Processing Events: Investigating Event Conceptualisation in Aphasia

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Chapter 4 The Sharon and Paul Test

4.1 Introduction

In Levelt's (1989) model, perspective-taking is said to be one of the essential tasks completed at the conceptual level. It must occur in order for ideas to be expressed in language, since the language Formulator cannot accept messages that are neutral as to perspective. This is not just true in relation to events and states: perspective-taking occurs whenever language is used for referring, from naming a simple, unified object to describing a complex scene (Levelt, Roelofs and Meyer, 1999). However, the stakes are generally higher in relation to the description of situations, which may involve a number of different participant entities and many possible relations. As discussed in Chapter 1, the complexity of perspective-taking is potentially linked not only with that of the situation being described, but also with the complexity of the argument structure used to describe it.

The Sharon and Paul Test focuses on the issue of perspective-taking within event description, hypothesised to be particularly problematic for people with event processing difficulties. It has two main aims. The first is to explore the kinds of cue that can help people with aphasia access verbs to describe situations in which there is an obvious 'perspective dilemma'. The second is to investigate the perspective naturally adopted by both people with aphasia and non-brain damaged speakers over this kind of situation, and the ease with which they can be encouraged to shift from it. A subsidiary aim was to try to design a test that would fill the gap between describing highly constrained, 'pared down' stimuli and talking about the real world. The situations are therefore presented on film, rather than in static pictures, and within more realistic settings, although the degree of visual complexity and background detail are still limited. Each of the stimulus situations involves two main participants playing roughly equally active roles, and from whose perspectives it could be readily described. The stimulus format is varied among three conditions. The first presents the situations in a 'neutral' way, unbiased as to perspective, while the second shows them from the perspective of one or other of the main participants. The third condition increases the level of constraint by adding a spoken language cue. In each case the task is simply to produce a verb to describe what is happening.

The questions addressed by the Sharon and Paul Test may be summarised as follows:

- Do visual or syntactic cues help people with aphasia to access verbs relevant to 'perspective-dilemma' situations?
- What perspective do speakers naturally adopt on this type of situation?
- How loyal are they to their preferred perspective when visual or syntactic cues are provided?

4.2 Test design

4.2.1 Test format

The format of the test was influenced by that devised by Fisher et al (1994). As described in Chapter 1 (sections 1.8.4.2 and 1.9.3), Fisher et al's study explored participants' sensitivity to syntactic structure by means of 'perspective dilemma' situations, where verbs focusing on the two main participant entities are readily available. Like the Fisher et al test, the Sharon and Paul Test also used a film format to elicit verbs. There were several reasons for this choice. First, film enables language production to be more realistically probed than is possible with many picture-based assessments. For example, it allows events to be presented within a 'real world' context, with a basic 'script' underlying each item. For instance, one item from the Sharon and Paul Test represents *borrowing/lending* within a garden, with a 'script' of a woman borrowing some loppers from her neighbour. Film also permits events to be presented in a dynamic and temporally extended manner, with different participants potentially playing roles at different times. Pictures, by contrast, provide input to the speaker that is almost inevitably more 'pared down'. The perspective decision(s) required may be less complex, since pictures necessarily offer a 'snapshot' of their targets, telescoping dynamic events into a single static frame. Some verbs are also very difficult to represent pictorially. For example, while a film makes it possible to show the subtle distinctions in meaning between verb pairs such as *give/take* and *lend/borrow*, this is difficult to do in pictures alone.

The issue of the effect of stimulus format on production is still under debate in the aphasia literature. For example, Dean and Black (2005) argue that it has a potentially far-reaching influence on the event descriptions produced. This effect should be particularly marked for people who have difficulty in paring down conceptual information into a language-ready format, and less so for those whose main difficulty is in accessing output forms. As described in Chapter 1 (section 1.5.3), Dean and Black's study compared the event descriptions produced by EM, a woman with hypothesised event processing difficulties, to

photographs versus simplified line drawings. Line drawings did not help EM to produce significantly more target verbs, but they did appear to help her focus on the key event participants, since her descriptions included fewer extraneous noun phrases. As a result, Dean and Black argue that line drawings may place "fewer demands on processes that pare down the full set of conceptual responses to an event into the schematic form necessary for expression in language" (p. 534) (though see critiques in Chapter 1).

However, the suggestion that stimulus format affects ease of output, at least for people with event processing difficulties, is not universally accepted. Nor is the idea that films necessarily present more complexity than pictures. For example, Berndt et al (1997b) hypothesised that pictures might be more problematic than films, since people with verb problems might have difficulty in isolating the part of a picture that must be packaged into a verb, one of the essential tasks achieved by Levelt's (1989) Conceptualizer. This might lead to the production of nouns rather than verbs. In fact, stimulus format was not found to affect either noun or verb production in Berndt et al's study. Nor, in a later study (Berndt, Burton, Haendiges and Mitchum, 2002), was the particular task used to elicit nouns and verbs found to be influential. However, it is worth noting that the influence of these factors was not specifically investigated with people who had already shown difficulty in processing events.

d'Honincthun and Pillon (2005) made a similar claim about the relative difficulty of verb naming from pictures and films, in this case in relation to frontal variant-frontotemporal dementia. They suggested that verb processing demands more executive resources than noun processing, since verbs encapsulate a great deal of semantic and syntactic information. In line with this hypothesis, JB, a woman with fv-FTD, showed significantly more difficulty in naming actions than objects from static pictures. However, when she was asked to name the same actions from films her performance improved to the extent that it was not significantly different from her object naming. d'Honincthun and Pillon argue that, for people with executive difficulties, naming from pictures is more difficult because it requires them to infer an action's temporal structure and movement features. This finding is not specifically related to the relative conceptual demands imposed by the two formats, and JB was not tested in relation to any hypothesised difficulty in conceptualising the nature of events. However, it does indicate that pictures are not necessarily easier than films; rather it is a question of the particular nature of the stimuli used. In this case, the film stimuli also offered very pared down versions of the actions, with no distracting additional detail apart from the essential clues to temporal structure and movement. Clearly, the specific demands of the task (both

conceptual and executive) need to be considered in relation to the particular skills of the person doing it.

Finally, there is the issue of whether to use an input or an output task. As described in Chapter 1 (section 1.5.4), a previous perspective task (Dipper, 1999) used a multiple choice format, on the grounds that unconstrained responses are very difficult to analyse. Participants in Dipper's study saw films of perspective-dilemma scenes such as one person carrying another (which could be described as either *riding* or *carrying*). Scenes were shown in two conditions: 'unbiased', where the filming was neutral as to perspective, and 'biased', where the film focused on one or other of the main entities. Biased stimuli were predicted to determine the perspective adopted, which would be reflected in the verbs chosen to describe the scene. Participants chose verbs from three options: the target (focusing on the highlighted entity), a verb encapsulating the opposite perspective, and a related distractor. For example, the options for an item representing *giving/taking* were *give*, *take* and *feed*.

A problem with this format, however, is that it penalises people who select the opposite-perspective distractor. It therefore fails to credit those who can accurately analyse the conceptual structure of the situation, and can identify a verb encapsulating the target action and its participants, but who do not respond in the predicted way to the filming. It is difficult to say, for example, whether the selection of *give* should be counted as an error in response to a scene which clearly shows a *giving/taking* situation but where the filming focuses on the taker. A number of studies (e.g. Sridhar, 1988; Fisher et al, 1994; Lakusta and Landau, 2005) have pointed to a natural bias towards Goal-directed actions, which goes along with a preference for Goal-focused verbs (such as *give* or *throw*) that encode the Goal path (either optionally or obligatorily) in a prepositional phrase. It is possible, depending on the nature of the constraint provided, that a visual focus on the Goal participant (for instance, the *taker*) may not shift speakers away from their natural preference for encoding Goals. Instead, it may reinforce the natural Goal-bias, leading to the selection of Goal-path rather than Source-path verbs (e.g. *give*, *throw*, or *sell* rather than *receive*, *catch* or *buy*).

In a more general sense, this type of stimulus invites the question of which perspective is encouraged by filming manipulations. Does a visual focus on one participant encourage the selection of a verb highlighting that participant, or encourage the speaker to adopt the 'viewpoint of the camera', leading to the opposite perspective? A further problem with this particular task was that only six verb pairs were explored, making reliable statistical analysis difficult. The Sharon and Paul Test differs from Dipper's task in that, rather than offering

choices, it invites free responses, with all the associated difficulties of interpretation and scoring.

4.2.2 Test conditions

Like Fisher et al's (1994) test, the Sharon and Paul Test used short filmed scenes to elicit verbs. After viewing each scene, participants were asked to describe the situation shown using a single verb. (Clips were initially shown twice, but this made the test lengthy to administer, and was consistently reported to be unnecessary.) The stimulus situations were presented in four conditions, each of which was completed on a separate occasion, at least one week apart:

1. Neutral

Here the situations were presented as neutrally as possible, with each of the main participants shown equally in view. From the responses to this condition it was possible to establish for each item which perspective was preferred by the non-brain damaged controls. This became known as the 'dominant perspective' for that item.

2. Perspective

In this condition the filming was manipulated to focus on one or other of the main participants. Each situation was first shown from one perspective before the full set was repeated with the filming manipulated in the opposite direction. For example, one item represents a *buying/selling* situation. Here the first version focuses on the buyer, who is shown in the middle of the screen, facing the camera. The seller is present, but stands with his back to the camera. At the end of the scene the camera is moved so that only the buyer is visible. In the second version the action is repeated, but here the seller stands in the middle of the screen and facing the camera, with the buyer shown only from behind. In this version the final shot shows the seller counting his money.

3. Perspective plus language

Here the perspective-manipulated stimuli were repeated with a spoken language cue overlaid. The format was exactly the same as in condition 2, although the order of items was changed in order to limit any practice effect. The cue was slightly different from that used in

the Fisher et al task. It consisted of a simple descriptive sentence with the verb replaced by a non-verbal 'buzzing' sound, in order to avoid any possibility of phonological cueing. For example, the cues for the *buying/selling* scenes were, '*Sharon [...] the radio from Paul*' and '*Paul [...] the radio to Sharon*'.

4. Neutral 2

This was an exact repetition of condition 1, included in order to assess whether the participants with aphasia showed any practice effect.

4.2.3 Selection of stimuli

Twenty five 'perspective dilemma' situations were initially selected. These included five of the six situations used in the Fisher et al study, excluding *ride/carry*, which was too difficult to film with adults. Twenty situations involved two animate participants (Sharon and Paul), while five involved a person acting upon an inanimate object. In order to counter any natural bias towards the person shown moving first, Paul and Sharon initiated roughly equal numbers of events. This was also intended to mitigate any bias towards either the man's or the woman's perspective.

A pilot study was first carried out to establish the viability of the stimuli. Ten non-brain damaged speakers saw the Neutral and Perspective versions of the stimuli and were asked to produce a single verb to describe each situation. The participants were all English-speaking adults who knew nothing about the purpose of the test, but were not in other respects matched to the participants with aphasia. From the 25 items, the final set was selected according to three criteria. First, the situations must be consistently recognisable, and describable by a single verb. The Neutral versions must therefore elicit a single verb from all ten participants. Where participants produced more than one verb, they must be able to select one that best fitted the scene. Secondly, the perspective manipulations must be at least recognisably distinct. One way to establish this would be to stipulate that all participants must produce different verbs in response to the two filmed perspectives. However, it was also predicted that for each situation, one perspective would be naturally favoured over the other. This made it unlikely that all speakers would shift from the preferred perspective to follow that of the film. Since the aim was simply to establish the potential for such a shift, a lower criterion was set by which at least four participants must produce different verbs to

mark the two perspectives. Finally, it must be possible to analyse the perspective represented by participants' responses.

