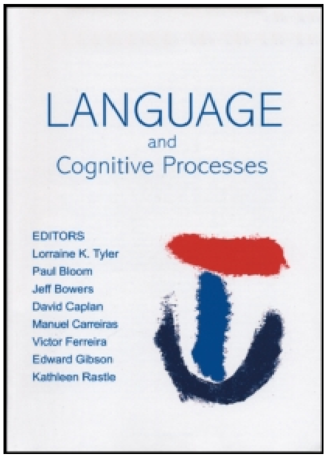

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Event processing through naming: Investigating event focus in two people with aphasia

Deborah Cairns and Jane Marshall
Department of Language and Communication Science, City University, London, UK

Paul Cairns
UCL Interaction Centre, University College London, London, UK

Lucy Dipper
Department of Language and Communication Science, City University, London, UK

Some people with aphasia may have trouble with verbs because of fundamental difficulties in processing situations in a way that maps readily onto language. This paper describes a novel assessment, the Order of Naming Test, that explores the conceptual processing of events through the order in which people name the entities involved. The performance of non-brain damaged control participants is described. The responses of two people with non-fluent aphasia are then discussed. Both 'Helen' and 'Ron' showed significant difficulty with verbs and sentences. Ron also had trouble on a range of tasks tapping aspects of event processing, despite intact non-verbal cognition. While Helen's performance on the Order of Naming Test was very similar to the controls, Ron's differed in a number of respects, suggesting that he was less focused on the main participant entities. However, certain aspects of his response pointed at covert event processing abilities that might be fruitfully exploited in therapy.

Correspondence should be addressed to: Jane Marshall, Department of Language and Communication Science, City University, Northampton Square, London EC1V 0HB, UK. E-mail: j.marshall@city.ac.uk

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INTRODUCTION

It is well known that some people with aphasia have particular difficulty with verbs (Berndt, Mitchum, Haendiges, & Sandson, 1997a; Edwards & Bastiaanse, 1998; Kim & Thompson, 2000; Thompson, Lange, Schneider, & Shapiro, 1997; see Druks, 2002 for review). This has often been associated with 'agrammatism' (Saffran, Schwartz, & Marin, 1980), though not in every case (Berndt, Haendiges, Mitchum, & Sandson, 1997b; Marshall, Chiat, & Pring, 1997). One of the possible causes of trouble with verbs and sentences is a difficulty at the conceptual level (Garrett, 1980; Levelt, 1989, 1999; see Dipper, Black, & Bryan, 2005 for review). This is the level at which messages are constructed for expression by the language system. For example, Levelt (1989) proposes that, in preparing to describe an event, one of the tasks achieved at the conceptual level is the formulation of the event's propositional structure. This maps out the main actors and their roles and forms the basis of the verb argument structure to be created by the language formulator. The formation of an event structure that can be readily mapped onto available language is a fundamental aspect of what Slobin (1996) terms 'thinking for speaking'. An impairment at the conceptual level would be reflected in difficulty in forming such a useful event structure.

It is difficult to assess the conceptual level in aphasia, as it requires the use of tasks that do not demand 'later' stages of language production. Sentence production or more complex narrative tasks such as those used by Sridhar (1988), for example, would be problematic for many people with aphasia. Tasks may of course be adapted to a format in which the participant selects a response from given options (as in Dipper, 1999). But this limits the range of available responses, and may bear little relationship to what happens in spontaneous production.

Despite such difficulties of assessment, a number of people with aphasia have been identified who appear to have difficulty at this level. MM (Marshall, 1994; Marshall, Pring, & Chiat, 1993) had non-fluent output with very limited access to verbs or sentences. She fared better with nouns, and indeed when trying to describe events tended instead to produce names of peripheral objects. MM had difficulty on tests that required no production, but simply tapped her thinking about events. For example, the Role Video requires the person to select a photograph that represents the outcome of a filmed event from distractors. While controls and many people with aphasia score at ceiling on this test, MM made five errors, all of them on reversible items involving two people. On the Event Perception Test (Marshall, Chiat, & Pring, 1999) MM scored 50/60, well below the normal range. This suggested that she had difficulty in conceptualising events and their role structure in a way that would drive verb selection. Furthermore, a therapy programme aiming to improve event conceptualisation brought about significant gains in verb and sentence production.

LC (Byng, Nickels, & Black, 1994) had very limited output and, when she was able to access language, it consisted almost entirely of single words. She was significantly more successful at naming nouns than verb homonyms. LC also performed at chance on a task in which she had to distinguish pictures of events from non-events. Therapy succeeded in helping her to form a conceptual representation of one type of pictured event, namely events with a single animate agent. However, she still had difficulty in identifying events and their participants if more than one event was shown in the same picture. LC seemed still to find it difficult to distinguish participants in an event labelled by a particular verb from other non-participant entities shown in the same picture.

In different ways, both MM and LC had difficulty in adopting a focus over events that could be readily translated into language. One way in which a difficulty at the conceptual level may manifest is in the production of a large number of extraneous noun phrases. Like MM, people may produce a large number of phrases that do not refer to core event participants (e.g., EM; Dean & Black, 2005). Alternatively, they may name instruments and other objects as well as agents and themes in place of verbs (Kemmerer & Tranel, 2000). These observations suggest that naming patterns may be informative about event conceptualisation. This idea is pursued in the current investigation.

This paper presents a novel approach for investigating the conceptual processing of events: The Order of Naming Test. The test explores the order in which a person names the entities involved in a pictured event. In a subsequent condition the person is asked to describe the same events in sentences, so allowing a comparison between their naming and sentence order. In the first part of the paper we show that for non-brain damaged controls, there is a significant relationship between naming and sentence order. This indicates that even in the pure naming task some level of event processing is taking place. The result also suggests that the test may be informative about event processing with people with aphasia, particularly when naming skills are relatively intact. Results from two people with aphasia are then presented, both of whom had verb and sentence impairments. One showed a pattern that mirrored the controls. The other showed a pattern that was different from the controls in several respects. His naming order hinted, however, at an important ‘covert’ skill, by uncovering an appreciation of causal agency. The implications of this data with respect to event processing are discussed.

TEST DESIGN AND CONTROL TESTING

The test consisted of simple action scenes presented as black and white line drawings. Each scene involved three main entities[1]: either a person acting upon another person with an instrument, or a person acting upon an object with an instrument. Examples of each type are illustrated in Figures 1 and 2.

Two versions of the test were prepared. The first consisted of the scenes presented on separate sheets of A4 paper (the 'event version'). The second version consisted of the same entities, in the same combinations, but arranged in triangular arrays (the 'array version'). The position of the entities within the arrays was balanced, so that agent, theme, and instrument each occupied the top position in one third of the items. An example of an array is shown in Figure 3.

