DF in the participants analyses and 15 DF in the sentences analyses.

It is difficult to determine the chance frequency of each type of continuation because the number of possible categories is potentially very large. However, we decided to base our estimate on the two categories (PURPOSE and RESULT) that we had identified before we started classifying them and to allow for a third 'catchall' category for 'other' continuations. Since there were two possible referents for the pronoun and three types of continuations (RESULT, PURPOSE, other), there was one chance in six (i.e., a 17% chance) of a category being produced in each condition.

Transfer verbs: Pronoun refers to Goal.   The number of PURPOSE continuations was significantly greater than chance in both Goal-Source sentences (participants: $t = 4.78$, $p < .001$; sentences: $t = 3.25$, $p < .004$) and Source-Goal sentences (participants: $t = 4.78$, $p < .001$; sentences: $t = 15.47$, $p < .001$). RESULT continuations did not differ from chance in either Goal-Source (participants: $t < 1$; sentences: $t < 1$) or Source-Goal sentences (participants: $t < 1$; sentences: $t = 1.15$).

Action verbs: Pronoun refers to Patient.   As can be seen in Table 5, RESULT continuations predominated with action verbs. The number of these continuations was significantly greater than chance in both Agent-Patient (participants: $t = 6.65$, $p < .001$; sentences: $t = 6.32$, $p < .001$) and Patient-Agent sentences (participants: $t = 6.54$, $p < .001$; sentences: $t = 4.85$, $p < .001$). PURPOSE continuations were significantly less frequent than chance in Patient-Agent sentences (participants: $t = 6.08$, $p < .001$; sentences: $t = 4.0$, $p < .002$), whereas they did not differ from chance in Agent-Patient sentences (participants: $t = 2.24$, $p < .04$; sentences: $t = 1.84$, ns).

State verbs: Pronoun refers to Experiencer.   Inspection of Table 5 indicates that RESULT continuations predominated. The numbers of these continuations were significantly greater than chance in both Experiencer-Stimulus (participants: $t = 10.33$, $p < .001$; sentences: $t =$

10.94, $p < .001$) and Stimulus-Experiencer sentences (participants: $t = 8.59$, $p < .001$; sentences: $t = 8.27$, $p < .001$). The number of PURPOSE continuations was significantly lower than chance in Stimulus-Experiencer sentences (participants: $t = 8.36$, $p < .001$; sentences: $t = 4.66$, $p < .001$). There were no PURPOSE continuations in Experiencer-Stimulus sentences.

DISCUSSION

According to the focusing view, the choice of a pronominal referent in action and transfer sentences is a function of a default focus on the thematic role associated with the endpoint of the event, a focus that is maintained when the connective is *so*. In state sentences, the connective must be encountered before attention can be directed to the endpoint of the state. The results in this study were, as expected, consistent with this hypothesis. The preferred pronominal referent was Goal in transfers, Patient in actions, and Experiencer in states. The question we now need to ask is whether or not these same results could also have been predicted by the choice of coherence relation in the continuation. That is, do these preferred pronominal interpretations co-occur with RESULT coherence relations?

The answer to this question is affirmative for actions and states, but not for transfers, where PURPOSE was the predominant coherence relation. Thus, our prediction that RESULTs would predominate with all three verb types was not confirmed. A strong view of the relational hypotheses, therefore, cannot be maintained in the light of our results. They indicate that PURPOSEs are not restricted to Agents and so suggest a weak view of the hypothesis, in which a unique coherence relation is consistent with the interpretation of the pronoun within each verb type, but not necessarily across verb types. The present results fit this weak view: the choice of PURPOSE relations in transfer continuations was accompanied by Goal pronominal referents; the choice of RESULT relations in action continuations was associated with Patient pronominal referents; and the choice of RESULT relations in state continuations was accompanied by Experiencer pronominal referents.

What, then, might explain the choice of PURPOSE continuations in transfer sentences rather than RESULTs? One possibility is that transfer verbs have a different semantic structure from actions and states. Whereas an action or state can be the cause of a subsequent eventuality (e.g., hitting someone causes them to cry; hating someone causes you to want to hurt them), a transfer does not seem to cause another eventuality. Rather it seems to create a condition that *enables* the Goal to do something (Goldman, 1986). For example, passing a book to Bill does not cause him

to read it, but it does enable him to read it. Consequently, a RESULT relation, as in the continuation, *he read it*, in *John gave the book to Bill so he read it* is less likely to be produced because it presupposes a causal structure underlying the transfer whereas there is only an enablement structure. Hence PURPOSEs, which do not conflict with the enablement structure, are preferred. Indeed, it could be argued further that the consequences of a transfer are part of the meaning of the verb itself, these consequences being that the Source no longer possesses the object and that the Goal now possesses the object. Our participants, therefore, produced completed sentences like *John passed the comic to Bill so he could read it*, because the initial fragment (*John passed the comic to Bill so …*) presupposes the consequence that Bill (the Goal) now possesses the comic, and it is this consequence that enables the intended action described in the continuation (Bill's reading the comic) to be carried out.

Overall, however, the critical finding is that in all three sentence types, thematic role focusing and coherence relations go together. In action and state continuations, the pronoun refers to the focused thematic role associated with the consequence of the eventuality, and the coherence relation is one of RESULT, in which the consequence for the individual is described. In transfer sentences, the pronoun also refers to the thematic role associated with the endpoint of the event but here the coherence relation is one of PURPOSE. Thus, the ambiguity of *so* allowed the participants to select the meaning of the connective that maintained consistency between the meaning of the verb, the focused entity, the coherence relation and the interpretation of the pronoun. In summary, therefore, our results are consistent with both hypotheses, and further suggest that language users strive to keep verb meaning, focusing, coherence relation and pronominal interpretation in alignment.