All 25 items were found to be describable by a single verb. Four were removed on the grounds that they consistently elicited the same verb in the Perspective condition despite the filming manipulations. Two more were removed because it was impossible to analyse the perspective of the responses. One of these represented either *putting* a cloth on a table, or *covering* the table. This was frequently described as 'laying', which may have referred either to the table or to the cloth. The second showed a man speaking and a woman listening, and was described generically by many participants as 'talking'.

The final stimulus set therefore contained 19 items. Eighteen involved two animate participants, while the last showed milk being poured from a jug into a glass. Here the human participant was relegated to the background, and the target verbs ('*pour/fill*') described the situation from the perspectives of the milk and the glass. Unfortunately the final stimuli were rather less evenly balanced than the original 25. Of the 18 items involving Sharon and Paul, Paul initiated the action in seven, Sharon in 11. A final check was added to the test stimuli in the light of the pilot participants' responses. In the Perspective and Perspective plus Language conditions, presentation was balanced so that respondents did not always see the favoured (dominant) perspective first. Instead, dominant and non-dominant perspectives alternated throughout. The full stimulus set is listed in Appendix 10, along with the cues used for each item in the Perspective plus Language condition. Three of the items are illustrated on the accompanying CD: *buy/sell*, *push/pull* and *pour/fill* – see Appendix 11 for details.

One criticism that may be levelled at the design is that it did not sufficiently control for the accessibility of the verbs within each pair. For example, it might be argued that differences in frequency may have influenced the selection of *award* over *accept* (frequency values of 22 versus 193: Francis and Kucera, 1982). This issue is considered further in the Discussion section. The relative accessibility of verbs between items, as opposed to within each pair, was less important, since the scoring considers responses to complete conditions, rather than to individual items. Since the test covered a wider range of situations than the six used by Fisher et al, the cues used in the Perspective plus Language condition also included a wider range of sentence structures. The possibility of different cueing effects from different sentence structures is also considered in the Discussion.

4.3 Participants

Perspective-taking was hypothesised to affect a wide range of individuals with verb difficulties, rather than just those with suspected difficulty in conceptualising events. The test was therefore completed by all six of the participants with aphasia. Twenty non-brain damaged control participants (all of whom were different from the pilot participants) also completed the test. Seven were men, thirteen women, aged from 36 to 75 (mean = 58.85, S.D. = 11.95). All were native English speakers. Their age on leaving full-time education ranged from 12 to 22 (mean = 17.8, S.D. = 3.32). Table 4.3 summarises their details.

Participant	Age	Sex	Age on leaving full time education	Most recent occupation
1	36	F	22	Charity worker
2	39	F	21	Charity worker
3	43	F	16	Office administrator
4	46	M	18	Building surveyor
5	50	M	16	Trades unionist
6	50	F	20	Charity worker
7	52	M	16	Company director
8	56	F	18	Hospital administrator
9	58	F	15	Personnel officer
10	59	F	16	Teacher
11	60	F	22	Civil servant
12	66	M	22	Lecturer
13	66	M	18	Local govt. administrator
14	67	F	18	Secretary
15	67	F	12	Housekeeper
16	71	M	22	Pensions manager
17	71	F	22	Housewife
18	71	M	16	Transport manager
19	74	F	14	Book keeper
20	75	F	12	Clerical worker
Mean	58.85		17.8	
S.D.	11.95		3.32	

Table 4.3 Control participants

4.4 Scoring system

4.4.1 Scoring of control participants' responses

The control participants' responses were used to establish the range of verbs produced by non-brain damaged speakers to each stimulus situation. All verbs produced by the controls were therefore considered acceptable. Table 4.4.1 presents the complete set of responses to each item. In each case, the list includes verbs produced in any condition, out of a total of 120 responses (20 participants each completing four conditions, two of which involved double stimuli). The two errors (items 10 and 18) were responses in which the person failed to produce a verb.

Item	Stimulus situation	Verbs produced
1	give/take	give (81) receive (15) present (8) take (8) accept (5) offer (2) thank (1)
2	push/pull	push (63) pull (35) move (14) shift (2) manoeuvre (2) drag (1) tug (1) help (1) measure (1)
3	pour/fill	pour (88) fill (32)
4	feed/eat	feed (85) eat (23) taste (7) swallow (3) spoon (1) give (1)
5	chase/flee	chase (62) threaten (21) run (19) hit (5) escape (5) quarrel (2) assault (1) attack (1) flee (1) retreat (1) fight (1) pursue (1)
6	throw/catch	throw (79) catch (35) play (5) lob (1)
7	award/accept	award (34) present (32) receive (22) reward (8) give (8) decorate (7) congratulate (4) accept (3) win (2)
8	kill/die	shoot (87) die (13) fall (8) collapse (4) kill (3) wound (2) get shot (2) murder (1)
9	sell/buy	buy (63) sell (45) pay (6) purchase (2) count (1) auctioneer (1) show (1) accept (1)
10	impress/admire	give (29) show (24) admire (20) offer (7) surprise (6) present (6) boast (3) accept (3) tempt (2) tempt (2) like (2) bake (2) take (2) impress (2) display (1) donate (1) look (1) congratulate (1) show off (1) share (1) talk (1) approach (1) receive (1) extol (1) thank (1) (plus 1 error)

11	teach/learn	teach (29) explain (20) ask (16) learn (15) help (9) instruct (5) show (5) question (4) advise (4) answer (3) work (2) query (2) demonstrate (1) inquire (1) point (1) discuss (1) receive advice (1) get information (1)
12	borrow/lend	borrow (64) lend (30) give (9) take (6) ask (3) loan (3) lose (1) return (1) hand (1) cut (1) clip (1)
13	push/fall	push (77) fall (26) tease (5) shove (5) play (3) hit (1) tumble (1) topple (1) joke (1)
14	offer/accept	offer (44) pour (30) accept (15) give (13) receive (5) ask (4) take (3) drink (2) taste (2) wait (1) entertain (1)
15	lead/follow	beckon (47) follow (42) lead (16) call (3) entice (3) come (2) guide (2) encourage (2) invite (1) persuade (1) lure (1)
16	show/examine	examine (42) show (22) inspect (21) look (19) ask (6) point (2) touch (1) demonstrate (1) hold (1) doctor (1) peer (1) complain (1) consult (1) investigate (1)
17	collect/donate	collect (42) donate (29) give (26) receive (6) request (5) ask (4) contribute (4) accept (3) take (1)
18	ask/tell	ask (58) tell (35) check (11) compare (2) answer (2) inform (2) inquire (2) give (2) point (1) explain (1) synchronise (1) arrange (1) time (1) (plus 1 error)
19	amuse/enjoy	laugh (35) entertain (34) clown (21) act (9) perform (8) dance (3) play-act (2) watch (2) amuse (2) joke (1) fool (1) enjoy (1) jest (1)

Table 4.4.1 Verbs produced by control participants (with number of instances across all conditions)

4.4.2 Scoring of responses of participants with aphasia

For the participants with aphasia, the free response format made it more difficult to establish which responses should be credited, since they produced a considerable number of verbs that did not relate to the target situations. As a result, two methods of scoring were adopted. The first does not play a large part in the analysis, but was included in order to give proper credit to whatever language the participants were able to produce. This method credited all verbs, whether or not they related to the stimulus situation, and including repeated (and possibly

perseverative) verb phrases. The second method aimed to give a clearer measure of the number of relevant verbs produced. The scoring system used was still generous, since the aim was to explore whether paring down the conceptual input would elicit more relevant verbs, rather than to measure access to specific targets. It therefore credited any verb that related to the overall situation, whether or not it matched the highlighted perspective of the stimulus. For this second count, responses that included a verb falling into any of the following categories were considered correct:

1. verbs produced by control participants in response to the same item in any condition
2. synonyms of the control verbs as listed in the New Oxford Thesaurus of English (2000)
3. verbs judged by a naïve rater to be acceptable descriptions of the main action shown

The naive rater knew nothing about the project or the test. After watching each Neutral film, he was given a set of 15 verbs and asked to circle any that he considered to be acceptable descriptions of the main action. In order to minimise any bias, he was not told that some of the verbs were produced by people with aphasia. The verb set for each item included all the responses of the participants with aphasia that did not fall into categories 1 or 2 above, plus an equal number of control responses and distractor verbs. Distractor verbs bore some relation to the action shown but were neither in the control set nor synonyms of the control verbs. For example, the verb set for the *throw/catch* item included six verbs produced by the participants with aphasia: *save*, *have*, *shovel*, *push*, *pull* and *close*. Control verbs for this item were *throw*, *catch*, *lob* and *play*, while distractors were *pass*, *offer*, *move*, *hold* and *joke*. (In this case, none of the additional verbs was judged to be acceptable.)

Verbs credited under categories 2 and 3 are listed in Appendix 12.

A final issue arose in relation to noun/verb homonyms. While the control participants' responses were consistently inflected (in most cases in the form of present participles), a number of the responses of the participants with aphasia were uninflected noun/verb homonyms. Given the participants' difficulty in producing verbs, there was a risk of crediting nouns in place of verbs, if these were automatically allowed. All homonymous credited responses were therefore screened according to the following criteria:

Names of concrete objects with a verb homonym that referred to the action shown (e.g. *spoon*, *gun*) were only credited if the verb frequency was equal to or higher than that of the noun. The same rule applied to abstract nouns relating to the action (e.g. *surprise*, *quarrel*). Frequency ratings were established using Francis and Kucera (1982). Where the noun named a concrete object that was present in the film, but the verb did *not* clearly relate to the action (e.g. *change* in a *buy/sell* scene), these were not credited. Where the noun referred to a concrete object that was not present, the verb was always credited (e.g. *shovel*, *court*). The sets of credited and excluded homonyms are again listed in Appendix 12.

Having established which verbs were considered to be correct, two main analyses were carried out. The first (presented in section 4.5) considered the number of verbs produced by the participants with aphasia in each condition. Here the aim was to explore the effect of the various cues on their production of relevant verbs. The second (presented in section 4.6) considered the responses of both the control participants and the participants with aphasia in relation to their perspective. In this case the aim was to see which perspective was naturally dominant, and to explore the effects of the various cues on the perspective adopted.

4.5 Number of verbs produced

4.5.1 Method of analysis

The analysis of the number of verbs produced by the participants with aphasia considered their response to each condition against a predicted order, using the Page Test for Ordered Alternatives (Page's L; Siegel and Castellan, 1988). The Page test is used for analyses of repeated measures (appropriate in this case since the same participants completed all conditions). The power of the test derives from the fact that its alternative hypothesis makes a clear prediction about the ranking of scores in the various conditions, rather than simply hypothesising a difference between scores. Thus the null hypothesis states that there is no difference between the median scores in each condition, while the alternative hypothesis states that the medians increase in a predicted order.

It was difficult to make clear predictions in relation to the *total* number of verbs accessed in the various conditions. One of the predicted effects of the perspective dilemmas posed by the stimuli was to make it difficult for people to isolate a perspective on the situations that could be packaged into a single verb. A possible response to this might be to try a number of different verbs, or to fall back on 'light' general verbs, only some (or none) of which might

approach the target. Because of the difficulty of predicting an expected ranking for the total number of verbs produced, this count was not analysed with the Page test.

It was possible, however, to make predictions about the number of *relevant* verbs produced. When only verbs credited according to the scoring criteria were considered, the least successful condition was hypothesised to be the first administration of the Neutral stimuli. The repeated Neutral condition might be expected to show some practice effect, and was therefore predicted to be slightly more successful. The visual manipulation in the Perspective condition was predicted to lead to a greater improvement, while the double cue in the Perspective plus Language condition was expected to offer the most support. It was therefore hypothesised that the number of relevant verbs accessed would increase across conditions in the following order: Neutral, Neutral 2, Perspective, Perspective plus Language.