Participants took part in two testing sessions, held at least one week apart. In the first session, they were shown the event version of the test and were asked to 'Name the things that you see'. They were specifically requested not to offer a description of the events. In the second session, they were shown the array version of the test, and were again instructed to name what they could see. Finally, they saw the event version once again, and were asked to

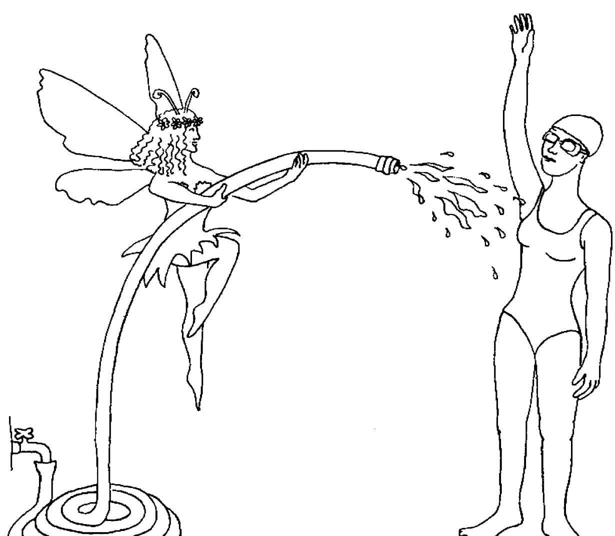

Figure 1. 'The fairy sprays the swimmer with a hose'.

[1] The term 'entity' is used to denote both complement arguments and adjuncts such as instruments.

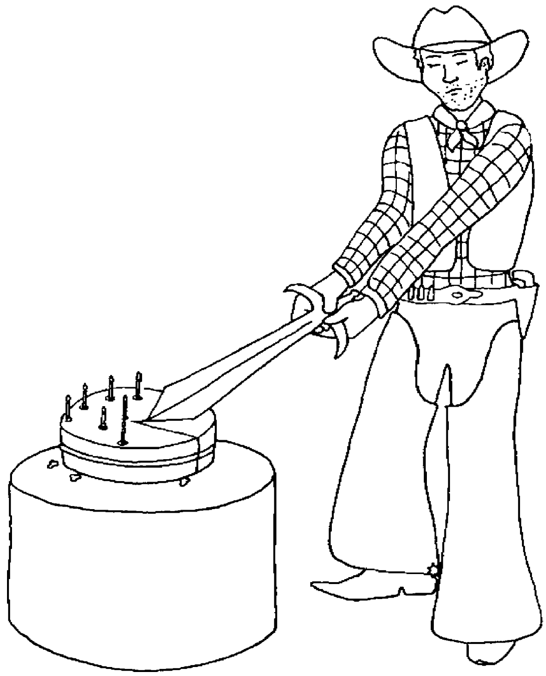

Figure 2. 'The cowboy cuts the cake with a sword'.

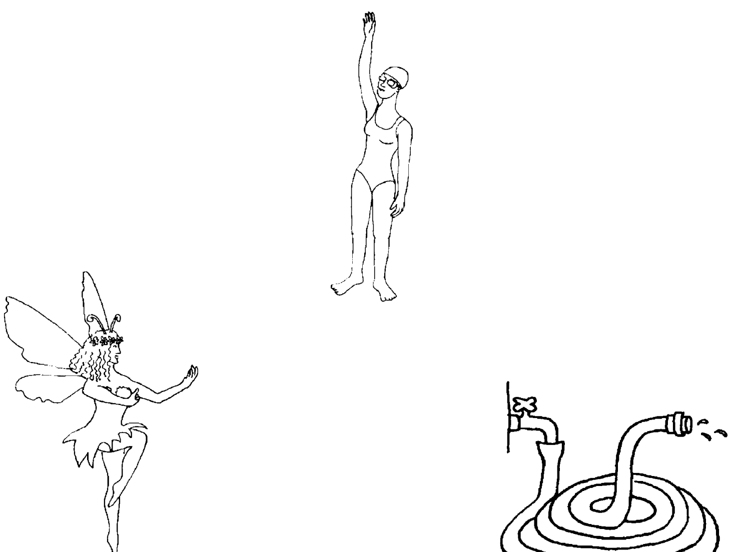

Figure 3. Array version of 'fairy/swimmer/hose' item.

TABLE 1
Test conditions and stimuli

Session no.	*Stimuli*	*Task*	*Rehearsed?*
1	Event version	1. Naming from Events	Yes
2	Array version	2. Naming from Arrays	Yes
	Event version	3. Sentence description	No

describe each picture with a simple sentence, with the instruction, 'Say what is happening in each picture'. In each condition, the order in which participants named the three target entities was recorded. Table 1 summarises the test regime.

A rehearsal mechanism was included which aimed to maximise name agreement. Names of entities were rehearsed before both Naming from Events and Naming from Arrays. The test items were subdivided into blocks of four (and one block of five). Before each block was presented, participants were shown cards with pictures of the individual entities involved in those events, and their names were spoken aloud. Thus before each block either 12 or (in one case) 15 names were rehearsed. The order in which entities' names were rehearsed within each block was randomised, so as to minimise any influence on participants' focus within the test. We were careful not to rehearse entities relating to the first item in each block immediately before that item appeared.

Control of test stimuli

The test items were controlled in various ways. Any difference in accessibility between words of different grammatical class was controlled by requiring participants to name only nouns. Within each item, the three main entities were matched for frequency (Francis & Kucera, 1982) and familiarity (Toglia & Battig, 1978). In order to achieve frequency-matched triads, it was important that animate entities should not be named simply as 'man', 'woman', etc. The target names for the animate entities were therefore much more specific, either being related to their intrinsic nature (e.g., wizard, fairy), or to their occupation (e.g., cowboy).

It was also important to control for aspects of visual salience that might influence order of naming. Target entities were, as far as possible, of a similar size. The left-right orientation of the scenes was also balanced. Agents therefore appeared on the left and right hand sides in equal numbers of items, and the direction of the action was balanced between left-to-right and right-to-left.

Exclusion of items from the final set

There were some items on which control participants failed to name all three target entities consistently, either because they omitted an obligatory entity or because they used an alternative name. Items were removed from the analysis if this occurred on 10% or more of control responses over all conditions (i.e., on six or more occasions overall). Five items were excluded in this way. One further item was omitted because there was no overall agreement about who was the agent in the picture (with two contrasting sentence frames featuring equally in the control responses). The final test comprised 27 items, 15 showing a person acting upon an object, and 12 showing one person acting upon another.

Two exceptions were allowed to the exclusion rule:

1. Where sentences were produced without mentioning the instrument, participants were credited with having implicitly named the instrument in the final position (e.g., 'The magician cuts the trousers [with scissors]').
2. Synonyms of the target names were also credited (as listed in *Roget's Thesaurus of English Words and Phrases, 1962*).

Exception 1 was allowed since a number of accurate sentence descriptions were produced that did not mention instruments. This was judged to be a normal way of describing actions in English, as instruments are not obligatory complements of the predicate. This exception accounted for 179/540 sentences in total (33.4%). The range was 0–21, with a mean of 8.95.

Twenty-seven synonyms were permitted as a result of exception 2, accounting for 13.6% of the naming responses. Their frequency values were checked, to ensure that targets were not consistently being replaced with higher frequency synonyms. In fact only 8 of the 27 permitted synonyms were of higher frequency than the targets.

Control participants

Twenty non-brain damaged control participants completed the test (see details in Table 2). They were not informed about the purpose of the experiment beforehand.