STUDY 2

In the Introduction, we pointed out that the connective *and* is ambiguous between a meaning characterised by *and then* and a meaning characterised by *whereupon*. The former meaning is associated with a NARRATIVE relation, whereas the latter is associated with a RESULT relation. Hence, when we consider continuations to *and* rather than *so*, as we do in this second study, we are concerned with the NARRATIVE rather than the PURPOSE relation. In this study, therefore, we re-analysed the *and* continuations from Stevenson et al.'s Experiment 1 to see if they revealed its ambiguity between NARRATIVE and RESULT coherence relations, and, if they did, whether a specific interpretation of the connective co-occurred with the interpretation of the pronoun. Consistent with the focusing hypothesis, Stevenson et al.'s Experiment 1 results showed that

the preferred referent of the pronoun was the thematic role associated with the endpoint of the eventuality. According to the relational hypothesis, we would expect this preferred pronominal referent to be associated with RESULT continuations, at least with actions and states. If, however, both RESULTs and NARRATIVEs are found with the same pronominal referent, then this would be evidence against the relational hypothesis.

With the transfer sentences, we sought to confirm the findings of the Study 1. On the basis of those findings and our interpretation of them, we would expect transfer continuations to be mainly NARRATIVEs rather than RESULTs, since we have proposed that transfers already encode the result of the action in the meaning of the verb. In other words, we expect that, wherever possible, participants will endeavour to interpret the connective in a way that maintains consistency between the meaning of the verb, the focused entity, the coherence relation and the interpretation of the pronoun.

Method

This experiment used 32 participants who each completed 64 sentence fragments. Sixteen fragments contained transfer verbs, 16 contained action verbs, 16 contained state verbs, and 16 were in a control condition that contained motion verbs. The control condition is not re-analysed here. There were, therefore eight sentences in each sentence version for each verb type. The procedure for categorising the continuations was the same as in Experiment 1. Six judges were used, two for each verb type, each judge categorising half the continuations, together with the continuations of six additional participants in order to do the initial and the final reliability checks. The final reliability check showed 90% agreement.

Results

The categorisations revealed that the two predicted relations predomi-nated. However, a third relation, that of BACKGROUND, also appeared in sufficient numbers to be included in the analyses of the results. Table 6 shows the mean number of each of these three categories of continuation when the pronoun referred to the preferred thematic role.

One sample t-tests were carried out on the continuations that referred to the preferred thematic roles. As was the case in the previous re-analysis, the results were too sparse to do any statistical analyses when the continuations referred to the non-preferred thematic role. We estimated chance level on the basis of the two possible pronoun interpretations and four possible continuation categories: RESULT, NARRATIVE, BACK-GROUND, and OTHER. Thus there was a 1 in 8 (i.e. 12.5%) chance of producing a given continuation. Since six statistical comparisons were

TABLE 6
Percentage of Result, Narrative and Background relations in the *and* completions of
Study 2 where the Pronoun Referred to the Preferred Thematic Role

Type of verb	*Sentence version*	*Type of completion*		
		Result	*Narrative*	*Background*
Transfer	**Goal**-Source	19	**60**	04
	John seized the comic from Bill and he	*read it.*	*watched Bill look for another.*	*smiled as he did it.*
	Source-**Goal**	26	**44**	03
	Bill passed the comic to John and he	*read it.*	*watched John look for another.*	*cheerfully let go of it.*
Action	**Patient**-Agent	**76**	06	06
	Patrick was hit by Joseph and he	*cried.*	*was kicked as well.*	*smiled despite the pain.*
	Agent-**Patient**	**53**	02	03
	Joseph hit Patrick and he	*cried.*	*asked to be hit again.*	*smiled despite the pain.*
State	**Exper.**-Stimulus	**59**	03	20
	Ken admired Geoff and he	*gave him the prize.*	*walked towards him.*	*respected Bill too.*
	Stimulus-**Exper.**	**62**	02	06
	Ken impressed Geoff and he	*gave him the prize.*	*took advantage of it.*	*impressed Bill in turn.*

Notes: Data from Experiment 1 of Stevenson et al., 1994. The preferred thematic role is in bold in the table, and the most frequent continuations are also in bold. Example fragments are shown in the Sentence Version column. Examples of completions are shown in the Result, Narrative and Background columns.

made for each verb type (two sentence versions $\times$ three continuation types—the OTHER category was not analysed), the alpha level was set at .008. There were 31 DF in the participants analyses and 15 DF in the sentences analyses.

Transfer verbs: Pronoun refers to Goal.   NARRATIVE continuations were the most frequent and were produced significantly more often than chance both when Goal was mentioned first (participants: $t = 10.63$, $p < .001$; sentences: $t = 9.04$, $p < .001$) and when Goal was mentioned second (participants: $t = 10.61$, $p < .001$; sentences: $t = 4.23$, $p < .002$). RESULTs were also significantly more frequent than chance but only on the participants' analyses, not on the sentences' analyses both when Goal was mentioned first (participants: $t = 2.98$, $p < .007$; sentences: $t = 1.0$, ns) and when Goal was mentioned second (participants: $t = 4.94$, $p < .001$;

sentences: $t = 1.95$, ns). The number of BACKGROUNDs was significantly below chance both when Goal was mentioned first (participants: $t = 8.26$, $p < .001$; sentences: $t = 8.88$, $p < .001$) and when Goal was mentioned second (participants: $t = 9.64$, $p < .001$; sentences: $t = 6.21$, $p < .001$).

Action verbs: Pronoun refers to Patient.   RESULT continuations were significantly more frequent than chance level, both when Patient was mentioned first (participants: $t = 17.86$, $p < .001$; sentences: $t = 12.46$, $p < .001$) and when Patient was mentioned second (participants: $t = 7.67$, $p < .001$; sentences: $t = 6.37$, $p < .001$). Both BACKGROUNDs and NARRATIVEs were significantly lower than chance when Patient was mentioned first (BACKGROUNDs: participants: $t = 4.98$, $p < .001$; sentences: $t = 2.83$, $p < .02$; NARRATIVEs: participants: $t = 3.71$, $p < .002$; sentences: $t = 3.04$, $p < .009$) and when Patient was mentioned second (BACKGROUNDs: participants: $t = 6.41$, $p < .001$; sentences: $t = 6.45$, $p < .001$; NARRATIVEs: participants: $t = 11.59$, $p < .001$; sentences: $t = 7.34$, $p < .001$).