4.5.2 Results

Table 4.5.2 (a) shows the total number of verbs produced by the participants with aphasia in response to each condition. For ease of comparison, scores for the conditions that included double stimuli (Perspective and Perspective plus Language) are halved. Each score is therefore presented as if out of a maximum of 19.

Participant	Neutral (N=19)	Perspective (N=38/2)	Perspective + Language (N=38/2)	Neutral 2 (N=19)
Carl	4	13	9.5	17
Jack	6	5.5	13	7
Helen	18	18	17.5	18
Ron	8	8	11	9
Harry	6	7	9.5	6
Melvyn	16	17	16.5	12
Mean	9.67	11.42	12.84	11.67
S.D.	5.85	5.35	3.49	5.32
Controls (mean)	19	18.98	19	19

Table 4.5.2 (a) Total verbs produced

Table 4.5.2 (b) presents the number of verbs that were relevant to each target situation. These were verbs credited according to the scoring system described above. Once again, scores for the double-stimuli conditions are halved.

Participant	Neutral (N=19)	Perspective (N=38/2)	Perspective + Language (N=38/2)	Neutral 2 (N=19)
Carl	2	5	5	7
Jack	4	4	8	4
Helen	16	14	17	17
Ron	6	7.5	8	6
Harry	5	5.5	8	4
Melvyn	12	14.5	13.5	11
Mean	7.5	8.42	9.92	8.17
S.D.	5.36	4.66	4.43	5.04
Controls (mean)	19	18.98	19	19

Table 4.5.2 (b) Number of credited verbs produced

The ordering of the credited responses is set out in Table 4.5.2 (c), together with the predicted order. Equal scores were given equal ranking.

Participant	Neutral	Perspective	Perspective + Language	Neutral 2
Carl	1	2.5	2.5	4
Jack	2	2	4	2
Helen	2	1	3.5	3.5
Ron	1.5	3	4	1.5
Harry	2	3	4	1
Melvyn	2	4	3	1
Total	10.5	15.5	21	13
Predicted order	1	3	4	2

Table 4.5.2 (c) Ordering of credited responses

The Page test indicated that the scores for credited verbs concurred to a significant degree with the predicted order: L = 10.5 + 26 + 46.5 + 84 = 167 (significant at $p \leq 0.01$). The changes in scores did not simply reflect a practice effect, since the second Neutral condition was only a little more successful overall than the first, and less so than either of the manipulated conditions. Indeed, only two of the six participants showed an increase in scores between the two Neutral conditions. As a group, therefore, the participants responded in the order predicted. Their scores also suggested that they were responding at least to some degree to the cues provided.

Harry and Jack appeared to be most helped by the Perspective plus Language condition, raising the possibility that it was the language cue rather than the visual manipulation that had helped them. Ron also scored most highly on this condition, although his score was close to that for the Perspective manipulation alone. These three individuals were therefore asked to complete a fifth condition: Neutral plus language (N=38). Here the Neutral stimuli were presented once again, this time with a language cue overlaid. The full stimulus set was shown twice, each item appearing once with a cue that matched the naturally dominant perspective, and once with a cue that went against it. Given that an over-riding practice effect had been ruled out, this condition should demonstrate the usefulness of the language cue alone. In order to reduce the degree of respondent burden, the other three participants did not complete this condition, since there was no suggestion that they were especially helped by the language frame. The Neutral plus Language condition therefore does not form part of the main analysis. Results for Jack, Ron and Harry are presented in Table 4.5.2 (d). Their credited scores from the previous conditions are also repeated for ease of comparison.

Participant	Neutral (N=19)	Perspective (N=38/2)	Perspective + Language (N=38/2)	Neutral 2 (N=19)	Neutral + Language (N=38/2)
Jack	4	4	8	4	9.5
Ron	6	7.5	8	6	8.5
Harry	5	5.5	8	4	8.5
Mean	5	5.67	8	4.67	8.83
S.D.	1	1.76	0	1.5	0.58

Table 4.5.2 (d) Number of verbs produced in the Neutral plus Language compared to previous conditions

For each individual, the score for the Neutral plus Language condition was slightly above that achieved on the Perspective plus Language condition, and markedly higher than either Neutral score (mean = 8.83, S.D. = 0.58). This did indeed suggest that the syntactic frame was offering the greatest support to these participants' production. The explanation for this is less clear; various possibilities are discussed in section 4.7.1.

Of course the Page test says nothing about the cause of an observed effect, or whether one condition is particularly significant in determining the order. A Wilcoxon signed ranks test was used to analyse the difference between pairs of mean scores. (This is again appropriate since the stimuli are repeated measures.) The following pairs of conditions were considered: Neutral versus Perspective, Neutral versus Perspective plus Language and Perspective versus Perspective plus Language. In each case the Page test's alternative hypothesis had made a clear prior prediction about the expected order of scores. This meant that it was appropriate to use one-tailed tests for the Wilcoxon analysis.

For the Neutral versus Perspective conditions, T = 3 (not sig.), indicating that there was no difference between these conditions. For the Perspective versus Perspective plus Language conditions, T = 2 (not sig.), again indicating no difference. However, when the Neutral condition was compared against the Perspective plus Language, T = 0 (significant at $p \leq$ 0.025, one-tailed test). So, although the change in scores between consecutive conditions was small, there was a significant change in the predicted direction between the original Neutral and the Perspective plus Language conditions.

4.6 Adoption of perspective

Three analyses of perspective were performed. The first (presented in section 4.6.1) aimed to establish which perspective was dominant for each item in the Neutral condition. This simply involved a count, for each item, of the number of control verbs that took the perspective of each main participant. The perspective represented by the majority of control responses was subsequently known as the *dominant perspective* for that item. The second analysis (presented in sections 4.6.2 and 4.6.3) considered the effect of the different cues on the perspective of responses. The aim here was to investigate the power of visual or visual-and-linguistic cues to 'shift' respondents from the naturally-preferred perspective. Responses of both the controls and the participants with aphasia were therefore considered in relation to the dominant perspective for each item. The third analysis (section 4.6.4) looked at the effect of cueing within rather than across conditions, by considering the number of items on which

respondents produced both perspectives within a condition. This was obviously only possible where both main perspectives were cued (i.e. in the Perspective and Perspective plus Language conditions). In each case, results for the control group are presented before those for the participants with aphasia.

4.6.1 Analysis of dominant perspective

Table 4.6.1 gives a breakdown of the perspectives adopted by the majority of control participants in the Neutral condition. For each item, the dominant perspective reported is the verb from the stimulus pair that corresponds to the group's most popular perspective. So, for instance, the dominant perspective for item 1 is reported as *give*. Under this are subsumed all responses whose perspectives correspond with that of *give*, i.e. *give*, *present* and *offer*.

Item number	Stimulus situation	Dominant perspective	No. of corresponding responses (N=20)
1	give/take	give	19
2	push/pull	push	11
3	pour/fill	pour	20
4	feed/eat	feed	17
5	chase/flee	chase	20
6	throw/catch	throw	19
7	award/accept	award	20
8	kill/die	kill	20
9	sell/buy	buy	17
10	impress/admire	impress	19
11	teach/learn	teach	14
12	lend/borrow	borrow	14
13	push/fall	push	17
14	offer/accept	offer	18
15	lead/follow	lead	15
16	show/examine	examine	19
17	donate/collect	collect	13
18	ask/tell	ask	16
19	amuse/enjoy	amuse	19

Table 4.6.1 Dominant perspectives for items in the Neutral condition

Most of the preferred verbs took the perspective of either Cause or Source. This was consistent with the findings of Sridhar (1988) and Fisher et al (1994) pointing to the same perspective preference. However a small number of situations did not fit the expected pattern. Three of these involved transactions (items 9, 12 and 17). Here, there was either some uncertainty over which participant was the causal agent (as in the *buy/sell* scene, where both parties could be seen as initiating the action), or else there was a mis-match between Causal agent and Source. The *lend/borrow* scene was filmed in such a way that the borrower appeared much more instrumental in causing the event, while in the *donate/collect* item the collector was clearly shown as causing the action. Two further items (items 2 and 11) involved situations in which there was some uncertainty over the causal agent, with both participants appearing to take active roles. Here, though, there was no doubt about the source of the action, which was duly reflected in the majority of control responses, though to a less strong degree. One other item (item 16) produced a surprising result. Here, Paul (the *shower*) was clearly playing the more causal role and initiated the action, while Sharon (the *examiner*) responded. However the controls almost all described this situation from Sharon's perspective, selecting verbs such as 'inspect', 'look' or 'examine'. It is not clear why this was, although it may have reflected the fact that that the two roles did not occur simultaneously, Sharon's action being the last seen.

There were two situations for which the target perspectives highlighted participants' psychological states (items 10 and 19). Here the controls overwhelmingly preferred the perspective of the intended Stimulus over that of the Experiencer. However it proved (perhaps unsurprisingly) very difficult to elicit psychological state verbs. While verbs representing the psychological state of each participant were present in the total set, they were only produced in response to the manipulated-perspective stimuli. In the Neutral condition, controls interpreted these situations as actions, for which they consistently adopted the perspective of either Cause or Source. For example, in the case of *impress/admire*, where Sharon is shown admiring a cake that Paul has baked, all controls produced verbs like 'show', 'give' or 'offer' in response to the Neutral film. Only when constrained by the visual or linguistic perspectives did they consistently produce verbs such as 'impress', 'amaze', 'surprise', 'tempt', 'admire' or 'extol'.

4.6.2 Maintenance of dominant perspective: Control participants

Here responses to each item are considered in relation to the perspective that was dominant in the Neutral condition. The mean number of items on which controls adopted the dominant perspective is first reported for each condition (Table 4.6.2 (a)). For the double-stimuli conditions, the total score is again halved. These results are then broken down, for the Perspective and Perspective plus Language conditions, according to whether the stimulus matched or went against the dominant perspective (Table 4.6.2 (b)). Scores for this analysis are no longer halved, since the number of stimuli in each case was only 19.

A small number of responses adopted a neutral viewpoint, rather than taking the perspective of either of the main participants. For example, in response to item 2, several controls responded with 'move' or 'shift' rather than 'push' or 'pull'. Since the main aim was to explore the controls' loyalty to the dominant perspective, these neutral verbs were also classed as non-dominant.

	Neutral (N=19)	Perspective (N=38/2)	Perspective + Language (N=38/2)	Neutral 2 (N=19)
Mean	16.35	13.35	9.63	15.7
S.D.	1.63	1.94	0.28	1.11

Table 4.6.2 (a) Control responses maintaining the dominant perspective: Mean and S.D.

	Perspective (N=19)		Perspective + Language (N=19)	
	Dominant-perspective stimuli	Non-dominant perspective stimuli	Dominant-perspective stimuli	Non-dominant perspective stimuli
Mean	16.15	10.55	18.9	0.35
S.D.	3.30	4.25	0.45	0.49

Table 4.6.2 (b) Control responses maintaining the dominant perspective: Dominant and non-dominant stimuli

The control participants produced a large number of dominant-perspective responses in the Neutral condition, with a mean of 16.35 out of 19 verbs (S.D. = 1.63). This was

unsurprising, given that the dominant perspective was defined as that represented by the majority of control participants' responses in this condition. In the Perspective condition the mean number of dominant-perspective verbs dropped to 13.35 (with S.D. of 1.94), possibly suggesting a degree of responsiveness to the perspective of the films. In the Perspective plus Language condition, the mean fell again to 9.63 (S.D. = 0.28), suggesting that the controls were more strongly constrained by the double cue in this condition. In the second Neutral condition the mean was 15.7 (S.D. = 1.11), close to the number for the first condition.