ANALYSIS AND RESULTS

Three main analyses of the data were performed, focusing on the number of entities named, the number of agents named first, and the order of naming in

TABLE 2
Control participants

Participant	*Age*	*Sex*	*Age on leaving full-time education*	*Most recent occupation*
1	36	F	22	Charity worker
2	43	F	16	Office administrator
3	45	M	18	Building surveyor
4	46	F	18	Security guard
5	47	F	22	Student
6	49	F	15	School caterer
7	50	M	19	Facilities manager
8	50	F	20	Charity worker
9	52	M	16	Company director
10	56	F	18	Hospital administrator
11	58	F	15	Personnel officer
12	59	F	16	Teacher
13	62	M	16	Teacher
14	66	M	18	Local government administrator
15	67	F	18	Secretary
16	67	F	12	Housekeeper
17	71	M	22	Pensions manager
18	71	F	22	Housewife
19	72	F	17	Bank manager
20	75	F	12	Clerical worker
Mean (*SD*)	57.1 (11.4)		17.6 (3.02)	

the different conditions. The following sections present the method and results of these analyses for the control participants.

Number of entities named

Control participants varied little in the number of entities they named in each condition. In the event condition the mean number named was 3.01 ($SD = 0.03$). In the array condition it was 3 (without exception). In the sentence condition the mean fell to 2.69, with *SD* of 0.27. Figure 4 presents a further breakdown of the controls' responses.

Agency

The number of items on which agents were named first in each condition was calculated and compared with chance, using a single sample *t*-test. Controls named agents first on approximately two-thirds of the event items (mean = 18.8, $SD = 3.90$). This was significantly above chance ($t = 11.2$, $p \leq .001$).

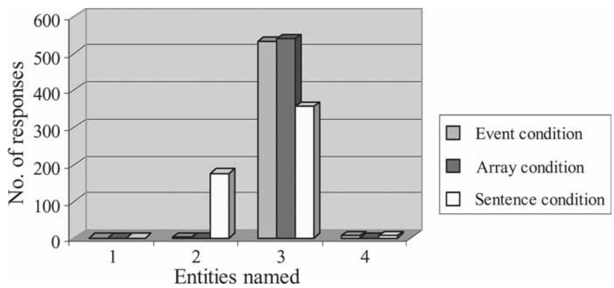

Figure 4. Number of entities named by controls by condition.

In naming from arrays the number of agents mentioned first was close to chance (mean $=9.25$, $SD=0.72$, $t=1.56$, not significant). Agents were named first in a significant majority of items in the sentence condition (mean $=25.4$, $SD=0.67$, $t=109$, $p\leq.001$).

Two further analyses probed the relative influence of agency and animacy. The first considered responses in the array condition. Having established that controls did not show any tendency to name agents first in the arrays, this analysis further considered whether animate entities would be preferred over inanimate. The number of animate entities named first was calculated for the subset of arrays involving only one animate entity. On these 15 items, control participants named the animate entity first on a mean of 5.4 items. This was not significantly different from chance, suggesting that, just as with agency, there was no particular 'pull' towards animate entities in the array condition.

The final analysis in this section aimed to tease apart the relative influence of agency and animacy. This analysis considered only the subset of 12 items involving two animate entities. The number of first-named agents in each condition was calculated and compared to chance using a single sample t-test. Results for this analysis are presented in Table 3.

This analysis confirmed that when naming from or describing events, controls were strongly predisposed to mention agents first, even when two

TABLE 3
Number of agents named first in two-animate entity items ($N=12$)

Participant		*Naming from events*	*Naming from arrays*	*Sentences*
Controls	Mean score	7	3.80	11.8
	Standard deviation	2.05	1.06	0.64
	Standard error	0.46	0.24	0.14
	Expected score	4	4	4
	t	6.54	0.85	54.3
	Level of significance	$p\leq.001$	not sign.	$p\leq.001$

animate entities were present in the picture. As previously, there was no tendency to name agents first in the array condition.

Order of naming

This analysis focused on the order in which participants named the target entities in the different conditions. This aimed to identify whether order of naming was related to a possible language frame (sentence order), or to a non-linguistic factor (page position).

The assessment had yielded the order in which participants had named the target entities in three different conditions. These orders of naming were then compared, two by two. For each comparison, a score was derived for each participant that reflected the closeness of fit between their orders of naming in the two conditions. The similarity between the orders of naming in each pair of conditions was compared to the pattern that would be expected by chance, using a single sample *t*-test. In each case the group's mean score was compared against the chance score.

Seven comparisons were made, as follows:

1. Each participant's order of naming from events was compared with their order of naming in their own sentences. The null hypothesis was that order of naming from events was not related to sentence order.
2. Each person's order of naming from events was compared with the group's modal sentence order for each item. The null hypothesis was that order of naming from events was not related to the modal sentence order.
3. Order of naming from events was compared with the page position or left-right order of the entities, in order to probe a possible effect of English reading order. Here the null hypothesis was that order of naming from events was not related to English reading order.
4. Order of naming from events was compared with the right-left order of the entities. This investigated the possibility that people might name in a way that was principled, but related neither to language nor to reading. In this case the null hypothesis was that order of naming from events was not related to right-left order.
5. Each person's order of naming from arrays was compared with their own sentence order. The null hypothesis was that order of naming was not related to sentence order.
6. Order of naming from arrays was also compared with English reading order. As the entities were here presented in a triangular pattern, English reading order was taken as top-down and left-to-right. The comparison was therefore with the order of the entities in top-left-right

positions. The null hypothesis was that order of naming from arrays was not related to reading order.

7. Order of naming from arrays was compared with the top-right-left order of the entities in the array pictures. Like comparison 4, this was included to probe for any right-to-left bias in naming order. The null hypothesis here was that order of naming from arrays was not related to right-left order.

Scoring method for order of naming analysis

The method of scoring for each comparison of naming orders was based on the calculation for the Kendall Rank Order Correlation Coefficient (Siegel & Castellan, 1988). In this calculation, each pair of entities is considered in the two conditions being compared. A mark is added to the score for each pair that occurs in the same order in the two conditions. Scores are therefore given for the closeness of 'fit' between the orders of naming in the two target conditions. For a comparison of three entities there are three distinct pairs to be considered; each score is therefore out of a maximum of 3. This system is illustrated in Table 4.

The total possible score for any condition was 81 (i.e., 3×27). For each item, there were six possible orders of naming. The chance score for any item was therefore 1.5 (the sum of possible scores divided by 6). The chance total score for each pair of conditions being compared was 40.5 (i.e., 1.5×27).

It might be argued that a Bonferroni correction should be used, because of the number of *t*-tests performed. Against this, we might argue that the analysis only considers a subset of the possible comparisons, four of which relate to order of naming from events while three consider naming from arrays. We therefore discuss the results both with and without a Bonferroni correction. Results that did not reach significance when the Bonferroni correction was applied are marked with an asterisk.

TABLE 4
Scoring system for comparison of orders of naming

Order of entities in condition 1	*Order of entities in condition 2*	*Score*
abc	abc	3
abc	acb	2
abc	cab	1
abc	cba	0
abc	bca	1
abc	bac	2

Results of order of naming analysis

Table 5 presents the results relating to naming from events. This indicates that order of naming from events was highly significantly related both to the controls' own sentence order and to the group's modal sentence order. (The two are clearly correlated.) The modal order used for the majority of sentences was that of agent, theme, instrument. This pattern was preferred for 23 of the 27 items, and was used in over 75% of all sentences produced.