State verbs: Pronoun refers to Experiencer.   RESULTs were significantly more frequent than chance when Experiencer was mentioned first (participants: $t = 11.52$, $p < .001$; sentences: $t = 10.27$, $p < .001$) and when Experiencer was mentioned second (participants: $t = 11.94$, $p < .001$; sentences: $t = 14.82$, $p < .001$). NARRATIVEs were significantly less frequent than chance both when the Experiencer was mentioned first (participants: $t = 10.52$, $p < .001$; sentences: $t = 7.01$, $p < .001$) and when Experiencer was mentioned second (participants: $t = 14.75$; $p < .001$; sentences: $t = 15.65$; $p < .001$). BACKGROUNDs were more frequent than chance when Experiencer was mentioned first, but these results were not significant at the required alpha level (participants: $t = 2.30$, $p < .03$; sentences: $t = 2.40$, $p < .04$). BACKGROUNDs were significantly less frequent than chance when Experiencer was mentioned second (participants: $t = 4.84$, $p < .001$; sentences: $t = 5.51$, $p < .001$).

Background completions.   BACKGROUND continuations were more frequent in continuations that referred to the first mentioned referent compared to the second mentioned referent, regardless of whether or not the first mentioned referent was the preferred referent of the pronoun. The total numbers across both the preferred and the non-preferred thematic roles were: Transfers: 18 vs. 3; Actions: 15 vs. 3; States: 36 vs. 16. One sample t-tests on all verb types combined confirmed this observation (participants: $t = 5.33$, DF $= 1, 95$, $p < .001$; sentences: $t = 4.40$, DF $= 1, 94$, $p < .001$).

Discussion

The main results confirm those found in Study 1. The data are consistent with the focusing hypothesis because the preferred referent of the pronoun was the one predicted on grounds of focusing. The main data can also be regarded as consistent with the (weak) relational hypothesis because the choice of relation for a given verb type was consistent with the choice of pronominal referent. RESULTs in actions continuations were associated with Patient pronominal referents; RESULTs in state continuations were associated with Experiencer pronominal referents; and NARRATIVEs in transfer continuations were associated with Goal pronominal referents. However, support for this latter association was less clear cut in this re-analysis than it was in Study 1. In this study, there was also a sizeable number of continuations in the transfer sentences that expressed RESULTs, even though the majority expressed NARRATIVEs. In both cases, Goal was the preferred pronominal referent, a finding that suggests a less strong relationship between pronoun resolution and the choice of coherence relation than between the pronoun resolution and the focused entity. However, the number of RESULTs was only significantly higher than chance on the participants analyses and so we cannot make too much of this finding. We also need to bear in mind that continuations that were ambiguous between a NARRATIVE and a RESULT interpretation were assigned to the RESULT category, which may have inflated the true number of RESULTs. In general, therefore, the results also confirm the idea that the meaning of transfer verbs makes NARRATIVE relations more likely than RESULTs.

Thus the main findings once again indicate that participants strive to interpret the connective in a way that maintains consistency between the meaning of the verb, the coherence relation, the focused entity and the interpretation of the pronoun. Therefore, in order to tease apart the two hypotheses, we need to devise an experiment in which the connectives are more specific and so enable us to test the proposition that coherence relations may exert an independent effect on pronoun comprehension. What our results show so far is that the choice of referent for the pronoun is generally consistent with the coherence relation. However, since the choice of referent is also the focused thematic role, we cannot tell whether the choice is determined by the focused entity or by the coherence relation or by both. By using more specific connectives, we aim to prevent the participants from exploiting an ambiguity in the connective in order to keep the pronominal referent in alignment with the verb's meaning, the focused entity, and the coherence relation. In doing this, we should be able to observe the effects of a dissociation between a potential referent for the pronoun selected on the grounds of focusing and a

potential referent of the pronoun selected on the grounds of fitting with the coherence relation.

There is one other result of this re-analysis that appears to support the focusing hypothesis rather than the relational hypothesis. This result concerns BACKGROUND continuations. (See Table 3 for a definition and example.) Although not many BACKGROUNDs were produced, they did conform to a specific pattern that was not related to the choice of the pronoun's referent. Across all three verb types, there were more BACKGROUNDs when the pronoun referred to the first rather than the second mentioned individual. In this instance, therefore, the relationship between the choice of coherence relation and the choice of referent for the pronoun seems to have broken down. We tentatively conclude, therefore, that the interpretation of a pronoun depends primarily on what is the current focus rather than on the coherence relation, since the BACK-GROUND relation appears to be specific to the first mentioned individual.

STUDY 3

In the first two studies, we found that the preferred coherence relations were RESULTs in actions and states, whereas in transfers, the preferred coherence relations were PURPOSEs when the connective was *so* and NARRATIVEs when the connective was *and*. In all these cases, the preferred choice of referent for the pronoun was consistent with both the focusing hypothesis and a weak relational hypothesis. In the present experiment we used connectives that were more limited in their choice of coherence relation so that we could avoid the situation in which two coherence relations are possible. We also wished to use a connective for which our two hypotheses yield different predictions about the choice of the pronominal referent. In this experiment, therefore, we used two connectives. One was *whereupon*, a connective that preferentially selects the RESULT interpretation of *and*, as outlined in the Introduction. With *whereupon* we predicted that the focused entity would be the entity associated with the consequences, comparable to the previous results, and that the preferred coherence relation would be RESULT with actions and states and NARRATIVE with transfers, again comparable to our previous results.

The other connective we used was *next*, a temporal connective. *Next* preferentially selects the NARRATIVE interpretation of *and*. We therefore predicted that the NARRATIVE interpretation would be selected with all three verb types. More critically, *next* allowed us to test between our two hypotheses because with *next*, the two hypotheses yield different predictions. According to the focusing hypotheses, *next* can be regarded as a connective that focuses on the temporal structure of the

discourse rather than its causal structure. We suggest that a temporal connective, unlike a causal connective, directs attention to the first mentioned referent. This suggestion is consistent with results using *then*, another temporal connective (Suri & McCoy, 1994). Suri and McCoy gave participants short texts in which a sentence containing a pronoun began with *then* and they found that their informants gave consistently high acceptability ratings to pronoun interpretations in which the pronoun referred to the first mentioned antecedent. However, these acceptability judgements were less consistent when *then* was omitted. The suggestion that *next* directs attention to the first mentioned referent is also consistent with the first mention advantage found by Gernsbacher and Hargreaves (1989) for verbs that do not have a clear causal structure. Although the verbs used in our study do have causal structures (McKoon et al., 1993), our proposal is that such verbs are interpreted non-causally when the connective favours a temporal rather than a causal interpretation. Hence the focusing hypothesis predicts that the preferred pronominal referent will be the one that is mentioned first. Turning to the relational hypotheses, *next*, like *and then*, is typically used to present events in a pre-planned sequence (Sandström, 1993). It therefore makes sense that both events should have the same volitional Agent (the one who made the plan) and that the favoured continuation should be NARRATIVE. Thus, *next* should select a pronominal referent that is consistent with this NARRA-TIVE interpretation: it should preferentially select the Agent as the referent. *Next* can thus be regarded as an 'Agent-preserving' connective.