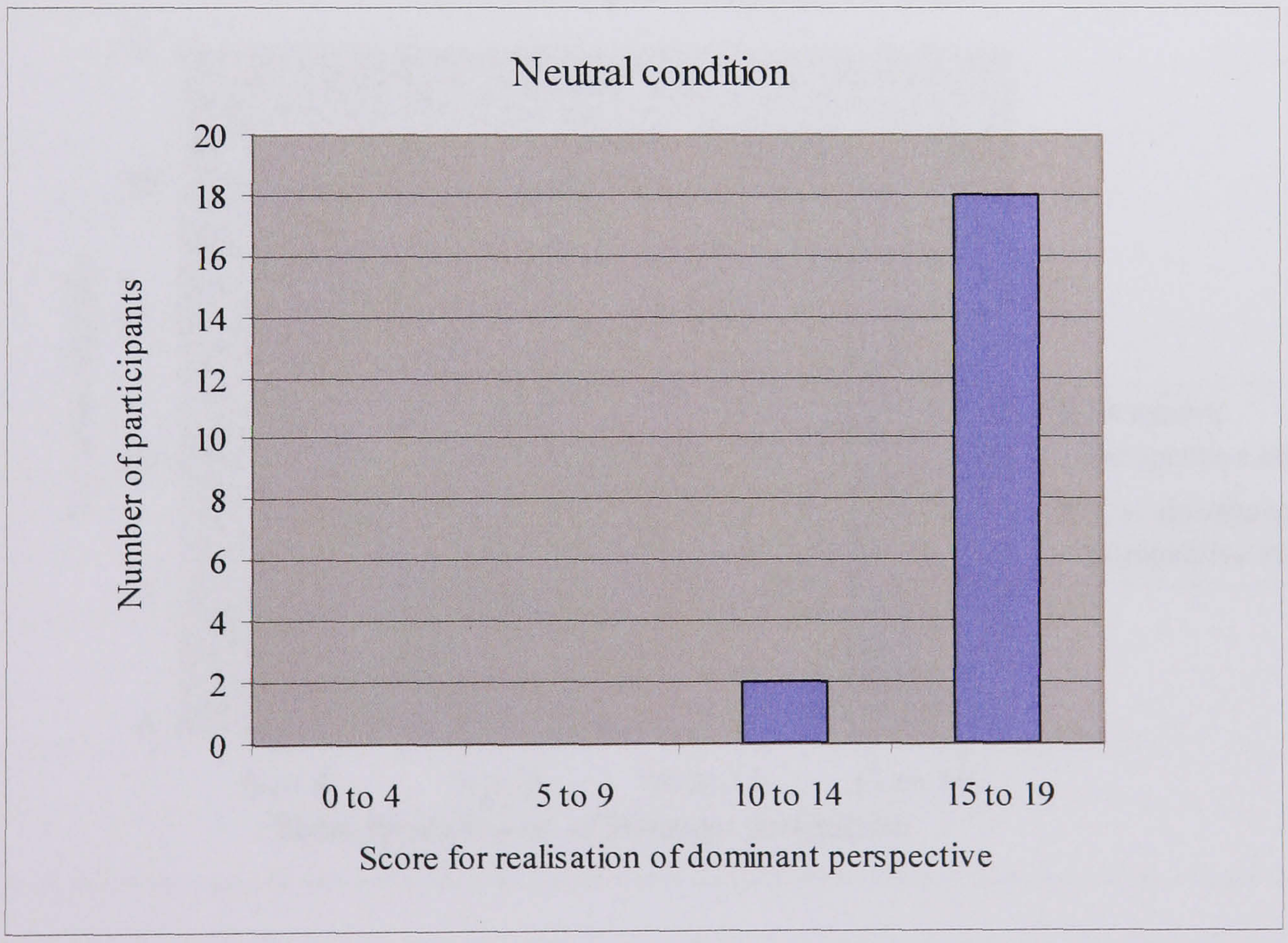
With stimuli that matched the dominant perspective, it was expected that responses would be likely to maintain that perspective. With non-dominant perspective stimuli, responses were expected to be less consistent, some participants being predicted to follow the perspective of the stimulus. These predictions were borne out when the control responses were further broken down. In the Perspective condition, where perspective was constrained by filming alone, the controls produced a mean of 16.15 dominant-perspective verbs (S.D. = 3.30) to dominant-perspective stimuli. In response to the non-dominant perspective films, the mean fell to 10.55 (with S.D. of 4.25). When constrained by both film perspective and a language cue, the controls responded very consistently to the stimulus perspective. Now the mean number of dominant-perspective responses to dominant-perspective stimuli rose to 18.9 (S.D. = 0.45). The controls were very unlikely to produce dominant-perspective verbs in response to doubly-cued non-dominant items, achieving a mean score of 0.35 (S.D. = 0.49).

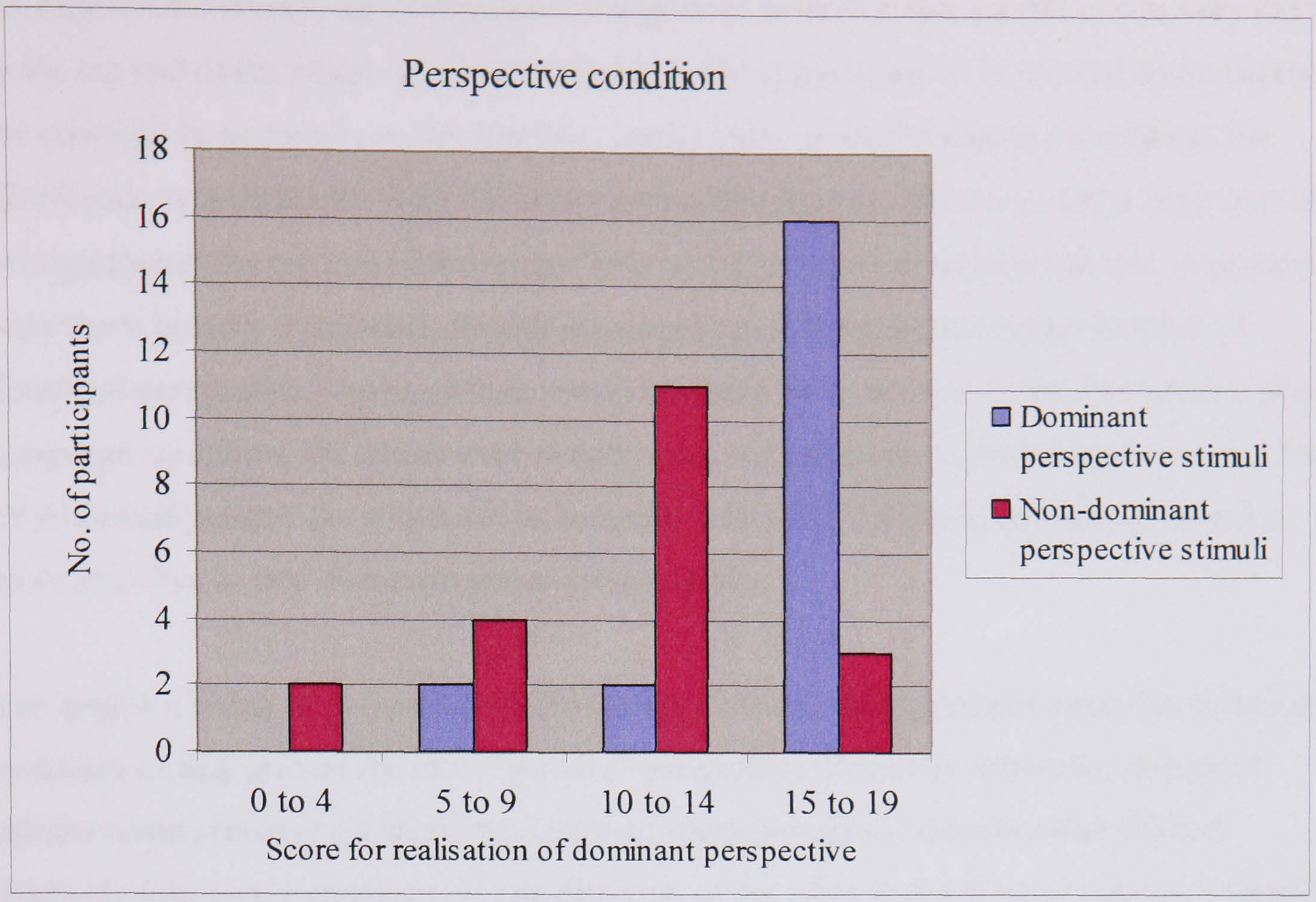
Since the dominant-perspective stimuli matched the controls' natural perspective preferences, they might have been expected to evoke rather more dominant-perspective verbs than the Neutral items. In fact, the number of dominant-perspective responses to dominant-perspective stimuli in the Perspective condition was similar to that in the Neutral condition. One possibility was that the perspective manipulations were not sufficiently distinct to prompt a change. However, the *non*-dominant perspective stimuli elicited considerably fewer dominant-perspective responses, suggesting that they were in fact perceptibly different. It seems more likely that the controls essentially perceived the Neutral and dominant-perspective stimuli in the same way. Their response to the Neutral items was so strongly constrained by the dominant perspective that there was little room for increase when they saw stimuli that reinforced this viewpoint. Only when the films were manipulated in the opposite direction did they start to take notice of their perspective.

The controls' responsiveness to the perspective manipulations may also reflect the influence of previous responses. For both dominant- and non-dominant perspective stimuli, they would

already have seen the opposite-perspective version of half the items. In the case of dominant-perspective stimuli, this may have led them to produce slightly more non-dominant responses, and fewer dominant-perspective verbs, than they would naturally have done. With the non-dominant stimuli, on the other hand, the number of dominant-perspective verbs may have been slightly raised.

It was possible that the mean scores were not in fact very informative about the control participants' pattern of responses. For example, they would make no distinction between groups of scores that were essentially clustered around the mean and those that were evenly split between very low and very high scores. The group scores for dominant-perspective responses were therefore broken down to show the distribution of individual responses, as illustrated in Figure 4.6.2. This represents the number of participants whose scores fell into each of four groups (low, low-middle, high-middle and high). To simplify matters, the breakdown was only completed for certain key sets of responses, as follows: Neutral, Perspective (dominant and non-dominant stimuli) and Perspective plus Language (dominant and non-dominant stimuli).