At first glance the table suggests that page position was also exerting an influence over order of naming from events. However, this may be deceptive. The relationship between order of naming and the right-left order was significantly *below* chance, indicating that this was a very unlikely order of production. The relationship between order of naming and left-right order was only just significant, and in fact was no longer so when a Bonferroni correction was applied.

This rather inconclusive result stimulated an additional analysis exploring the influence of page position. This analysis considered responses to the 15 items in which a person was shown acting upon an object. Of these, seven showed the agent on the left acting on an object on the right (left-to-right items) and eight showed the opposite configuration (right-to-left items). Figure 5 shows an example of each type.

If left-right page position influenced production there should be a relationship between naming and left-right order for all items. If another factor such as the direction of the action influenced naming, this would not be the case. In this case we would expect the left-right order to manifest only when it was congruent with the direction of the action.

The analysis of the one-animate entity items therefore considered the controls' order of naming from events against the left-right order of the pictures, and did so for both left-to-right and right-to-left items. The null

TABLE 5
Scores for comparisons with order of naming from events

	Naming from events vs. own sentences	*Naming from events vs. modal sentences*	*Naming from events vs. left-right order*	*Naming from events vs. right-left order*
Mean raw score	51.3	52.3	47.3	32.5
SD	8.02	7.06	10.78	11.65
Standard error	1.79	1.58	2.41	2.60
Expected score	40.5	40.5	40.5	40.5
t score	6.02	7.48	2.82	3.07
Level of significance	$p \leq .001$	$p \leq .001$	$p \leq .05$*	$p \leq .01$

Figure 5. One-animate entity items: left-right and right-left orientations.

hypothesis was that the direction of the action was not related to the order of naming. The analysis compares the means of two subsets of scores, using a correlated groups *t*-test:

– Order of naming from events versus left-right order for left-to-right items
– Order of naming from events versus left-right order for right-to-left items.

The difference between the mean scores for the two subsets was compared with chance. A chance score represents the difference we should achieve if the null hypothesis were upheld, and order of naming was the same for both left-to-right and right-to-left items (i.e., 0). Results for this analysis are presented in Table 6. This suggests that the direction of the action significantly influenced order of naming. Indeed a left-right order of naming was evident only for pictures involving a left-right direction of action.

The next part of the analysis explored the order of naming from arrays (see Table 7).

Table 7 reveals one positive significant relationship, that is between naming order from arrays and the top-left-right order. It seems that the control participants adopted a reading-like order when naming the entities in an array. The comparison between array naming order and sentence order was also significantly different from chance. However, here scores were *lower* than chance and the significance did not survive a Bonferroni correction. There was no relationship between the top-right-left order and naming.

Discussion of the control data

The control data revealed four main findings:

- across all conditions, naming was restricted almost entirely to the three main entities (agent/theme/instrument)
- when naming from and describing events, controls had a strong tendency to mention agents first
- page position strongly influenced naming from arrays but only minimally influenced naming from events (if at all)
- the order of naming from events was strongly related to sentence order.

Each of these findings will be discussed in turn.

The first finding showed that controls' naming was highly constrained. This was hardly surprising given the rehearsal procedure that preceded the test. It did, however, confirm that controls were focused on the main entities. There was no tendency to name additional or peripheral objects, such as items of clothing or component parts of the instruments and themes.

TABLE 6
Order of naming for one-animate entity items

Mean score for left to right items	2.26
Mean score for right to left items	0.86
Mean difference score	1.40
Sum of difference scores	29.4
Standard deviation	0.08
t	7.84
Level of significance	$p < .001$

TABLE 7
Scores for comparisons with order of naming from arrays

	Naming from arrays vs. own sentences	*Naming from arrays vs. top-left-right order*	*Naming from arrays vs. top-right-left order*
Mean raw score	39.2	68.15	46.15
SD	2.61	12.29	15.65
Standard error	0.58	2.75	3.50
Expected score	40.5	40.5	40.5
t score	2.23	10.06	1.61
Level of significance	$p \leq .05$*	$p \leq .001$	*ns*

The second finding suggested that non brain-damaged speakers pay particular attention to the entity in the role of agent, and therefore adds to the evidence that agency may be a key concept in our thinking about events (see also Black & Chiat, 2000, 2003; Clark, 2001; Corrigan & Denton, 1996; Fisher, Hall, Rakowitz, & Gleitman, 1994). The data confirm that agency, rather than animacy, was the crucial factor, given that agents were named first even when there were two animate entities in the picture. They also suggest that agents were not simply named first because they were in some way visually salient, since naming from arrays showed no such effect.

The third finding was that page position only influenced naming order when participants were dealing with arrays. Here participants typically named in a reading-like order, in that they started with the top item then progressed from left to right. The left-right order was much less evident in naming from events. Indeed, when the direction of the event was clearly contrary to the left-right order (i.e., in events showing people acting on objects with agents on the right of the page), left-right naming was virtually eliminated.

The final and most important finding was the relationship between naming from events and sentences. This indicated that the order in which participants named the entities in event pictures bore a strong relationship to the word order in the sentences that they eventually used to describe those pictures. Why did this arise? Some trivial explanations can be dismissed. For example, it seems unlikely that sentence and naming order were determined by the relative accessibility of the three nouns, given that the triads were matched for frequency and familiarity, and given that a different order emerged when participants were naming from arrays. The results from naming from arrays would similarly challenge visual salience as an explanation. If visual prominence were the most influential factor, we would expect this to manifest equally across the three conditions.

An alternative explanation is that naming was influenced by the event or role structure of the situations. In other words, when faced with a picture of an event, participants may automatically engage in conceptual level processing that uncovers the main actors and their roles. This processing will be reflected in their order of naming, even when they are not explicitly constructing sentences. So, in the types of events used here, naming will typically begin with the agent, followed by the theme and finally the instrument. This explanation concurs with evidence from eye-tracking experiments, showing that when individuals examine events their order of focus is related to the role structure of those events, and indeed to the word order used in their descriptions of those events (Griffin & Bock, 2000; Meyer & Dobel, 2004).

The above account suggests that order of naming from events can provide a window onto conceptual processing, since by naming in a sentence-like order participants show that a degree of event analysis has taken place. A slightly different account is possible. When looking at the event pictures, control participants may have internally constructed full sentences, then isolated the relevant nouns for the naming task. This would inevitably lead to a naming order that mirrored sentence production. Teasing apart these alternative explanations is difficult, and would require a different type of experiment from that used here. Nevertheless, the control data show that when non-brain damaged individuals name from event pictures they do so in a way that is linguistically principled. Their naming is not random, or primarily determined by page position. Rather it is driven by the role structure of the events. We can conclude that these controls have undertaken aspects of event analysis. In some cases, this may have progressed as far as sentence production. In others, it may have remained at the pre-formulation stage. In either case, we can see the evidence of their event processing in their naming.

The control data established that the Order of Naming Test was a potentially useful method for exploring event processing in aphasia, particularly when naming is relatively preserved. If a person's order of naming from events mirrors the controls' sentence order this would suggest that aspects of event analysis are preserved. Thus the test may reveal a competence that is otherwise masked by poor sentence production. If, on the other hand, their patterns of naming differ from the controls, this may point to difficulties in event analysis.