Since one of our hypotheses predicted a preference for the pronoun to be interpreted as referring to the Agent of the preceding clause, only action verbs were used in this experiment. We therefore took the opportunity to improve our selection of action verbs. Our primary concern so far has been that our action verbs contain Agents. However, grouping according to agency does not produce a coherent set of verbs. Indeed, the action verbs used by Stevenson et al. (1994) and by us in Study 1, consisted of two distinct categories. One of these two categories corresponded to what Levin (1993) has called "judgement verbs", e.g., *criticise*, *blame*; the other corresponded to what Levin called "verbs of contact by impact" e.g., *hit*, *push*. Judgement verbs have been classified as interpersonal verbs by McKoon et al. (1993). According to McKoon et al., interpersonal verbs are verbs that show implicit causality and can be defined as verbs in which one of the protagonists has to have a mental representation of the other. The other two types of verbs we used in Studies 1 and 2, transfers and states, could both be said to be interpersonal verbs, according to this definition. We need, therefore, to check that the results we obtained for action verbs are not due to the interpersonal judgement verbs that were included, with impact verbs behaving in some other way.

All the judgement verbs we used in this experiment were "object-initiating" (McKoon et al., 1993). That is, the perceived causal instigator of the event was the object and not the subject. We also classified the impact verbs as object-initiating. It seems more likely that a person would hit someone else because the victim provoked an attack (object-initiating) than because the hitter felt aggressive (subject-initiating). Some support for this classification comes from Stevenson et al.'s (1994) studies and our Study 1, where the impact verbs included among the action verbs produced comparable results to the judgement verbs. Certainly all the items analyses on action verbs were significant in Stevenson et al.'s (1994) study and in Study 1, indicating that impact verbs and judgement verbs behaved in the same way. We therefore assumed that both the judgement and impact verbs are object-initiating and we tested this assumption in Study 3.

Method

Participants. Forty-eight student volunteers from the University of Durham participated in the study.

Materials. Thirty-two fragments were constructed, 16 containing judgement verbs and 16 containing impact verbs. Each fragment introduced two individuals and ended in a pronoun. There were two versions for each verb type; in version one (Agent-Patient fragments), the Agent was mentioned first, in version two (Patient-Agent fragments), the patient was mentioned first. Half the fragments in each version contained *next*, half contained *whereupon*. When *next* was used, the fragment contained a full stop before the connective. Since *whereupon* is a subordinating conjunction, there was no full stop when *whereupon* was used. The fragments were presented in booklets in which each fragment was followed by a series of dots to indicate that continuations were required. The order of presentation of the fragments was randomised for each subject.

Design. There were three factors in the experiment: Verb type (judgement or impact), Sentence version (Agent-Patient vs. Patient-Agent) and Connective (*next* vs. *whereupon*). For each verb type participants saw 16 sentences, eight in version 1, and eight in version 2. Half of the sentences in each version contained the connective *whereupon*. The other half contained the connective *next*. The assignment of sentences to conditions was counterbalanced so that across the experiment as a whole, each sentence appeared equally often in each condition.

Procedure. Each subject was given a booklet containing the 32 sentence fragments, and was asked to write a continuation to each one.

No time limits were imposed, but participants were instructed not to spend too much time on them. The continuations were scored to identify the referent of the continuation, and the type of continuation used (e.g., RESULT, NARRATIVE, CAUSE, BACKGROUND).

Results

Interpretation of pronouns.   Pronoun interpretations were determined by two naive independent judges who showed 98% agreement. The percentage of interpretations in which the pronoun in the continuation referred to the first mentioned referent in the fragment is shown in Table 7. Two analyses of variance were carried out on the data in the table. A two (version) by two (connective) repeated measures analysis was used when calculating F_1. When calculating F_2, version was an independent factor.

Judgement sentences.   Analyses of variance revealed a significant main effect of connective (F_1 = 23.54, DF = 1, 47, $p <$ .001; F_2 = 26.16, DF = 1, 30, $p <$ .001): there were more first mention references with *next* than with *whereupon*; and a significant main effect of sentence version (F_1 = 60.35, DF = 1, 47, $p <$ .001; F_2 = 48.94, DF = 1, 30, $p <$ .001): there were more first mention references with the Patient-Agent versions than the Agent-Patient versions. There was also a significant interaction between connective and version (F_1 = 50.02, DF = 1, 47, $p <$ .001; F_2 = 65.36, DF = 1, 30, $p <$ .001): the first mention preference appeared in both versions with *next*, but only in the Patient-Agent version with *whereupon.* One sample *t*-tests supported these observations. First mention references were significantly greater than chance in both sentence versions when the connective was *next* (Agent-Patient: participants: t = 3.97, $p <$ .001; sentences: t = 4.12, $p <$ .001; Patient-Agent: participants: t = 6.44, $p <$ .001; sentences: t = 4.92, $p <$ .001). However, when the connective was

TABLE 7
Percentage of References to the First Mentioned Individual as a Function of Sentence Version and Connective in the new Experiment

Type of verb	Sentence version	Connective	
		Next	*Whereupon*
Judgements	Patient-Agent	73	82
	Agent-Patient	68	26
Impacts	Patient-Agent	76	88
	Agent-Patient	69	22

whereupon, first mention references were above chance with Patient-Agent sentences (participants: $t = 10.86$, $p < .001$; sentences: $t = 9.29$, $p < .001$), but below chance with Agent-Patient sentences (participants: $t = 5.29$, $p < .001$; sentences: $t = 9.55$, $p < .001$).