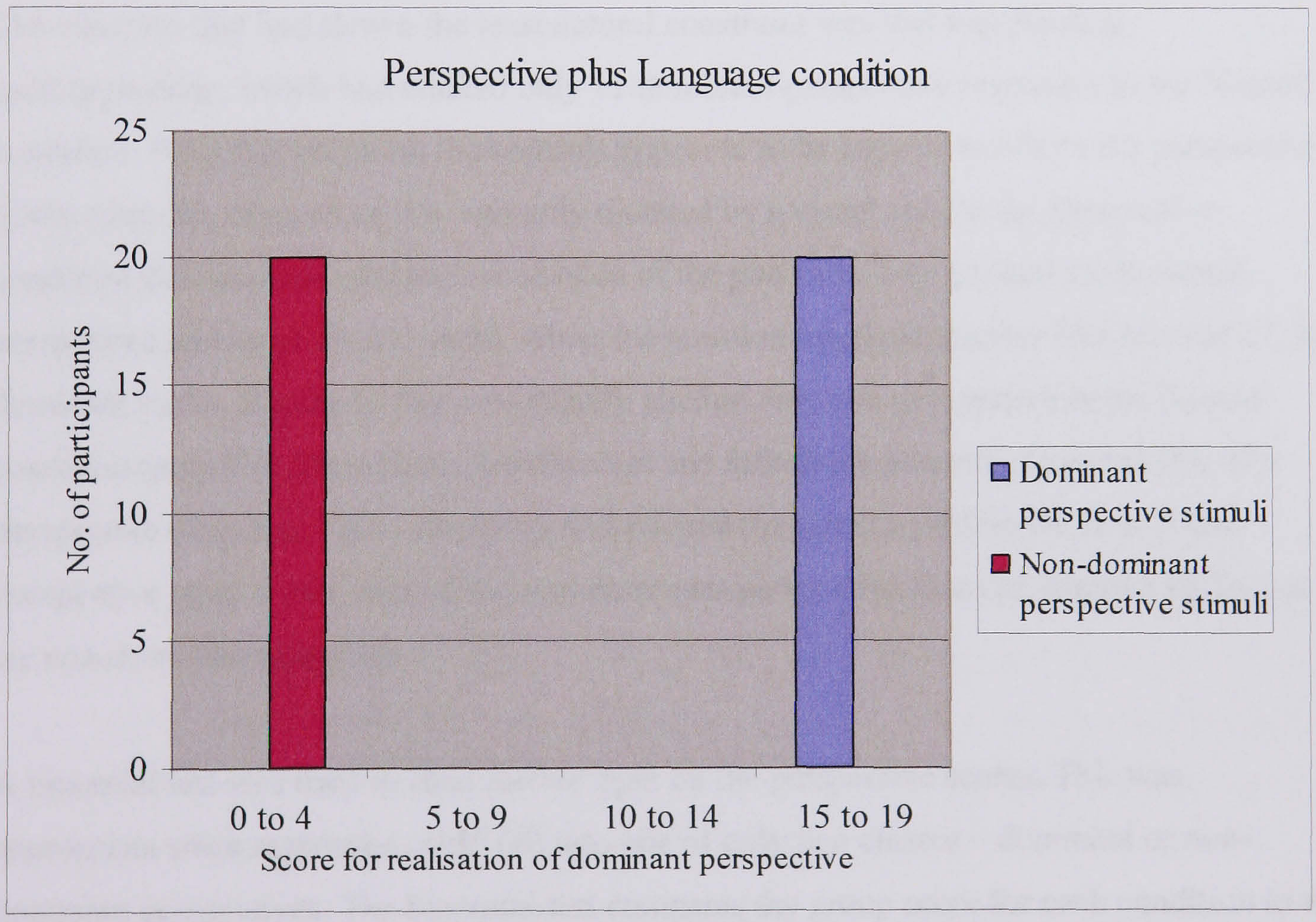


Figure 4.6.2 Breakdown of control responses maintaining the dominant perspective

As Figure 4.6.2 shows, the distribution of responses in the Neutral condition was very much to the top end of the range. This was reflected in the mean score of 16.35, and demonstrates the controls' basic loyalty to the dominant perspective. In the Perspective condition, the distribution was different. With dominant-perspective stimuli, there was still a large number of responses at the top end of the range. With non-dominant perspective stimuli, responses were more broadly distributed, though most controls still produced a larger number of dominant-perspective responses than would be expected by chance. In the Perspective plus Language condition, the scores were evenly split, with all controls producing between 15 and 19 dominant-perspective responses to dominant-perspective stimuli, and none producing more than four to non-dominant perspective stimuli.

The largest number of perspective shifts between conditions might be expected in response to situations that present the most 'genuine' perspective dilemmas, where the degree of natural constraint over speakers' perspective is less powerful. Situations that elicited relatively less strong responses in one direction or the other in the Neutral condition should therefore show stronger effects of the stimulus manipulations in the Perspective and Perspective plus Language conditions. There was some evidence to support this prediction. The situation that had shown the least natural constraint was that representing *pulling/pushing*, which had elicited only 11 dominant-perspective responses in the Neutral condition. With this situation, the controls appeared to be happier to follow the perspective of the stimulus, even when this was only dictated by a visual cue. In the Perspective condition the dominant-perspective version of the *pull/push* item elicited 15 dominant-perspective and three neutral verbs, while the non-dominant perspective film elicited 17 non-dominant verbs. Situations that consistently elicited only one perspective in the Neutral condition (*pour/fill*, *chase/flee*, *award/accept* and *kill/die*) apparently presented less of a perspective dilemma. These situations still elicited the same loyalty in the face of the Perspective cues, where each of the non-dominant perspective films produced only five or six non-dominant responses.

A binomial test was used to shed further light on the perspective scores. This was appropriate since responses could fall into one of only two classes – dominant or non-dominant perspectives. The binomial test compares the group score for each condition to the result that would be obtained if participants were responding at random as to perspective. The alternative hypothesis in each case was that their responses were significantly swayed by the dominant perspective. Both non-dominant and neutral verbs were therefore counted as members of the same class. For sample sizes greater than 35, the binomial distribution

approximates the normal distribution, allowing the result of the test to be interpreted in the usual way (Siegel and Castellan, 1988). The null hypothesis assumes that responses are independent – in other words, that a particular response on one item does not increase the likelihood of producing the same response on the next. If the null hypothesis is rejected, this may therefore either be because of some facet of the condition (for example, the perspective of the stimuli), or because the assumption of independence was unfounded. Results of the binomial test are presented in Table 4.6.2 (c).

Score	Neutral	Perspective		Perspective + Language	
		Dominant-perspective stimuli	Non-dominant perspective stimuli	Dominant-perspective stimuli	Non-dominant perspective stimuli
Raw mean score	16.35	16.15	10.55	18.9	0.35
z score	14.06	13.65	2.15	19.28	-18.78

Table 4.6.2 (c) Results of binomial test for responses maintaining the dominant perspective: Controls (N=19)

At first sight, the z scores appear very high. For example, the raw mean score of 16.35 in the Neutral condition is represented on the binomial test by a z score of 14.06. However, this is less surprising given that the binomial test considers scores against a situation in which each response is produced at random. A mean score of 16.35 represents a total of 327 out of a possible 380 dominant-perspective responses, clearly far above the chance level. In this context, even a mean raw score of 10.55, which appears to be close to chance, translates to a z score of 2.15. The results of the binomial test confirmed what the breakdown of individual scores had suggested. The controls were certainly not responding randomly as to perspective. In the Neutral condition they were very loyal to the dominant perspective. In the Perspective condition, they still remained loyal as a group to the dominant perspective, but less strongly so in response to non-dominant than to dominant-perspective stimuli. In the Perspective plus Language condition, their responses were very strongly constrained by the perspective of the stimuli, even where this went against the naturally more dominant perspective.

4.6.3 Maintenance of dominant perspective: Participants with aphasia

The credited responses of the participants with aphasia were analysed in the same way as the control verbs for their loyalty to the dominant perspective. Results are set out in Table 4.6.3 (a). Figures for the double-stimuli conditions are once again halved.

Participant	Neutral (N=19)	Perspective (N=38/2)	Perspective + Language (N=38/2)	Neutral 2 (N=19)	Neutral + Language (N=38/2)
Carl	1	2.5	2.5	3	-
Jack	2	3	4	2	5
Helen	8	4	8	10	-
Ron	2	4	3	2	5
Harry	4	5	7	4	6
Melvyn	6	9.5	9.5	8	-
Mean (%)	3.83 (51)	4.67 (55)	5.67 (57)	4.83 (59)	5.33 (60)
S.D.	2.71	2.52	2.89	3.37	0.58
Mean total credited verbs	7.5	8.42	9.92	8.17	8.83

Table 4.6.3 (a) Credited responses of participants with aphasia maintaining the dominant perspective (percentage of total shown in brackets)

In the Neutral condition, unlike the controls, the participants with aphasia produced a mean of only 3.83 out of 7.5 dominant-perspective verbs (51%). They went on to maintain a similar proportion of dominant-perspective responses in each subsequent condition, producing a mean of 55% in the Perspective and 57% in the Perspective plus Language conditions. The number of dominant-perspective responses was slightly higher in the second Neutral condition (59%) than in the first. Jack, Ron and Harry responded similarly again in the Neutral plus Language condition, although again with a slightly higher mean (60%).

This was clearly a different pattern from that of the controls. In the Neutral condition, the participants with aphasia were much less constrained by the controls' dominant perspective. They then went on to maintain roughly the same proportion of dominant-perspective responses in each later condition. Although in the Perspective plus Language condition this was similar to the proportion produced by the controls, for the controls this represented a

marked reduction from previous conditions. One possibility was that the participants with aphasia were responding sensitively to the Perspective and Perspective plus Language manipulations. Their responses to these two conditions were therefore broken down, as with the controls, to examine the effect of stimulus perspective. The results are set out in Table 4.6.3 (b). As before, scores are no longer halved, since each stimulus set represents half of the total.

Participant	Perspective		Perspective plus Language	
	Dominant-perspective stimuli	Non-dominant perspective stimuli	Dominant-perspective stimuli	Non-dominant perspective stimuli
Carl	2	3	3	2
Jack	3	3	4	4
Helen	5	3	9	7
Ron	5	3	1	5
Harry	7	3	7	7
Melvyn	9	10	13	6
Mean	5.17	4.17	6.17	5.17
S.D.	2.56	2.86	4.40	1.94

Table 4.6.3 (b) Credited responses of participants with aphasia maintaining the dominant perspective: Dominant and non-dominant stimuli (N=19)

With this breakdown, there did appear to be some differences according to the perspective of the stimulus. The group as a whole produced slightly more dominant-perspective responses to dominant than to non-dominant perspective stimuli in each condition. However there was clearly a considerable amount of variation within the group, indicated by the relatively high standard deviations. Only Helen appeared to respond consistently to the perspective alternations, with a slight drop between dominant and non-dominant perspective stimuli in each condition (although Melvyn also responded strongly to the Perspective plus Language condition).

Binomial tests were performed once again on the selected scores. Rather than comparing the number of dominant-perspective responses against the total possible responses, these compared the number of dominant-perspective responses against the number of credited verbs produced per condition. Results are set out in Table 4.6.3 (c).

Score	Neutral	Perspective		Perspective + Language	
		Dominant-perspective stimuli	Non-dominant perspective stimuli	Dominant-perspective stimuli	Non-dominant perspective stimuli
Mean credited responses	7.5	8.5	8.33	10	9.83
Mean dominant-perspective responses	3.83	5.17	4.17	6.17	5.17
z score	0.14	1.55	0.01	1.81	0.40

Table 4.6.3 (c) Results of binomial test for responses maintaining the dominant perspective: Participants with aphasia (N=19)

The binomial tests confirmed that in the Neutral condition, unlike the controls, the responses of the participants with aphasia were very close to chance in terms of perspective. The results also pointed to some influence of stimulus perspective in the perspective-manipulated conditions. In both cases the z scores for dominant-perspective stimuli were higher than those for non-dominant perspective stimuli. The difference between scores on the two halves of each condition was much smaller than for the controls, however, and none of the z scores rose above 2. In other words, while stimulus perspective seemed to have some effect on the responses of the group as a whole, they were by no means completely constrained by it.

Even if the perspective manipulations did not elicit more verbs that matched their own perspectives, it was possible that they would induce the participants with aphasia to perceive the situations in a more 'perspectivised' way. Being cued as to perspective might therefore lead them to produce more perspective-specific, as opposed to neutral verbs, even if the perspective represented was not the same as that of the stimulus. The number of neutral verbs produced by each person in each condition was therefore counted. Results of this count are presented in Table 4.6.3 (d).

Participant	Neutral (N=19)	Perspective (N=38/2)	Perspective + Language (N=38/2)	Neutral 2 (N=19)	Neutral + Language (N=38/2)
Carl	0	0	0	0	-
Jack	1	0	0	0	0.5
Helen	5	1	1	1	-
Ron	1	0.5	2	1	0.5
Harry	0	0	0	0	0
Melvyn	2	0	0	0	-
Mean	1.5	0.25	0.5	0.33	0.33

Table 4.6.3 (d) Number of neutral verbs produced per condition

Although the mean number of neutral verbs did reduce from the first Neutral condition, the numbers represented are very small, and the difference was largely caused by Helen's slightly raised score in response to the original items. The group's mean scores for the subsequent conditions were very similar, with no tendency to revert to neutral verbs on second viewing of the Neutral stimuli. If a statistical analysis were to be performed on these scores, the Friedman test would be the most appropriate tool. However, even if a significant result were to emerge, it would be difficult to attribute causality to it, since the scores are so close to one another and include such a large number of ties, and since most of the difference is accounted for by Helen's initial response. These results were therefore not subjected to a statistical analysis.