The second part of this paper describes the responses of two people with aphasia on the Order of Naming Test. Both had impaired verb and sentence production but a relative facility with nouns. They also revealed different patterns of performance in background testing designed to explore event processing skills. They therefore seemed good candidates for exploring the use of the test.

PARTICIPANTS WITH APHASIA

Helen

Helen was 44 when she had a subarachnoid haemorrhage from a ruptured anterior communicating artery aneurysm. This caused aphasia and a right sided hemiparesis (which resolved). Helen was right-handed and a monolingual English speaker. She was educated to Ph.D. level and worked as a scientific civil servant. She had not worked since her brain haemorrhage but developed alternative interests such as horticulture. The study was conducted 4 years after Helen's haemorrhage.

Helen's production was non-fluent with word-finding difficulties and phonological errors. Her speech was agrammatic with reduced verbs and limited verb argument structure (see sample in Figure 5).

Ron

Ron was a 51-year-old man who had a CVA in the left Middle Cerebral Artery region 10 years prior to the study. This caused aphasia and a right sided hemiplegia. Ron was right-handed and a monolingual English speaker. He left school at 18, and had worked most recently as a car salesman. Although retired since his stroke he retained many interests and attended social groups and adult education classes.

Ron's speech displayed typical signs of agrammatism. He produced strings of noun and adjective phrases, linked by resourceful use of social phrases such as 'Interesting, actually . . .', 'Funny you should say that . . . ' and 'Imagine that'. Outside these phrases there were few verbs and very little verb argument structure (see sample in Figure 6).

Background testing (Table 8)

Both Helen and Ron scored within or very close to the range of non-brain damaged people on two tests of non-verbal cognition: the Pyramids and Palm Trees Test (Howard & Patterson, 1992) and Raven's Standard Progressive Matrices (Raven, Raven, & Court, 2000). They also showed no evidence of visual-perceptual impairments. For example, both performed normally on letter and line cancellation tasks designed to probe for neglect.

Lexical testing revealed some striking dissociations between nouns and verbs. Both Helen and Ron scored at or near ceiling in their comprehension of concrete nouns (PALPA spoken and written word-to-picture matching; Kay, Lesser, & Coltheart, 1992). Comprehension of verbs, as measured by

Helen: Two guys ... and Hardy. And they have a ... a donkey [draws donkey and man]. And er ... this is the [points to drawing of man] ... is walking [gestures walking] and er ... donkey. And this [draws pallet] there is er ... lying down it's like er ... it's you know it's you know it's um ... [draws] that for ... it's like a you know like [mimes bumping movement] [unintell.] and they've got ... [draws pallet attached to donkey with man lying on it] er ... the man like that. So it's ... it's [gestures bumping movement] you know like [mimes someone asleep] sleep [unintell.]. And then this was right [points to picture] and then er ... it water [gestures walking] the ... the man [drawing] and the donkey, and it's it's it's not [gestures horizontal movement] it's ... so in the lake it was like asleep [mimes sleeping]. It's um ... wet [mimes waking up and gesticulating].

Ron: Two men ... straight [gestures tall person] and then ... [gestures fat person asleep]. Then river ... river and then ... asleep ... and then snoozing. And then one ... bye! [waves]. And then ... [gestures splashing] Oy! And then obviously wet, dripping wet. And Olly [gestures drying]. And rip rip [gestures wringing handkerchief]. And all right? [gestures thumbs up] ... all right [gestures moving on]. And then river ... [gestures falling under water] ... dripping wet. And then ... oh hang on ... horse or donkey ... then sit down and forgot ... dripping [gestures wringing handkerchief]. And then ... and bye! [waves].

Figure 6. Narrative samples (recounting a clip from a Laurel and Hardy Film).

the VAST (Bastiaanse, Edwards, & Rispens, 2002) was more problematic. Although Helen made only three errors her performance was outside the range of unimpaired controls (her errors all consisted of selecting the related

TABLE 8
Results of background testing with Helen and Ron

Test	*Helen*	*Ron*
Pyramids and Palm Trees (3 picture version)	51/52	48/52
Raven's Standard	53/60	43/60
Progressive Matrices	50th–75th percentile	10th–25th percentile
PALPA spoken word to picture matching	39/40	38/40
PALPA written word to picture matching	40/40	39/40
VAST verb comprehension	37/40	30/40
Object naming (Object and Action Naming Battery)	152/162	116/162
Action naming (Object and Action Naming Battery)	81/100	17/100
VAST sentence comprehension	22/40	24/40

verb distractor). Ron made 10 errors, the majority of which involved selecting the distractor object. So, for example, he selected a picture of dough in response to the verb 'kneading'.

The dissociation between nouns and verbs was more evident in production. When tested on the Object and Action Naming Battery (Druks & Masterson, 2000) both participants showed a significant advantage for nouns (Helen: Nouns 94%, Verbs 81%, $\chi^2 = 10.34$, $p \leq .01$; Ron: Nouns 72%, Verbs 17%; $\chi^2 = 73.75$, $p \leq .001$). No effects of frequency, familiarity or age-of-acquisition were evident in either person's naming. Indeed, both showed an ability to access relatively low-frequency nouns (such as 'goose pimples', 'Jaffa orange segments' and 'perseverance'). Most of Helen's errors on the action naming task consisted of semantically related verbs or nouns. The vast majority of Ron's errors involved naming an object present in the stimulus picture.

Turning to sentences, both participants were impaired on the VAST test of sentence comprehension (Bastiaanse et al., 2002). All of Helen's errors involved the selection of the reverse-role distractor. In addition to 13 reverse-role errors, Ron made one lexical and two combined role/ lexical errors, suggesting that he had some difficulty in working out who was doing what to whom and in processing the core meaning of the verb. A further possibility is that he had difficulty in interpreting pictured situations.

To summarise, both Helen and Ron demonstrated substantial difficulties in producing and comprehending verbs and sentences, offset by strong processing of concrete nouns. In line with this, their spontaneous speech contained little verb structure and a high dependency on noun phrases. Performance on non-verbal cognitive tasks was good. However, these had not required processing of events. It remained a possibility, therefore, that difficulties at the level of event analysis were contributing to their problems with verbs. This possibility is explored in the following section.

Tests of event processing

Five tests of event processing were administered. These are summarised below.

The Picture Attribute Test (Fiez & Tranel, 1997) probes non-verbal understanding of actions. Participants are asked questions about paired action pictures such as, 'Which of these actions would make the loudest sound?' There are 75 items on the test and unimpaired controls achieved a mean of 69 correct ($SD = 4$).

The Event Video (Dipper, 1999) presents 20 filmed scenes that must be classified as either static states or events. Both events and states are filmed with a moving camera so that states may not be identified on the basis of absence of movement alone. Unimpaired controls and most people with aphasia make no errors.

The Role Video (Marshall et al., 1993) presents 32 filmed events followed by photographs of possible outcomes. The correct outcome picture must be selected from distractors. One distractor shows the result of the same action but with a change of roles, while the other presents the outcome of a different event. For example, one film shows a man selling a camera to a woman. The target photograph shows the woman holding the camera, while the role distractor presents the man with the camera and the event distractor presents the woman holding a letter. Only limited control data are available, but these suggest that people without brain injury make no errors.