Impact sentences.   Analyses of variance revealed: a significant main effect of connective ($F_1 = 22.68$, DF = 1, 47, $p < .001$; $F_2 = 60.28$, DF = 1, 30, $p < .001$), where there were more first mention references with *next* than with *whereupon*; and a significant main effect of sentence version ($F_1 = 22.23$, DF = 1, 47, $p < .001$; $F_2 = 226.856$, DF = 1, 30, $p < .001$), where there were more first mention references with the Patient-Agent than the Agent-Patient versions. There was also a significant interaction between connective and version ($F_1 = 77.74$, DF = 1, 47, $p < .001$; $F_2 = 179.83$, DF = 1, 30, $p < .001$): the first mention preference was more marked in the Patient-Agent versions than the Agent-Patient versions. Once again, one sample *t*-tests supported these observations. First mention references were significantly greater than chance in both sentence versions when the connective was *next* (Agent-Patient: participants: $t = 4.56$, $p < .001$; sentences: $t = 8.13$, $p < .001$; Patient-Agent: participants: $t = 7.30$, $p < .001$; sentences: $t = 10.89$, $p < .001$). However, when the connective was *whereupon*, first mention references were above chance with Patient-Agent sentences (participants: $t = 12.96$, $p < .001$; sentences: $t = 22.95$, $p < .001$), but below chance with Agent-Patient sentences (participants: $t = 6.63$, $p < .001$; sentences: $t = 10.17$, $p < .001$).

Discussion

These results show an effect of connective on the interpretation of the pronoun. Importantly, the results held for impact verbs as well as judgement verbs, thus supporting the idea that accessibility of a referent is not dependent on whether or not an interpersonal verb is used. When *whereupon* is used, the thematic role associated with the endpoint of the action is the preferred referent. Patients are preferred to Agents. Since *whereupon* directs attention to the consequences of an action, these results are consistent with those reported in Stevenson et al. (1994). By contrast, the preference for the thematic role associated with the endpoint of the described action was much reduced when the connective was *next*, in favour of the first mentioned referent. Thus far, therefore, the results favour the focusing hypothesis rather than the relational hypothesis. *Next* focuses on temporal rather than causal structure, thereby shifting the focus to the first mentioned referent. The relational hypothesis predicted that the Agent would be the referent of choice for the pronoun, but this was not the case. However, one way in which the relational hypothesis might be

maintained, albeit in a revised form, would be if the type of continuation produced is also consistent with the choice of the first mentioned individual as the referent of the pronoun.

Type of continuation.   The continuations were categorised by two naive independent judges according to the procedure outlined in Study 1. The final reliability check showed 88% agreement.

Continuation for Next.   Table 8 shows the percentage of RESULT and NARRATIVE continuations when the connective was *next*. One-sample *t*-tests were carried out on the continuations where the pronoun referred to the preferred referent. The preferred referent was the first mentioned referent in each case. We assumed three possible categories of continuation as our chance level, the two predicted categories, RESULT and NARRATIVE, and an OTHER category, which consisted of any other continuation. There were two possible assignments, which, when combined with the three categories of continuation, made a chance level of one in six, i.e., 17%. There were 63 DF in the participants analyses and 15 DFs in the sentences analyses. There were four comparisons for each verb type (judgement and impact) and so the alpha level was set at .01.

TABLE 8
Percentage of Result and Narrative Continuations in the *Next* Conditions of Study 3 where the Pronoun Referred to the Preferred Thematic Role

Type of verb	Sentence version	Type of continuation	
		Result	Narrative
Judgement	**Patient**-Agent	**50**	12
	Joseph was criticised by Patrick. Next he	*tried to improve his performance.*	*was blamed by Bill.*
	Agent-Patient	17	**52**
	Patrick criticised Joseph. Next he	*was delighted when Joseph got into trouble.*	*insulted Sue.*
Impact	**Patient**-Agent	**62**	10
	Joseph was hit by Patrick Next he	*hit him back.*	*was threatened by Bill.*
	Agent-Patient	21	**48**
	Patrick hit Joseph. Next he	*was punished severely for doing so.*	*kicked him as well.*

Notes: The preferred thematic role is in bold in the table, and the most frequent continuations are also in bold. Example fragments are shown in the Sentence Version column. Examples of completions are shown in the Result and Narrative columns.

Judgement sentences.   The preferred choice of continuation depended on the sentence version. In the Patient-Agent versions, the number of RESULT continuations was significantly above chance (participants: $t = 7.73$, $p < .001$; sentences: $t = 6.33$, $p < .001$), whereas the number of NARRATIVE continuations was no different from chance (participants: $t = 43$, NS; sentences: $t = 64$, NS). In the Agent-Patient version, the reverse pattern was found. The number of NARRATIVE continuations was significantly above chance (participants: $t = 7.09$, $p < .001$; sentences: $t = 6.25$, $p < .001$), whereas the number of RESULT continuations was no different from chance (participants: $t = 2.09$, $p < .05$; sentences: $t = 1.65$, NS).

Impact sentences.   The results were the same as those for judgement sentences. The preferred choice of continuation depended on the sentence version. In the Patient-Agent versions, the number of RESULT continuations was significantly above chance (participants: $t = 11.83$, $p < .001$; sentences: $t = 16.10$, $p < .001$), whereas the number of NARRATIVE continuations was no different from chance (participants: $t = 1.43$, NS; sentences: $t = 2.45$, $p < .03$). In the Agent-Patient version, the reverse pattern was found. The number of NARRATIVE continuations was significantly above chance (participants: $t = 6.32$, $p < .001$; sentences: $t = 5.75$, $p < .001$), whereas the number of RESULT continuations was no different from chance (participants: $t = 1.05$, NS; sentences: $t = 1.33$, NS).

One possible reason for the failure of *next* to show an Agent-preserving effect is that the participants might have found the task too difficult when presented with Patient-Agent sentences and so resorted to a superficial first mention strategy for interpreting the pronoun rather than choosing the Agent as the referent. If this had happened, we would expect the Patient-Agent sentence fragments plus continuations to be less coherent than the Agent-Patient fragments plus continuations. Such a possibility seems unlikely for two reasons. First, informal observation suggested that the participants had no difficulty constructing the continuations, and second, the type of continuation produced was very consistent, a result that would not be expected if the participants are producing incoherent continuations. However, to check this possibility further, a sample of 16 Agent-Patient and 16 Patient-Agent sentence fragments plus continuations were presented to an independent group of eight participants. The sample included both judgement and impact sentences. The participants were asked to rate the fragments plus continuations for comprehensibility on a five point scale, where five represented completely comprehensible and one completely incomprehensible. The results showed no significant difference between the two versions (both Fs < 1). The means were 3.99 for Agent-Patient sentences and 4.01 for Patient-Agent sentences.