A final possibility was that, even if the participants with aphasia were not strongly constrained as to perspective, the dominant-perspective stimuli might still help them to access more verbs. Just as these items led the controls to produce more responses that were congruent with the perspective of the stimulus, so they might provide more support to the aphasic participants' verb search, since they matched the perspective that was in some sense more 'naturally' dominant. To explore this possibility, a separate analysis was carried out of the credited responses of the participants with aphasia to *only* the dominant-perspective stimuli. If these were indeed the most helpful, they should account for a larger proportion of the credited responses than the non-dominant items. The results of this count are presented in Table 4.6.3 (e).

Participant	Perspective		Perspective plus Language	
	Dominant-perspective stimuli	Non-dominant perspective stimuli	Dominant-perspective stimuli	Non-dominant perspective stimuli
Carl	4	6	5	5
Jack	4	4	8	8
Helen	13	15	18	16
Ron	7	8	6	10
Harry	8	3	8	8
Melvyn	14	15	15	12
Mean	8.33	8.5	10	9.83
S.D.	4.32	5.32	4.80	3.82

Table 4.6.3 (e) Credited responses of participants with aphasia to dominant-perspective stimuli (N=19)

It is clear from the table that the dominant-perspective items did not in fact help the participants with aphasia to access any more verbs than the non-dominant items. For each condition, the mean number of credited verbs produced to dominant- and non-dominant perspective stimuli was almost exactly the same.

4.6.4 Perspective shifts within condition

The aim of the final analysis was to look further at the effects of the perspective manipulations, in this case considering how far people could be constrained to shift perspective within condition. Different effects might be predicted (for the controls at least), depending on whether the dominant or non-dominant perspective was shown first. Items shown from the dominant perspective first would be predicted to elicit a dominant-perspective response. Controls might be less likely to shift to the opposite perspective when the non-dominant version of the same item was subsequently presented. Items that were presented non-dominantly first, however, might be predicted to have a better chance of overcoming the natural 'pull' towards the dominant perspective. On these items more non-dominant verbs might initially be expected. It is harder to predict how control participants would respond when they then saw the dominant perspective versions of the same items. They might be most strongly influenced by the perspective of their previous response; alternatively this might be over-ridden by the natural pull towards the dominant perspective.

In order to make sure that any effect was not simply caused by quirks within particular items, the control group was divided into two. Unfortunately, thanks to 20/20 hindsight, the groups were not quite equal. Twelve participants saw items 1-19 before 20-38, while eight saw items 20-38 before 1-19. Within each set, items were organised so that dominant and non-dominant stimuli alternated. Table 4.6.4 shows the mean number of perspective shifts produced by the controls within each condition.

	Perspective	Perspective + Language
Total (N=19)	9.45	18.6
Items presented dominantly first (N=9/10)	5.2	
Items presented non-dominantly first (N=9/10)	4.3	

Table 4.6.4 Mean perspective shifts within condition: Controls

Taking the Perspective plus Language condition first, it was clear that almost all of the controls' responses demonstrated a shift in perspective. This was as expected, given the result of the previous analysis. The score for this condition was therefore not broken down further. In the Perspective condition, controls shifted perspective on a mean of 9.45 out of the 19 items. Of the items seen first from the dominant perspective, the controls subsequently shifted to the alternative perspective on a mean of 5.2 items, while maintaining perspective on a mean of 4.4. The stimuli presented from the non-dominant perspective first elicited a slightly lower mean of 4.3 perspective shifts, with a mean of 5.1 items eliciting no shift. Overall, these results suggested that the perspective from which the controls first viewed an item did not make a great deal of difference to the likelihood of eliciting a perspective shift. However, the raw scores (while not formally analysed) did go against the predicted direction, with stimuli that were presented dominantly first generating slightly more changes than those first seen from the non-dominant perspective.

Individual items elicited different numbers of perspective shifts, with a mean of 10.05 and a range of 4-16 shifts per item. The items that most consistently generated shifts were those representing *pull/push*, *buy/sell*, *amuse/enjoy* and *ask/tell*. The items that were least likely to induce perspective shifts were *impress/admire* and *offer/accept*. Both of the latter elicited a majority of verbs matching the perspective of the person initiating the event, whether or not they were filmed from that person's perspective. Most participants therefore described the

impress/admire scene (in which Paul impressed Sharon with his baking) as either 'showing' or 'giving', and the *offer/accept* scene (in which Sharon offered Paul a glass of wine) as either 'offering' or 'pouring', despite the fact that the wine was not in fact poured.

The participants with aphasia produced few examples of perspective shifts within condition. This is not really surprising, given that a perspective shift requires production of verbs relating to each perspective. In the Perspective condition in particular, the group produced a mean of only 2.17 shifts (with S.D. of 3.06). Here only Helen (5) and Melvyn (7) produced more than one example. The Perspective plus Language condition generated a slightly larger number of shifts (mean = 3.5, S.D. = 2.17), though here too the total for each participant was much lower than the number of credited verbs.

4.7 Discussion

The Sharon and Paul Test explored speakers' responses to situations in which there was a clear dilemma of perspective. These are situations in which the process of perspective taking is made more complex by the lack of perceptual cues as to the most appropriate perspective to adopt. One source of perspective confusion for people with aphasia may be situations involving a large number of participants and potential relations. Here, however, while the choice of perspective was still potentially very wide, only two main participants were highlighted. The dilemma arose from the fact that both participants were matched on many of the perceptual features that could naturally constrain perspective choice (such as size and animacy), and by the availability of verbs to describe the situation from the perspective of each. This kind of situation is likely to be especially problematic for people with verb difficulties, since the 'thinking-for-speaking' involved relies particularly heavily on linguistic rather than perceptual processing. Making this kind of perspective choice demands knowledge of the available verbs, and of the foregrounding and focusing properties, linked with syntactic structure, that they bring.

More specifically, the test asked a number of questions about participants' processing of perspective in such situations:

- Do visual or syntactic cues help people with aphasia to access verbs relevant to such situations?
- What perspective do speakers naturally adopt on this type of situation?
- How loyal are they to their preferred perspective when visual or syntactic cues are provided?

The test conditions were designed to explore the effects of two types of stimulus manipulation, each of which might be hypothesised to pare down the complexity of the perspective choices involved. The Perspective condition offered a visual cue, by presenting the target situations from the perspective of each of the main participants. The Perspective plus Language condition combined this cue with a syntactic frame in which the verb was missing. In some cases this offered a bare minimum of structure, serving only to identify the foregrounded participant: e.g. '*Paul* ... '. In others the syntactic frame included more information, for example specifying the theme in a change of possession situation: '*Paul* ... *the flowers to Sharon*'.

As noted previously, the target verbs relating to each item were not matched on every possible lexical parameter. Many different factors have been argued to influence verb production, including frequency and familiarity (e.g. Jescheniak and Levelt, 1994; Kemmerer and Tranel, 2000), imageability (Bird, Howard and Franklin, 2000) and semantic factors (Breedin et al, 1998). Lexical factors may certainly have influenced the accessibility of the targets. On the other hand, at least as far as frequency and familiarity are concerned, such an effect may also be circular, in that the relevant verbs may have attained higher frequency or familiarity ratings because they represent the more naturally dominant perspectives. In practical terms it proved impossible to match each verb pair on all possible lexical parameters. While almost any situation can be described in more than one way, the number of situations that offer an obvious 'perspective dilemma', in that they can be readily described by a single verb from the perspective of more than one participant, is relatively small. The number of 'perspective dilemma' situations that are easily filmable is even smaller. It was not essential to control for ease of lexical access between as opposed to within items, since the scoring considers a person's performance on the complete set in each condition. However, differences in the accessibility of particular verbs may have influenced participants' performance on individual items.

The stimuli also represent situations that might be described by verbs with a range of different argument structures, and different numbers of argument structure possibilities. Both

of these factors have been shown to affect ease of production (e.g. Thompson et al, 1997; Kim and Thompson, 2000; Shapiro et al, 1987, 1989; Shapiro and Levine, 1990; Shapiro et al, 1993), although the relation between them and the conceptual complexity of each situation is not entirely clear. In addition, the perspective pairs highlighted within certain items in the test sometimes encouraged the production of verbs with different argument structures. However, only in the conditions where a language cue was overlaid was the choice of verb strongly constrained to fit a particular structure. In the Neutral and Perspective conditions, a whole range of verbs might equally have been used to describe each scene, including verbs that focused on entirely different aspects of the situation from that intended. Moreover, in all conditions, the aim was to encourage the production of any relevant verb, rather than one that specifically fitted the perspective of the film or syntactic frame. All of the cues might therefore be regarded as primarily serving to pare down the situational complexity of the scenes, by suggesting a way out of the perspective dilemmas they presented.

4.7.1 Number of verbs produced

The first analysis considered the number of verbs produced by the participants with aphasia in each condition. The Page test showed that this concurred with the predicted order. As predicted, the least successful was the first Neutral condition, followed by the repeated Neutral, Perspective and Perspective plus Language conditions. Without the second Neutral condition, it would have been impossible to rule out a practice effect, since the predicted order was the same as the order of administration. However, the group's score on the second Neutral condition was only marginally higher than on the first, and lower than the intervening conditions, indicating that the improvement was not simply owing to practice. This suggested that the stimulus manipulations were having some effect on the participants' access to relevant verbs, although the absolute changes in scores were generally small. Wilcoxon tests showed that the only significant improvement for the group was that between the original Neutral and the Perspective plus Language conditions. The shift between scores on the remaining conditions, while moving in the predicted direction, was not great enough to reach significance.

The effectiveness of the linguistic cues was confirmed by the responses to the final Neutral plus Language condition. Ideally all participants should have been asked to complete this, but for reasons of respondent burden only three did so. They achieved similar scores to those on the Perspective plus Language condition. While the Neutral plus Language condition was

not included in the formal analysis, the responses suggested that, for these three individuals at least, the language frame offered the most help. It is difficult to say for sure how the language cues worked, aside from the fact that they almost certainly functioned differently for different individuals. They were certainly not universally successful, since only Helen and Melvyn (who had scored most highly throughout) achieved scores above 50% on the Perspective plus Language condition.

One possibility was that the main support was provided by the syntactic frame. Berndt and Haendiges (2000) offer a precedent for this suggestion, as their participant, JH, achieved significantly better verb naming when a sentence frame was provided for completion (e.g. '*The choir began to* …'). However, some of the syntactic frames provided in the Sharon and Paul Test were very minimal. In six cases the cue consisted simply of either '*Paul … Sharon*' or '*Sharon … Paul*'. For two of these items, one version of the cue was simply '*Paul …*' (representing '*Paul dies*' and '*Paul falls*'). If syntax were the key, these minimal-cue items (representing 32% of the total) might be expected to be less helpful than those offering a more full or detailed frame. In fact, they were just as successful, accounting for between 30% and 50% of each person's credited verbs in the Perspective plus Language condition. Rather than pointing to the importance of a full syntactic frame, these cues seem likely to have functioned in a similar way to the visual cues, focusing the speaker on one of the participants, and encouraging them to use this person as an 'anchoring point' from whose perspective to process the situation. By including the non-verbal sound in the position of the target verb, they may also have reminded participants that a verb was required. This reminder, in combination with the cue to focus on one person over the other, may have guided their verb selection by limiting the options to those that matched the highlighted perspective and/or the language frame. If participants were indeed responding to the cues in this way, this would point to some useful retained 'mapping' skills.