The Kissing and Dancing Test (Bak & Hodges, 2003) is identical in format to the Pyramids and Palm Trees Test, but involves judgements about action pictures. So 52 triplets of action pictures are presented and the person is asked to select from the lower pair the action that is most semantically related to the one at the top. Unimpaired controls make up to four errors on the test (mean score $= 50.4$, $SD = 1.5$).

The Event Perception Test (Marshall et al., 1999) requires a person to analyse the language-relevant aspects of events, by selecting two pictured representations of a verb from a distractor. This requires them to process those aspects of the event that specifically relate to the selection of a verb, such as the manner of movement or the effect on an object. Ten unimpaired controls each made no more than three errors from a total of 60 items.

Helen and Ron's results on these tests are summarised in Table 9. Scores falling outside the range of unimpaired controls are marked with an asterisk.

Taking Helen first it is evident that only one of the tests (the Event Perception Test) caused her any difficulty. Ron, in contrast, was impaired with virtually all. He made errors in distinguishing events from states (the Event Video). With the Role Video, he made both event and role errors, suggesting that he was not clear about the type of event that had occurred or its role structure. Semantic judgements about events were similarly weak in the Kissing and Dancing Test and the Event Perception Test. It is also worth noting that his errors on all tests were distributed across the items. They did not, for example, occur only with early items, where comprehension of the task may have been insecure.

Interpreting performance on these tests can be difficult. For example, errors may reflect a deficit in event analysis or may have other origins, such as a misunderstanding of test requirements. Performance on any single task, therefore, is unlikely to be conclusive. However, the consistent profile of impairment displayed by Ron across the tests suggested that he might have difficulty in analysing events in a language-relevant way, a difficulty that was not obviously shared with Helen.

TABLE 9
Results of event processing tests: raw score and (%) correct

Test	*Helen*	*Ron*
Picture Attribute Test	72/75 (96)	67/75 (89)
The Event Video	20/20 (100)	18/20 (90)*
Role Video	32/32 (100)	27/32 (84)*
Kissing and Dancing Test	51/52 (98)	46/52 (88)*
Event Perception Test	54/60 (90)*	51/60 (85)*

The results so far suggested that the Helen and Ron were good candidates for the Order of Naming Test. They were both impaired with verbs and sentences, but had sufficient naming skills to complete the test. They also showed a different profile in tests of event processing. Helen was largely unimpaired on these tests, suggesting that she might perform normally in order of naming. Ron on the other hand was impaired. If his order of naming was similarly out of kilter this might add to the evidence that an event processing impairment was contributing to his difficulties with verbs.

Administration of the Order of Naming Test

The administration of the Order of Naming Test was the same as with the controls. Helen and Ron took part in two test sessions. In the first they were asked to name the entities from the event version of the test. In the second they were asked first to name the entities in the arrays. They were then shown the event version again and asked to describe each picture with a simple sentence. As with the controls, naming from events and naming from arrays were preceded by the rehearsal procedure.

Analysis and results

Number of entities named

The number of entities named per item in each condition was counted. In Ron's case, this was done twice. In the first analysis the total number of nouns produced was counted. Repetitions were discounted, but where two or more synonyms were produced that clearly related to the same entity, these were separately credited. The second analysis was stricter. This included only names of entities that were visible in the picture and did not credit either repetitions or synonyms. Results are presented in Table 10 with comparative control data.

It is clear that Helen named a very similar number of entities to the controls in all the conditions. Like them, she focused purely on the agent,

TABLE 10
Number of entities named

Participant		*Naming from events*	*Naming from arrays*	*Sentences*
Controls	Mean	3.01	3	2.69
	Standard deviation	0.03	0	0.27
Helen	Mean	3.07	2.96	2.63
Ron	Mean (all nouns)	4.93	5.33	5.44
	Mean (visible entities only and synonyms removed)	4.11	4.44	4.22

theme and instrument. Ron, in contrast, produced more nouns in every condition, even in the more stringent analysis.

Number of agents named first

Table 11 shows the number of agents named first by Helen and Ron in each condition, with comparative control data. Both participants performed similarly to the controls in that they tended to mention agents first whenever they were responding to event pictures. No such primacy was seen in the array condition. When producing sentences, Helen and the controls were particularly likely to start with the agent. This pattern was also evident, though less strongly, in Ron's sentences.

As with the controls, we investigated whether Helen and Ron were likely to name agents first even when the pictures showed two animate entities. Table 12 shows that this was indeed the case.

Order of naming from events

This analysis aimed to determine whether Helen and Ron's naming order from events mirrored sentence order, as it had done with the controls. Specifically, their order of naming from events was compared with their own sentence order, the control group's modal sentence order, reading order

TABLE 11
Number of agents named first

	Event condition	*Array condition*	*Sentence condition*
Helen	22	9	24
Ron	18	5	17
Controls mean	18.8	9.25	25.4
(*SD*)	(3.90)	(0.72)	(0.67)

TABLE 12
Number of agents named first in two-animate entity items ($N = 12$)

Participant		*Naming from events*	*Naming from arrays*	*Sentences*
Controls	Mean score	7	3.80	11.8
	Standard deviation	2.05	1.06	0.64
Helen		8	3	10
Ron		8	2	8

(left-right) and right-left order of the pictures. The chance score for each of these relationships was 40.5. (The scoring method for the order of naming analysis was the same as used with the controls.) Helen and Ron's scores were also transformed into z scores in order to determine whether they were significantly different from the mean of the controls. These results are presented in Table 13, with control group data for comparison.

Taking Helen first it is clear that she performed similarly to the controls. There was a strong relationship between her order of naming from events and sentence word order. This is signalled by the high scores for both sentence comparisons (own sentences: 59; control modal sentences: 54) which are both comfortably above chance. Page position did not seem to drive Helen's order of naming. The comparison score for left-right order was below chance. The comparison for right-left order was above chance, but not markedly so. None of Helen's *z* score comparisons was significant.

Unlike the controls and Helen, Ron's naming from the event pictures bore no relationship either to his own sentence order or to the controls' modal sentence order. Scores for both of these relationships were at chance (36 and 38 respectively). The comparisons with left-right and right-left order were particularly low, indicating that page position was not influencing his order of naming. Turning to the *z* scores, only one comparison reached significance, that for modal sentence order.

It was possible that Ron's scores were adversely affected by difficulty in producing the target names, which might cause him either to omit targets or to make naming errors. This prompted a further analysis of only those items on which Ron had named all three targets. Results for this analysis are presented in Table 14. The chance score now varies among the different comparisons, as different numbers of items had to be excluded in the event and sentence conditions.

Ron now scored close to the mean of the controls on both of the comparisons of naming from events against sentence order. His scores for the comparisons between naming from events and both reading order and right-left order were still close to chance.

TABLE 13
Scores for comparisons with order of naming from events: Controls, Helen and Ron

Participant		*Naming from events vs. own sentences*	*Naming Ron rom events vs. modal sentences*	*Naming from events vs. left-right order*	*Naming from events vs. right-left order*
Controls	Mean raw score (*SD*)	51.3 (8.02)	52.3 (7.06)	47.3 (10.78)	32.5 (11.65)
Helen	Raw score	59	54	32	43
	z score	0.96	0.24	−1.42	0.90
		(*ns*)	(*ns*)	(*ns*)	(*ns*)
Ron	Raw score	36	38	27	26
	z score	−1.91	−2.03	−1.88	−0.56
		(*ns*)	($p \leq .05$)	(*ns*)	(*ns*)

Order of naming from arrays

Helen and Ron's order of naming from arrays was compared with sentence order, reading order and top-right-left order. As above these scores were transformed into z scores. Results are presented in Table 15 with control data for comparison.