Continuations for Whereupon. The percentage of RESULT and NARRATIVE continuations when the connective was *whereupon* is shown in Table 9. As before, one sample *t*-tests were carried out on the continuations where the pronoun referred to the preferred referent (the Patient). As was the case with *next*, chance level was estimated at 17% and the alpha level was set at .01. There were 63 DFs in the participants analyses and 15 DFs in the sentences analyses.

Judgement sentences.   The results were as expected. RESULT continuations were significantly greater than chance in both sentence versions (Patient-Agent: participants: $t = 17.87$, $p < .001$; sentences: $t = 11.77$, $p < .001$; Agent-Patient: participants: $t = 9.05$, $p < .001$; sentences: $t = 15.32$, $p < .001$), whereas NARRATIVE continuations were significantly below chance in both sentence versions (Patient-Agent: participants: $t = 4.25$, $p < .001$; sentences: $t = 3.58$, $p < .004$; Agent-Patient: participants: $t = 7.51$, $p < .001$; sentences: $t = 5.26$, $p < .001$).

Impact sentences.   The results were the same as for judgement sentences. RESULT continuations were significantly greater than chance in both sentence versions (Patient-Agent: participants: $t = 20.78$, $p < .001$; sentences: $t = 26.16$, $p < .001$; Agent-Patient: participants: $t = 9.97$, $p <$

TABLE 9
Percentage of Result and Narrative Continuations in the *Whereupon* Conditions of Study 3 where the Pronoun Referred to the Preferred Thematic Role

Type of verb	Sentence version	Type of completion	
		Result	*Narrative*
Judgement	**Patient**-Agent	**73**	07
	Joseph was criticised by Patrick whereupon he	*defended himself.*	*also criticised by Bill.*
	Agent-**Patient**	**58**	05
	Patrick criticised Joseph whereupon he	*defended himself.*	*told him to correct the mistakes.*
Impact	**Patient**-Agent	**82**	04
	Joseph was hit by Patrick whereupon he	*burst into tears.*	*was threatened by Bill.*
	Agent-**Patient**	**62**	03
	Patrick hit Joseph whereupon he	*expected Joseph to cry.*	*kicked Peter.*

Notes: The preferred thematic role is in bold in the table, and the most frequent continuations are also in bold. Example fragments are shown in the Sentence Version column. Examples of completions are shown in the Result and Narrative columns.

.001; sentences: $t = 15.56$, $p < .001$), whereas NARRATIVE continuations were significantly below chance in both sentence versions (Patient-Agent: participants: $t = 9.26$, $p < .001$; sentences: $t = 6.71$, $p < .001$; Agent-Patient: participants: $t = 9.61$, $p < .001$; sentences: $t = 9.04$, $p < .001$).

Discussion. The results for *next* support the focusing hypothesis. The attention directing properties of the connective determine the choice of pronominal referent. More crucially, this choice of referent was not consistently paired with a specific coherence relation. Thus, when focusing and coherence relations are dissociated, it is focusing that determines the choice of pronominal referent, not the coherence relation. However, the coherence relation did vary as a function of the thematic role of the pronominal referent. When the pronominal referent was an Agent, NARRATIVEs were selected; when the referent was a Patient, RESULTs were selected. With *whereupon*, the results, as in the previous studies, were consistent with both hypotheses, thus confirming our general claim that, whenever possible, people strive to keep the pronominal referent aligned with the focused entity, verb semantics, coherence relations. Finally, as with the interpretation of the pronouns, the choice of coherence relation was the same for both judgement and impact verbs, thus showing that the findings are not specific to interpersonal verbs.

GENERAL DISCUSSION

Overall, our results support three main conclusions. First, the focusing hypothesis rather than the relational hypothesis gives the best explanation of pronominal interpretation; second, when focusing and the coherence relation diverge, then the coherence relation remains closely tied to the thematic role of the pronominal referent; and third, wherever possible, people strive to maintain consistency among focusing, verb semantics, coherence relations and the interpretation of the pronoun. In the discussion that follows, we review these three conclusions and consider their implications for pronoun comprehension. In doing so, we supplement our view of pronoun comprehension based on semantic factors by discussing how structural factors might also fit into our overall model. We also suggest that the observed link between thematic roles and coherence relations makes explicit the link between a represented entity and a represented event. We then review the functions of connectives revealed by our results.

The main support for our first conclusion, that focusing best explains pronoun interpretation, comes from Study 3. In that study, we used specific connectives that made it difficult for participants to select a particular interpretation of the connective in order to maintain consistency between

all the relevant factors. One of those connectives, *next*, also allowed us to generate alternative predictions for the two hypotheses. The results showed that pronominal interpretation was consistent with the prediction based on the focusing hypothesis rather than the relational hypothesis: participants preferred to interpret the pronoun as referring to the first mentioned referent but they did not select a unique coherence relation to accompany this choice of pronominal referent. Instead, the coherence relation depended on the thematic role of the selected referent. Additional support for the view that focusing best explains pronominal references comes from the BACKGROUND continuations in Study 2. In that study, BACKGROUND relations were associated with the first mentioned referent, whereas the preferred pronominal referent was the (focused) thematic role associated with the endpoint of the described eventuality irrespective of its position in the fragment. Hence we conclude overall that the focusing hypothesis gives the best explanation of the choice of pronominal referent.