The analysis of the number of verbs produced also enabled a comparison between the total verbs and those credited as acceptable descriptions of each situation. The scoring system for the latter was generous, crediting any verb that was deemed appropriate to the situation, including both those that matched the stimulus perspective and those that went against it. However, there was still a considerable number of responses that could not be credited. The discrepancy was especially marked for Carl, many of whose verbs were either 'light' ('do', 'get', or the copula 'be'), or repetitive phrases such as 'Try to get', 'He/She's saying' or 'Go on'. In fact, Carl was almost unable to produce verbs in isolation. Instead he produced either a sentence (e.g. 'She is going… saying that you are quite good' in response to a film of

Sharon giving Paul a medal), a short phrase lacking a creditable verb (e.g. 'She is back' in response to a shooting scene), or an occasional single word ('good', 'cheese', 'wrong', 'out').

Ron, like Carl, produced a large number of long and sentence-like responses, and found it impossible to limit his responses to single words, except for occasional nouns (e.g. 'ball' in response to the *throwing/catching* scene). In fact, when he was specifically reminded to produce only a verb, this consistently elicited a noun. However, there were fewer occasions on which Ron produced a verb that could not be credited. Most of Ron's un-credited responses were verbless phrases. For example, shown the Perspective version of *sell/buy* in which Paul sells a radio to Sharon, he said, 'Man, radio, and then 30 quid or 15 pound but slight, woman. Really man, radio and things'.

Like Carl, Jack also produced a large number of 'light' verbs, especially 'get' and 'have', which could sometimes be credited. He also tended to repeat previous responses, as he realised that the same verb might serve for a number of stimuli. For example, having accessed 'shovel' in the Perspective condition, he then used it for many of the scenes depicting changes of possession. Interestingly, the verbs he used in this way were not necessarily the same in every condition. So in the Perspective plus Language condition he made similar use of 'have' to describe a range of possession changes.

Across the group there were a number of examples of very resourceful language use, which are not necessarily reflected in the strict scores. For example, Melvyn encapsulated a scene of Paul giving Sharon some flowers with the verb 'courting', which unfortunately did not make the credited group. Similarly, Ron responded to the film of Paul teaching Sharon on the computer with, 'Woman and computer… Internet… puzzled… so teacher… Paul… giving'. While he was not able to encapsulate the idea of information being transferred from one person to the other in a single verb, this clearly points to an ability to analyse the overall structure of this event and its participant roles.

4.7.2 Analysis of perspective

The control participants showed a strong preference for the perspective of either Cause or Source in response to the Neutral condition. Where they deviated from this pattern, there was in all but one case either a genuine dilemma over who played the more causal role, or else the Cause and Source roles were played by different people. The same preference also

applied to situations representing psychological states. Even in the perspective-manipulated conditions, while some psychological state verbs were produced, these proved harder to elicit than verbs representing the Cause or Source perspective.

The analysis of dominant-perspective responses indicated that the controls were considerably constrained by the naturally dominant perspective. The perspective manipulations in the Perspective condition appeared to have some effect: the overall proportion of dominant-perspective responses was slightly lower than in the Neutral condition, and that to non-dominant perspective stimuli was lower still, though still above chance. However, it was only when doubly cued by both film perspective and linguistic frame that the controls consistently followed the perspective of the stimulus. In the Perspective plus Language condition they produced a high proportion of dominant-perspective verbs to dominant-perspective stimuli, and very few in response to non-dominant perspective stimuli. The analysis of perspective shifts confirmed their responsiveness to the cues in this condition. As expected, they shifted consistently according to the stimulus perspective. Far fewer shifts occurred in the Perspective condition, with the first-seen perspective making little difference to the likelihood of eliciting a shift.

The participants with aphasia were in general much less constrained by the controls' dominant perspective. In the Neutral condition, the number of dominant perspective verbs produced was very close to chance. (The second administration of the same stimuli elicited a similar though slightly higher proportion.) Unlike the controls, the participants with aphasia also maintained approximately the same proportion of dominant and non-dominant perspective responses in the Perspective and Perspective plus Language conditions. No individual participant's responses were consistently congruent with the stimulus perspective. Only Helen produced more dominant-perspective responses to dominant than to non-dominant stimuli in both manipulated conditions, though she still produced a larger number of non-dominant responses overall. Melvyn responded strongly to the perspective of the stimulus in the Perspective plus Language condition, but not when cued by the film alone. However, this did not mean that the group as a whole was unresponsive to the stimulus manipulations in these two conditions. The mean score for dominant-perspective verbs fell slightly between dominant and non-dominant perspective stimuli in each case. This was confirmed by the binomial tests, which produced consistently higher z scores for dominant than for non-dominant items, though the difference was much less than for the controls.

It was not at all clear how the perspective manipulations worked for the participants with aphasia. Paradoxically, even when a condition elicited more verbs, this was not necessarily because the stimuli constrained the participants' selection to verbs that matched the stimulus perspective. Many credited responses went against the cued perspective. Nor did the perspective manipulations appear to drive participants to produce a larger number of verbs that were marked as to perspective in either direction (as opposed to neutral verbs). The mean number of neutral verbs across the group was small in every condition, and only Helen showed any real tendency to produce fewer neutral verbs in later conditions than in the first. A third possibility was that the participants with aphasia might produce more appropriate verbs to dominant than to non-dominant perspective stimuli, since the dominant perspective was the one that, for the controls at least, was the most natural. In fact, the dominant-perspective stimuli accounted for no more than half of the participants' credited responses. While it is impossible to be sure why they did not respond in the same way as the controls to the dominant-perspective films, one possibility is that they were not able to analyse them as readily for their causal structure, or to identify the natural 'anchoring point' – usually the Cause or Source participant – on which description hinges.

A final tentative proposal is that the perspective-manipulated conditions provided general supports to the participants in accessing their 'verb lexicon' (rather as the general reminders to think about the action had helped Ron in the Object and Action Naming Battery). For example, it is possible that the language system requires certain types of input in order to recognise that the stimulus to be described is a 'verb situation'. Candidates might be the information that the situation involves an action, with a causal agent, necessitating the adoption of perspective, and bringing with it certain syntactic requirements. However, while the cues in the manipulated conditions may have offered sufficient information to highlight the fact that a verb was needed and to activate the verb lexicon, they did not provide a sufficient drive for the selection of specific verbs.

4.7.3 General discussion

The control participants' responses confirmed that non-brain damaged speakers are strongly constrained in their response to perspective-dilemma situations. The strength of their loyalty to the dominant perspective was surprising, suggesting either that the Perspective cues were not sufficiently differentiated, or that they served only to focus the controls on aspects of the situations that were already foregrounded for them. Some support for the latter interpretation comes from the number of participants who expressed surprise on hearing some of the

language cues in the Perspective plus Language condition, despite having already seen silent versions of the same items. For them, the spoken cues clearly did not concur with their natural interpretation of the scenes, which may possibly reflect a more basic or abstract conceptualisation. For example, faced with any kind of *giving* or *taking* scene, they perhaps fell back on a basic conceptualisation of caused changes of possession that constrained them, in the absence of strong cues otherwise, to describe the scene as 'giving' (or one of its equivalents).

Different situations elicited different degrees of loyalty from the controls, with Neutral items generating between 11 and 20 dominant-perspective verbs. The *pull/push* situation appeared to present the most 'genuine' perspective dilemma, in response to which the controls seemed happier to follow the perspective of the stimulus, even when, as in the Perspective condition, this was only dictated visually. Situations that consistently produced only one perspective in the Neutral condition, on the other hand, elicited a similar loyalty to that perspective in response to the Perspective cues. These situations apparently offered less of a natural perspective dilemma.

Formal investigation of the individual responses of the participants with aphasia was not possible, since the analysis was all done on a group basis. However, it was clear that different individuals were helped to different degrees by the stimulus cues. Only Ron, Harry and Jack (and possibly Melvyn) performed in the way predicted, showing some improvement across the manipulated conditions but no practice effect. Helen's scores were almost at ceiling throughout, while Carl's possibly indicate an effect of the cues in both manipulated conditions which carried over into the second Neutral condition, or may just reflect a practice effect. It is interesting, therefore, that as a group the participants' scores increased in the predicted order. It is difficult to be sure how the stimulus manipulations worked, but it is possible that both visual and linguistic cues served, at least in part, to pare down the complexity of the situations, including their perspective dilemmas. By highlighting one main participant over the other, and demonstrating what type of event to extract from the situation, they may have eliminated a number of alternative interpretations and competing verbs. Interestingly, the Perspective plus Language condition appeared to provide the greatest constraint for both controls and participants with aphasia, though the effects were different. One of the control participants commented, 'You get different verbs when the rest of the sentence is in, because it doesn't need so much encapsulation'. For some of the participants with aphasia at least, this observation might equally apply.

In one sense, the small change in the scores of the participants with aphasia was rather disappointing. In particular, the visual manipulation did not cause a significant increase across the group, although all participants but Helen fared better in the Perspective than in the Neutral condition. On the other hand, any improvement is potentially interesting, given that this type of situation is inherently problematic and that no therapy or discussion was involved. If the test does indeed serve to pare down the complexity of perspective dilemma situations, it would point to a general form of support for people who have difficulty in encapsulating such situations in verbs. Since the issue of perspective taking is not just confined to situations in which there is an obvious perspective dilemma, but is applicable to all event description, any useful cue might have a potentially far-reaching effect. Indeed, we might predict an even stronger effect in response to essentially easier situations, where the perspective dilemma is less extreme. It seems likely that this would be most helpful for those who have trouble in analysing the structure of situations, for example in 'anchoring' their perception to a particular perspective while they search for a relevant verb. This would fit with previous hypotheses about the difficulties experienced by Ron and Harry (who performed most consistently with the test predictions), but less well with those about Melvyn and Jack.

The implications for therapy must therefore remain hints rather than absolutes. Some people might benefit from therapy that helped them to narrow down perspective choices simply by focusing on one or other of the main participants in a situation. Their production might also be supported by encouraging them to name the person on whom they were focusing, much like the minimal syntactic cues in the Perspective plus Language condition of the test. For others the support provided by fuller syntactic cues would clearly be the most significant element in 'scaffolding' both their thinking for speaking and, through this, their language access. Finally for some people, like Helen, the situations included in the test clearly pose little difficulty. For them, such 'paring down' techniques might only be relevant in relation to the description of much more complex situations, perhaps involving more participants or including a number of co-occurring events.

Chapter 5 Investigations of Non-verbal Modalities

5.1 General introduction

Both Ron and Harry have been hypothesised to have some degree of impairment in their conceptualisation of events for language. The final set of investigations explored the implications of this hypothesis for their use of non-verbal modalities. The basic question posed is to what extent non-verbal communication reflects the same difficulties in event conceptualisation as language production. Non-verbal modalities seem an obvious choice for assessment, since they are likely to be more accessible than language for people with difficulties in thinking-for-speaking. They also offer potential insights into the nature of event conceptualisation without demanding language access. Both Ron and Harry certainly made spontaneous use of at least one non-verbal modality in conversation. In each case the modality chosen for assessment was one for which the person concerned showed a natural preference. For Ron this was gesture. Despite his hemiplegia Ron frequently used gesture alongside speech, as demonstrated in his Laurel and Hardy narrative. The first investigation (sections 5.2 to 5.10) therefore explored his gestures through a number of assessments relating to both actions and objects. Harry by contrast often conveyed messages through drawing, which he typically preferred to speech. The final investigation (sections 5.11 onwards) probed Harry's drawing of events, using an assessment recently devised for a study of drawing in people with severe aphasia (Sacchett, 2005).