Helen, like controls, showed no relationship between order of naming from arrays and her own sentence order, achieving a raw score of 35. Her scores for the relationships with page position order were also similar to controls. That for naming from arrays vs. top-left-right order was particularly high (76), suggesting that this was a very dominant pattern for Helen. The score for naming from arrays vs. top-right-left order was also considerably above chance, but suggested a less close relationship than with English reading order. Once again, none of these scores was

TABLE 14
Sores for comparisons with order of naming from events: Ron's errorless items

	Naming from events vs. own sentences	*Naming from events vs. modal sentences*	*Naming from events vs. reading order*	*Naming from events vs. right-left order*
Ron	33	34	21	24
Controls mean	30.9	34	29.8	20.6
(SD)	(4.72)	(4.91)	(7.77)	(8.19)
Chance score	24	25.5	25.5	25.5

significantly different from the controls' mean once transformed into *z* scores.

Ron's naming from arrays was unrelated to his own sentence order, achieving a comparison score of 24. His array naming was more strongly related to reading (top-left-right) order (raw score of 45). However it showed the closest fit with the opposite order (top-right-left), a clockwise pattern that was used very little by the controls. Here Ron achieved a raw score of 64. Only one *z* score was significantly lower than the mean of the controls. This was the score for the comparison of naming from arrays with Ron's own sentence order.

Discussion of data from participants with aphasia

It was hypothesised that Helen and Ron might perform differently on the Order of Naming Test. Although both displayed difficulties with verbs and sentences they had responded differently to testing of event processing, with Helen achieving high scores on almost all of these tests while Ron's performance was impaired. This led to the prediction that Helen might perform normally in order of naming, whereas Ron would not.

Helen's performance in the Order of Naming Test was very much in line with our predictions. All the key findings from the controls' data were also present in hers. In all conditions she only named the three main entities, showing that she was focused on the agent, theme, and instrument. Like the controls, she showed a strong bias towards agency, in that whenever she was responding to event pictures she named the agent first. This was evident even when there were two people in the picture. Turning to her order of naming, this was influenced by page position only when Helen was dealing with arrays. Here, like controls, she tended to follow a reading-like order. In contrast, her naming from events was oblivious to page position. Just as with

TABLE 15
Scores for comparisons with order of naming from arrays

Participant		*Naming from arrays vs. own sentences*	*Naming from arrays vs. top-left-right order*	*Naming from arrays vs. top-right-left order*
Controls	Mean raw score (*SD*)	39.2 (2.61)	68.15 (12.29)	46.15 (15.65)
Helen	Raw score	35	76	53
	z score	−1.61	0.64	0.44
		(*ns*)	(*ns*)	(*ns*)
Ron	Raw score	24	45	64
	z score	−5.82	−1.88	1.14
		($p \leq .001$)	(*ns*)	(*ns*)

controls, naming order here showed a strong relationship to sentence order. This suggested that Helen was able to analyse the role structure of the depicted events and that her naming was driven by this analysis.

The Order of Naming Test served to reveal a competence in Helen that was not immediately obvious from her sentence production. In this context it is worth reflecting on her sentence scores. It is striking that Helen's order of naming from events was related not only to the controls' modal sentence order but also to her own. This suggested that, even though her sentences were disordered, they retained some degree of word order structure. In some cases this was achieved by building sentences round non-specific general verbs, as is seen in the following samples:

'The painter was picturing for an angel'
'The blacksmith make a horseshoe and the hammer is hammer'

In other cases her attempts at sentences comprised little more than lists of nouns:

'The fairy the hose the water in the swimmer'
'The knight is match of a flame is . . . the matches and the candle'

However even here there are vestiges of propositional structure, in that utterances at least start with the agent.

Overall, Helen's pattern of naming suggested that her focus was constrained in a way that was very similar to the controls. She named a similar number of entities per item and showed a strong initial focus on agents in events but not arrays. Her naming from events was more closely related to sentence order than to page position. Although Helen's language in the sentence condition was unlike that of the controls, her naming in all conditions was apparently driven in a very similar way.

Results from Ron are less clear-cut. Before discussing his findings one concern has to be acknowledged: Ron may differ from the controls for reasons that are unconnected with the hypothesis being tested, an obvious candidate being word-finding difficulties. Some reassurance in this regard may be gained from Helen's performance. She was clearly able to complete the test, and showed a similar pattern of responses to the controls, despite some word-finding difficulties. However, the possibility remains that Ron, who has more difficulty in confrontation naming than Helen, may have been affected by difficulties in accessing the target names.

We tried to minimise this risk in a number of ways. First, targets were matched for frequency and familiarity, which are known to affect ease of naming. Targets were not matched for age-of-acquisition, which would have been difficult given the unusual nature of the stimuli. We know, however, from Ron's performance on the Objects and Actions Naming Test that age of acquisition was not an influential factor in his naming. Second, the rehearsal exercise was designed to help Ron's naming, with targets rehearsed immediately before each group of stimuli. Finally, we established generous scoring criteria, which credited any words listed as synonyms of the target in a thesaurus (Roget, 1962). Further, as the aim was to assess order of focus rather than the ability to access particular words, Ron was credited with having named an animate target wherever his focus was clear. Descriptions of entities that included either 'man' or 'woman/lady' were accepted under this criterion.

The results offered further evidence that Ron had the naming abilities to carry out this task. First, as is discussed below, he tended to name more entities per item than the controls, with his production including many low-frequency nouns. His performance in the array condition was also reassuring. Here participants were asked to name the same entities that appeared in the event pictures, although separately drawn in triangular arrays. In this condition, Ron behaved similarly to the controls, in that his naming order was clearly dominated by page position. It seemed that Ron's naming skills were sufficient for him to produce most of the required nouns and that, when he was not required to process events, he resembled the controls in adopting a principled ordering strategy.

Ron's performance on the Order of Naming Test was different from the controls in a number of respects. One striking difference was in the number of entities named. Almost without exception, controls limited their naming to the three main entities, whereas Ron named additional items in all three conditions. Furthermore, this pattern occurred despite the fact that the names of the key entities were rehearsed before the event and array conditions. In most cases, the additional nouns were names of peripheral objects related to the main entities, such as items of clothing. However, some were not even visible in the picture, such as items of equipment typically associated with the situation depicted.

A number of explanations for Ron's hypernaming might be considered. It is possible that he misunderstood the test instructions, and simply named everything that he could see or think of. Ron may also have been influenced by previous experiences of naming tests or therapy, or he may have named irrelevant entities in the process of activating the targets. An alternative interpretation is that Ron's pattern of naming was related to his event impairment. If Ron, like the controls, was focusing on the key entities within events we would expect his naming to be more constrained, particularly in the event and sentence conditions. This was not the case. Instead he was repeatedly waylaid by peripheral and even inferred objects. This is a pattern familiar from previous studies (e.g., MM, Marshall et al., 1993; EM, Dean & Black, 2005) and also closely echoes Ron's spontaneous conversation. If Ron could not direct his attention in a principled manner to the main entities involved in events, his production became dominated by strings of often rather superfluous object names.