Our study has concentrated on semantic focusing. However, there is considerable support for the idea that structural factors also affect pronoun resolution (Gordon, Grosz, & Gilliom, 1993; Hudson-D'Zmura, 1988; Hudson, Tanenhaus, & Dell, 1986; Hudson-D'Zmura & Tanenhaus, 1998). Indeed, in their original study, Stevenson et al. (1994) found a first mention effect as well as semantic effects in their first two experiments: The default preference for the thematic role associated with the endpoint of the described eventuality was greater when the preferred thematic role was also the first mentioned referent. Thus, focusing, and hence pronoun resolution, are influenced by structural as well as semantic factors. The influence of both semantic and structural factors is also apparent in the choices of pronominal referent in our Study 3. Table 7 shows the percentages of references to the first mentioned individual. It can be seen from the table that when the first mentioned referent was the preferred pronominal referent, as when the connective was *next*, the preference was always greater when the thematic role associated with the endpoint was also mentioned first. That is, there were more references to the first mentioned individual in Patient-Agent versions than in Agent-Patient versions. On the other hand, when the thematic role associated with the endpoint of the event (that is, the Patient) was the preferred pronominal referent, as when the connective was *whereupon*, the preference was always greater when the Patient was mentioned first rather than second (82% vs. 74% for judgements and 88% vs. 78% for impacts). Thus, our results support the idea that the greater the number of factors favouring a particular pronominal interpretation, the greater the likelihood of that interpretation being given and, we would predict, the more rapidly the pronoun should be interpreted.

However, it is not always the case that structural and semantic factors jointly contribute to focusing. In Stevenson et al.'s Experiment 3, using *so* and *because*, there was no evidence of a first mention effect, except for transfer fragments containing *because*. Thus, semantic focusing can occur alone, and an important task for future research is to determine the conditions under which one kind of focusing or the other (or both) may appear. For the moment, we note that a similar situation may also be the case with the match between a specific discourse entity and the coherence relation. So far, we have claimed that the match is between a particular thematic role and a coherence relation. However, our results for BACKGROUNDs in Study 2 suggest that structural factors may also be implicated in the match between a particular entity and coherence relation. BACKGROUNDs in Study 2 were associated with first mentioned pronominal referents, not with the thematic role of the referent. However, the numbers of BACKGROUNDs were very small in Study 2, so without further work, it is not clear how much weight should be attached to this finding. Our main point remains that both semantic and structural factors, as well as other factors, can influence focusing and hence pronoun resolution.

These results concerning focusing are consistent with a dynamic view of focusing in which the focus changes during the course of comprehension as a function of each new input (Stevenson, 1996). Initially, the individual mentioned first in an utterance will be in focus, then, if an event verb is encountered, the focus shifts towards the thematic role associated with the endpoint of the described event. If this thematic role is mentioned first, then the focus stays on the first mentioned entity, but if it is mentioned second, then the focus shifts to the second mentioned entity. If a connective is then encountered, the resulting focus is modified yet again according to the attention directing properties of the connective. The most accessible referent of a pronoun is the one that is the most highly focused at the end of this dynamic process. A similar process occurs when the utterance contains a state verb, except that in this case the verb does not influence focusing. (See Stevenson & Urbanowicz, submitted, for empirical support for such a dynamic model.) Although we have only discussed this dynamic model in terms of focusing, both semantic and structural, it is likely that other features of the input also influence pronoun comprehension. Such additional features not only include verb semantics and coherence relations, but also such features as contrastive stress, and tense and aspect, as well as idiosyncratic features of the verbs within the categories we have studied. A complete model of pronoun comprehension would include all of these factors.

Our dynamic model also has implications for the time course of comprehension. In particular, it implies that the pronoun will be

interpreted immediately it is encountered as long as it is highly focused, for example, by being favoured by both structural and semantic focusing. Such a proposal is consistent with the results of Garrod et al. (1994), who found that as long as the pronominal referent was in focus, then comprehension of the pronoun was immediate. However, comprehension was delayed when the pronoun referred to the non-focused referent. We suggest that in these latter circumstances, interpretation is delayed until the coherence relation is identified. For example, in a sentence such as *John hit Bill and he kicked him too*, structural focusing favours John (the first mentioned referent), whereas the verb favours Bill (the Patient). However, the connective is ambiguous between a NARRATIVE reading, which would favour the Agent and hence reinforce the focus on the first mentioned referent, and a RESULT reading, which would reinforce the focus on the Patient. Consequently, the comprehender will not be able to interpret the pronoun until the coherence relation (a NARRATIVE) has been identified. Although this account is compatible with our data, it is not strictly confirmed by our data, since we only used an off-line sentence continuation task. The account predicts though, that in a reading time task, reading times for the clause containing the pronoun should be facilitated most when there is more than one feature favouring the same entity, and the coherence relation turns out to be consistent with that entity. Conversely, reading times should be impeded when there is no strongly focused entity so that the coherence relation has to be determined in order to interpret the pronoun (as in the above example). Furthermore, reading times should be most impeded when focusing selects one individual as the referent for the pronoun but the coherence relation selects the other. This would be the case in *John hit Bill. Next he kicked him back*, where focusing favours the Agent as the pronominal referent whereas the RESULT coherence relation favours the Patient.

Our second conclusion was that when the above consistency is not possible, the coherence relation and the thematic role of the pronominal referent remain closely coupled. This conclusion is based on the results of Study 3. In Study 3, the preferred pronominal referent was the first mentioned entity, that is, the focused entity. However, there was no consistent relationship between the choice of coherence relation and the choice of pronominal referent. Instead, when the pronominal referent was an Agent, NARRATIVEs were preferred, and when the pronominal referent was a Patient, RESULTs were preferred. Thus, we conclude that when the focused entity is not a unique thematic role, the coherence relation remains closely linked to the thematic role of the focused entity. Focusing therefore determines the pronominal referent but the thematic role of the referent stays in line with the coherence relation. Hobbs (1979) was the first to propose a relational view of pronoun resolution, arguing

that pronouns are interpreted as a by-product of discovering the coherence relations within a text. Our results do not support his view. However, they do support a weaker view in which coherence relations may contribute to pronoun resolution when there is no focused entity and in which the coherence relation is strongly linked to the thematic role of the pronominal referent.

Why should the thematic role of the pronominal referent be aligned with the coherence relation? One possibility is that the thematic role provides the link between a represented entity and the represented event. In the Introduction, we suggested that focusing affects the status of entities in a mental model whereas coherence relations affect the inter-relationships between events. However, such a distinction leaves open the question of how represented entities fit into the represented event. That is, we also need to specify a function that links the entities to their roles in the represented events. The most likely candidates to fulfil this function are thematic roles, since they specify the semantic roles occupied by the entities in the described events. This notion of roles as linking the representations of entities and events is similar to Sanford and Garrod's (1981) notion of roles, except that Sanford and Garrod think of roles in terms of their linguistic expression (that is, definite descriptions) whereas we think of them in terms of their semantics. The need for such a link would explain our results for *next*. By aligning the thematic role of the focused entity with the relevant protagonist in the next event, the fit between a represented entity and its role in the represented event can also be captured, even when the focused entity itself does not pick out a unique thematic role.