Ron also differed from the controls in his order of naming, since there was no relationship between the order in which he named the entities in the events and either his own sentence order or the controls' modal order. Ron's scores were directly compared to those of the controls, by transforming them into *z* scores. This showed that only Ron's score for the relationship between naming from events and the modal sentence order was significantly lower than that of the controls.

Why did the second comparison, involving Ron's own naming and sentence order, fail to reach significance? In some respects this is a problematic comparison, since it depends upon Ron's sentence production, which we know to be very disordered. The comparison between Ron's naming from events and the controls' modal sentence order does not rely on Ron's own sentence skills, so it arguably offers a fairer assessment of the degree to which Ron's naming was driven by the structure of the event. Another reason may lie with the control group. As a group, the controls' naming from events was very significantly related both to their own sentence order and to the modal sentence order ($p \leq .001$). However, there was considerable variation within the group, leading to high standard deviations in each case. One participant scored so low on each of these comparisons, achieving *z* scores of 2.53 and 2.59 respectively, that we may consider her an outlier (Hair, Anderson, Tatham, & Black, 1998). If this person is removed from the group, Ron's *z* scores for naming from events against the two sentence orders both prove significant: 2.47 ($p \leq .02$) and 2.66 ($p \leq .01$) respectively. In other words, Ron's order of naming was significantly less strongly related to either sentence order than that of the remaining controls.

The results so far are in line with the hypothesised event-processing impairment. Ron seemed to be less focused on the main entities in events than controls and displayed a different order of attention, indicated by the lack of relationship between his naming order and sentence structure. This suggested that, unlike controls, his naming was not driven by the underlying structure of the event.

Other aspects of the results were less in line with the hypothesis. The start of this discussion acknowledged that Ron's results on the test might be influenced by word-finding difficulties. While we were able to demonstrate relatively strong naming abilities, it remains a possibility that subtle retrieval impairments were still exerting an influence. This possibility was explored by conducting a second analysis of Ron's naming order, which only included responses in which Ron had named all the targets. Now Ron appeared to be much more similar to the controls. In the two crucial comparisons between order of naming from events and sentence order Ron's score was now at or even slightly above the controls' mean.

This further analysis suggests that Ron was after all much more like the controls in his order of naming than he previously appeared to be. However, a number of caveats may be raised about these results. First, this comparison takes no account of potential outliers in the control group. Second, as we have suggested, one of the main reasons for Ron's lower score on the original analysis was that he frequently named peripheral entities, or objects not visible in the picture, rather than the main targets. The analysis of errorless items excludes all items on which he failed to name the targets – including both those on which he made a naming error, and those on which he omitted targets while naming non-target entities. By excluding the latter, we may be removing the very items on which Ron demonstrated his essential difference from the controls.

The analysis is also perhaps unfairly harsh to the controls, who also made errors or omissions on a number of items that are not discounted in the scoring. Finally the scoring system does not take account of the fact that Ron often named a number of non-target entities before or inbetween the targets. His scores rarely reflect the first three entities focused on, but give credit for target names wherever they were produced. In fact, naming of non-target entities either preceded or interrupted target names on 14 event items, 16 arrays, and 15 sentences. Controls, on the other hand, generally only named three items, and are therefore only scored for the first three entities to attract their attention.

Given the above provisos, the errorless analysis alone offers only weak evidence of a similarity between Ron's naming and that of the controls. However, there was a final, more striking, point of correspondence. Like controls, Ron showed a strong tendency to name agents first in both the event and sentence conditions. Moreover, he did so not only on items involving one animate entity, but also on those involving two, showing that he was not simply naming people first.

Ron's tendency to name agents first suggests that, like the controls, he was paying particular attention to the cause of the event. It points, therefore, to an important preservation of one aspect of event knowledge, an aspect that is central to verb meaning (Kemmerer & Tranel, 2003). Interestingly, Ron was not able to capitalise further on this knowledge in the sentence condition, since here he named no more agents first than in the event condition. It seemed that Ron had some 'covert' sensitivity to agency, which encouraged him to name agents first. He could not, however, exploit this knowledge when asked explicitly to build sentences. This is in line with other evidence that people with Broca's type aphasia have underlying knowledge of argument structure that is not demonstrated in their sentence production (Shapiro & Levine, 1990).

It is difficult to formulate cast-iron conclusions from Ron's data. A number of features were different from the controls and suggestive of an event-level impairment. His naming was not constrained to the three main entities and did not clearly mirror sentence order, suggesting that it was not driven by the structure of the event. On the other hand, when his error items were removed a closer correspondence with the control data emerged. The test also revealed an area of preserved event knowledge; that is, an appreciation of agency.

Another dilemma should be acknowledged. Even if performance is unambiguously disordered in the Order of Naming Test the source of the difficulty could still be debated. The problem may originate with an impairment of event processing. This may prevent the person from analysing the role structure of the depicted event and so lead to linguistically unprincipled naming. An alternative view argues for a more interactive relationship between language and event processing. Under this account the construal of the event may be, at least in part, determined by the words used to describe it. A failure to access those words (and particularly the verb), would thus generate the difficulty in event analysis. This debate suggests that if Ron were different from the controls, this could be because of an underlying event level impairment, or because his linguistic deficits made it difficult for him to analyse events in a language appropriate way.

CONCLUSIONS AND IMPLICATIONS FOR THERAPY

Many people with aphasia display a pattern of skills and weaknesses similar to Helen's and Ron's, in that they have relatively well preserved access to nouns but impoverished verb and sentence structures. The Order of Naming Test uses the relative skill with nouns to provide a 'window' onto event conceptualisation, an aspect of processing that is normally difficult to investigate. In Helen's case the test revealed a pattern of performance that was very similar to controls and suggested that she retained important skills in event analysis. Ron's performance was more ambiguous but hinted that his problems might originate, at least in part, with difficulties at the event level.

The stimuli in this test are highly constrained line drawings, encompassing a limited range of event structures. They involve a small number of participant entities with little or no background detail. The demands imposed upon the speaker by real-life communication are clearly much greater. For example, picking apart complex situations or talking about multiple events in the way required for narrative or conversation demands a much greater imposition of constraint (see Black & Chiat, 2003). Normal communicative contexts also require us to guide the listener over a developing story by ordering a number of propositions, or 'macroplanning'

(Levelt, 1999). It would be useful to explore how task materials interact with features of event structure and language to constrain a person's attention over events. In other words, how far can materials (both linguistic and visual) be manipulated to do some of the work of thinking for speaking for us? (See Dean & Black, 2005, for an investigation of these issues.)

More particularly, therapy may exploit such materials to help people with aphasia to adopt a conscious thinking strategy. This might help them to maintain a useful focus over events, for instance by 'anchoring' their attention while the object of focus is fitted to available language (see Marshall et al., 1993; Marshall, 1994, 1999 for similar ideas). Alternatively, therapy may serve to bring covert knowledge of thematic role structure, like that hinted at by Ron's focus on agents, to a conscious level. This approach to therapy may be useful regardless of whether the event processing impairment is seen as the originator of the problem or its consequence. If aphasia does indeed affect some people's thinking about events in the way the Order of Naming test suggests, then aphasia therapy needs to take more account of that thinking. We need to find creative ways to bolster thinking about events in order to help people talk more fully about them.

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