Our third conclusion was that people strive to maintain consistency among the focused entity, the semantics of the verb, the coherence relation, and the pronominal referent. This conclusion was based on the results of Studies 1 and 2, particularly the results for transfer verbs. Taking the results as a whole, the most striking finding in the first two studies was that the interpretation of the pronoun coincided not only with the focused entity but also with the coherence relation. Further, with transfers, participants interpreted *so* in its PURPOSE sense (Study 1) and *and* in its NARRATIVE sense (Study 2). This was in contrast to action and state fragments where both *so* and *and* were interpreted in their RESULT sense. We argued that this finding with transfers arose because participants tried to avoid RESULTs since RESULTs violated the meaning of the transfer verb—that it enables a subsequent event rather than causes it. This response to the semantics of transfer verbs was made possible, we suggest, because of the ambiguity of the connective, which was exploited in order to maintain consistency between focusing and coherence relation when selecting a pronominal referent.

However, there is also considerable leeway in how the variables relate to each other and the processes concerning focusing and coherence relations may be more loosely coupled than we have implied. It is possible, for example, for a pronoun to refer to a non-focused referent and there was always a minority of such cases in our data. For example, in *Joseph hit Patrick. Next he hit him back*, the pronoun, *he*, refers to the Patient, the second mentioned individual, which is not the focused individual. This is an example where the choice of coherence relation (RESULT) was consistent with the pronominal referent, in accordance with the relational hypothesis, whereas the choice of referent was not consistent with the focusing hypothesis. Similarly, there was a more sizeable minority of cases in which the pronoun referred to the focused entity but the coherence relation was not consistent with the thematic role of the pronominal referent. For example, in *Stephanie blamed Kim. Next she made a citizen's arrest*, the pronoun refers to the Agent, which is the focused entity. But the relation is best characterised as a RESULT rather than a NARRATIVE and we would normally expect a RESULT to be associated with a Patient rather than an Agent. We can also find cases in which both the pronoun refers to the non-focused entity and the coherence relation is inconsistent with the thematic role of the pronominal referent as in the following example, *Joseph hit Patrick whereupon he apologised saying he meant to hit Bill*. In this example, the pronoun refers to the Agent whereas the focused entity is the Patient, and the coherence relation is a RESULT, which is normally associated with the Patient. Thus, we regard notions like focused entity, coherence relation, and verb semantics as pressures that favour one potential pronominal referent over another, not as hard constraints.

Our results also highlight the importance of the connective not only for focusing, through its attention directing properties, and for interpreting of the coherence relation, through its lexical meaning, but also for selecting either a causal or a temporal interpretation of the first clause. All but one of the connectives we used brought into focus the thematic role associated with the endpoint of the described eventuality. The remaining connective, *next*, brought the first mentioned entity into focus. The meaning of the connective also constrained the possible coherence relations; *so* permitted either RESULT or PURPOSE; *and* permitted RESULT, NARRATIVE and, less frequently, BACKGROUND; *whereupon* strongly favoured RESULT and *next* favoured NARRATIVE but also allowed RESULT if the pronominal referent was a Patient. The connectives we used also selected either the causal or the temporal interpretation of a clause. Connectives with a causal meaning, such as *because*, *so*, *and*, and *whereupon*, select the causal interpretation of a clause. By contrast, the temporal connective, *next*, like *then*, selects the temporal interpretation of the clause. All in all, therefore, the connectives play a pivotal role in a

number of aspects of comprehension: they contribute to the focusing of entities in a mental model of the discourse; they constrain the interpretation of the coherence relation; and they affect the interpretation given to the preceding clause, as having either a causal or a temporal structure.

In summary, we have contrasted a view of pronoun resolution that says the focused entity is most likely to be chosen as the referent of the pronoun with a view that says the coherence relation between the clause containing the potential referents and the one continuing the pronoun also contributes to the choice of a pronominal referent. In Studies 1 and 2, we found that people aim to maintain consistency between the meaning of the verb, the focused entity, the coherence relation and the referent of the pronoun. Transfers behaved differently from actions and states because their meaning does not favour a RESULT relation. We then described a study in which we used two specific connectives. One, *whereupon*, was expected to behave like result-*and* with actions and states and like narrative-*and* with transfers. The other, *next*, was expected to produce a dissociation between the focused entity and the coherence relation and we wished to observe the effects of such a dissociation. The results confirmed our expectations and we found that *next* directed attention to the first mentioned individual by focusing on the temporal rather than the causal structure of the described event. Hence the pronouns referred to this structurally focused entity. We also found that the participants produced NARRATIVEs when the first mentioned individual was an Agent, whereas they produced RESULTs when the first mentioned referent was a Patient. Thus the referent of the pronoun was the structurally focused entity but the coherence relation depended on the thematic role of the referent.

We discussed these results in relation to the relative contributions of focusing and coherence relations to the choice of a pronominal referent and reached a number of, sometimes tentative, conclusions. First, we concluded that during comprehension, what is in focus changes dynamically as a function of each new input. Second, we concluded that a pronoun is immediately interpreted as referring to the most highly focused entity if there is one, but that in the absence of a highly focused entity, pronoun resolution is delayed until the coherence relation is known and so can contribute to the pronoun's interpretation. We also concluded that there are likely to be other pressures on pronoun interpretation besides the ones we have considered, and that the greater the number of pressures that favour a particular interpretation, the faster should be the interpretation of the pronoun. Fourth, we concluded that the link between thematic roles and the coherence relation, which is maintained even when the pronominal referent is not a specific thematic role, serves the function of mapping a represented entity into its relevant role in the represented event. Finally, we concluded that connectives play a pivotal role in comprehension,

having three distinct functions: an attention directing function, a function for constraining the possible coherence relation between the two connected events, and a function for interpreting a clause as having either a causal or a temporal structure.

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