5.2 Introduction to the investigations of gesture

The first question posed in relation to gesture is, 'How do non-brain damaged speakers gesture actions in isolation, as opposed to within a natural communication context?' Kendon's (1988) continuum, discussed in Chapter 1 (section 1.10.1), makes it reasonable to predict that the context within which a gesture is elicited will influence its form, even when outside of spontaneous communication. According to the 'Right Shift' theory outlined in Chapter 1, gestures that are more directly driven by language rather than by visuo-spatial processing are predicted to fall further to the right of the continuum. This means that, like language, they will be driven more by a 'message'-type conceptualisation than by a non-linguistic 'sketch' (de Ruiter, 2000). As a result, they should themselves be 'pared down' in a language-like way. In practice, we would clearly not expect the production of full 'signs' unless the participants were already users of sign language. Nor would true 'emblems' necessarily be predicted, since the number of highly standardised gestures is fairly small, and

certainly does not encompass every possible target action. However, just as the move towards sign language represents the absorption of gesture into a highly symbolic linguistic system, so we might expect to see gestures become relatively less pantomimic and more 'symbolicised' the more they are mediated by language. A more specific formulation of the first question is therefore, 'Do the action gestures of non-brain damaged speakers change systematically according to the context in which they are elicited?'

The main question addressed in relation to Ron is, 'In what ways (if any) do Ron's action gestures differ from those of non-brain damaged speakers?' Perhaps the most obvious way to compare Ron's gestures with those of controls would be to judge how good they are, or how successfully they convey their targets. However, it would be difficult to form clear hypotheses in this case. For example, it would be wrong to assume that event processing for language and event processing for gesture are identical, or would show parallel impairments. The non-linguistically mediated aspects of Ron's conceptual system may well be intact, and may be able to drive many aspects of gesture production. Indeed, there were a number of suggestions that this was the case. For example, Ron clearly made normal use of objects in the real world, retained knowledge of concepts like Cause and Effect, and could process the non-linguistic aspects of pictures sufficiently to limit his gross errors on tests of event processing. In addition, he already made spontaneous use of gestures to convey meaning.

However, while Ron was clearly able to gesture, his gestures might be expected to reflect some of the same conceptual difficulties as had been hypothesised in relation to his language. As a result, one prediction would be that they would not be influenced by language in the same way as those of non-brain damaged speakers. Language would not be predicted to act as a natural 'paring down' mechanism, so that more language-mediated contexts would not be expected to elicit simpler or more 'symbolicised' gestures. Just as with the controls, a more specific formulation of the main question therefore asks, 'Do Ron's action gestures vary according to elicitation context?'

A second prediction might be that, like his speech, Ron's gestures would display a stronger focus on objects than those of the controls. This might be reflected in his gestures of objects as well as actions, since objects similarly offer scope for a range of different representations, from a simple outline to a detailed depiction of their use. A disproportionate number of gestures that clearly highlight an object's form in isolation from an action (for example, gestures in which an object is outlined or represented statically) might be indicative of a corresponding conceptual focus. A second question to be asked of Ron's gestures would

therefore be, 'Do they differ from those of non-brain damaged speakers in their representation of objects?'

Ron's gestures were explored through both a novel action-gesture task (the Action Gesture Test) and an already-available test of object gestures (Marshall et al, 2004). Carl also completed each test. Like Ron, Carl made use of gesture in conversation, but he was not hypothesised to share Ron's event processing difficulty. He was included in order to minimise the risk of ascribing differences that were due to aphasia in general to specific problems in conceptualising events. If Ron and Carl performed similarly to one another, but differently from non-brain damaged individuals, this would point to some aspect of their aphasia as the source of the difference. If Ron performed differently from both Carl and non-brain damaged gesturers, a specific difference in his conceptualisation of events would appear more likely.

Other explanations for such a difference would of course still be possible. For instance Ron, but not Carl, had a right sided hemiplegia, which may have affected the nature of his gestures. One response to this would have been to ask all the controls to gesture using only their non-preferred hands. However, this was felt to be so unnatural for most non-brain damaged people as to have a potentially drastic effect on the gestures they would produce. Another possibility would be to have a second control group produce one-handed gestures. It was not possible to do this for all the gesture assessments, but one test was treated in this way (see section 5.4). In fact, being limited to the use of one hand made no difference to the controls' gestures in this task. For all the other assessments, it remains possible that Ron's hemiplegia may have contributed to any differences identified. However, he was so experienced at gesturing with one hand, and did so so naturally, that this was not felt to be very likely. Indeed he reported that it made no difference whether he used one hand or two, even for gestures such as *motorcycling* that would normally be produced two-handed.

5.3 The Action Gesture Test

In the Action Gesture Test, participants are asked to produce gestures relating to a series of action pictures. The stimuli are presented in a number of different conditions, designed to manipulate the extent to which language is involved in the gesture process. Since the prediction of the Right Shift theory relates to the potential 'paring down' effect of language, the test explores the relative complexity of the gestures produced in each condition. It first

investigates the nature of Ron's and the controls' gestures separately, before probing for any overall difference between the two.

5.3.1 Design

Sixty picture stimuli were initially selected. In order to be easily gesturable, these were all line drawings of actions involving a single person either acting alone or acting upon an object. In order to ensure that the stimuli in the final set were recognisable and would reliably elicit action gestures, five pilot participants were asked to gesture the action shown in each picture, and to comment on any that they found problematic. Eight of the pictures were considered by at least one person to be either difficult to interpret or hard to gesture. These were removed from the final set. Twelve further pictures were then removed at random in order to produce a target set of 40. Of these, 32 represented a person acting upon an object (e.g. *cutting a cake*), and eight showed a person acting alone (e.g. *sleeping*). The complete set is listed in Appendix 13.

The 40 final pictures were presented to participants in three different conditions (meaning that each person produced 120 gestures in all):

Condition 1: Gesture alone

Here participants were asked simply to produce a gesture for the main action shown in each picture. As some of the participants in the pilot had shown a tendency to describe actions as they gestured, they were specifically asked not to speak.

Condition 2: Name then gesture

Here participants were asked to name the action shown in each picture, and then to produce a gesture.

Condition 3: Gesture from a verbal cue

Here participants produced a gesture from a verb cue alone. However, in order to ensure that Ron understood each verb, the pictures were first presented in groups of ten, and their names spoken aloud. The pictures were then removed, and participants were asked to produce

gestures for the actions they had just seen. For example, they were asked, 'Can you show me *sleeping*?'

The first condition provided a baseline measure of participants' gestures without overt interference from language. In the second condition participants were asked to encode each action verbally before producing a gesture, with the prediction that, for the controls at least, the resulting gestures should be simpler and possibly more 'symbolicised'. In the third condition gestures were produced from a verbal stimulus alone, without reference to pictures. Here the amount of linguistic 'filtering' should be at its greatest. If the Right Shift theory was correct, the gestures produced in this condition, at least by the controls, should be at their most 'pared down'. However, even here there was some visual mediation thanks to the naming exercise that preceded gesture production.

A criticism that might immediately be levelled at this design was that participants' responses to later conditions may have been influenced by their memory of the gestures they had produced earlier. This is certainly possible, and could have been avoided by counter-balancing conditions so that different individuals completed them in different orders. However, it was also very important that the gestures produced in condition 1 should not be influenced by people's experience of gesturing in more language-mediated conditions. Similarly, since condition 3 was hypothesised to elicit the most 'purely' language-filtered gestures, it was important that this should not colour responses to condition 2. For this reason it was decided that all participants would complete conditions in the designated order. Conditions were completed at least one week apart, in the hope of lessening any learning or practice effects.

5.3.2 Control participants

In addition to Carl, ten non-brain damaged speakers acted as control participants. Four were men, six women, aged 43 to 72 (mean = 56.7, S.D. = 10.48). All were native English speakers, and none had any knowledge of sign language. Their age on leaving full time education ranged from 15 to 22 (mean = 18.2, S.D. = 2.53). Details of the control participants are summarised in Table 5.3.2.

Participant	Age	Sex	Age on leaving full-time education	Most recent occupation
1	43	F	16	Administrator
2	45	M	18	Building surveyor
3	50	M	19	Facilities manager
4	50	F	20	Charity worker
5	52	M	16	Company director
6	58	F	15	Personnel officer
7	59	F	16	Teacher
8	67	F	18	Secretary
9	71	F	22	Housewife
10	72	M	22	Pensions manager
Mean	56.7		18.2	
S.D.	10.48		2.53	

Table 5.3.2 Control participants

5.3.3 Scoring

The participants' gestures were filmed and then shown to a group of naïve raters, who knew nothing about the project or about aphasia. There were 11 raters in all: each one saw all 120 of Ron's gestures, and all 120 produced by one of the control participants. Ten raters therefore rated Ron and one of the non-brain damaged controls, while one person rated Ron and Carl. Gestures were shown in groups of ten, alternating groups between Ron and the control participant, and counter-balancing the three conditions. Within each group, individual gestures were identified by number. The raters were not told about the purpose of the test, nor about the order of the conditions. Instead they were simply told that they would see two people doing gestures to represent everyday activities, one of whom had had a stroke. (The person who rated Carl was given a different instruction, which made clear that both Ron and Carl had had strokes.) Following the predictions already made about the relative complexity of gestures produced in different contexts, the raters were asked to judge the complexity of each gesture. Gestures were judged on a scale from 1 to 7, 1 representing the very simple and 7 the most complex. Raters were specifically asked to disregard Ron's hemiplegia in judging his gestures. The target for each item was given on the rating form.

In order to clarify what was meant by simple and complex gestures, each rater first saw a training video which contained an example of each type. Very simple gestures were defined as those containing only one component action with no extra detail. In the example given, the demonstrator represented *brushing hair* with a single repeated brushing action. Complex gestures were defined as those containing more component actions, with a greater degree of detail, and possibly including a narrative structure. The complex version of the *brushing* gesture showed the person outlining a mirror, looking at herself whilst patting her hair, picking up a hairbrush, brushing her hair and replacing the brush. In order to ensure that lengthier gestures were not automatically rated as more complex, both examples were of the same duration.

5.4 Outlining of objects in action gestures

Just as Ron's gestures were hypothesised not to respond to the 'paring down' properties of language in the same way as those of controls, so they were also hypothesised to display a relatively stronger conceptual focus on the objects present in action scenes. This would mirror the pattern seen in Ron's spoken language. The second part of the investigation considered the relative strength of participants' focus on objects within their action gestures, using the coding system devised by Marshall et al (2004). This codes object gestures along a continuum of representational categories, from gestures in which the object is shown being used within an action context to those in which is it presented in isolation. The 'purest' category is that in which the form of the object is outlined. An outlined object is not shown as if being either held or used, but as if seen from the viewpoint of a person external to the action. The present investigation therefore counted the number of gestures produced by Ron, Carl and the non-brain damaged controls that included an object outline. If Ron was indeed having difficulty in paring down the complexity of the actions, and showed a correspondingly stronger focus on objects, his gestures might be predicted to include a large proportion of outlines. This would not be predicted for non-brain damaged speakers, since their processing of actions should be driven more strongly by the sets of 'pre-packaged' features furnished by their language systems.

The author and another scorer watched all of the gestures produced by all 12 participants, and independently counted the number that included an object outline. The second scorer was included in order to counter any 'author' bias, and had not been involved in the rating of complexity. Any disagreements as to the presence of an outline were resolved immediately after the scoring. The scorers were able to agree on all but five of the 1440 gestures. In the

case of these five (all of which were produced by the same person), an object outline was assumed to be present. No disagreement arose in relation to Ron's gestures.

A second analysis of object-outlining was also included in acknowledgment of the fact that Ron's gestures may have been constrained by his hemiplegia. In the case of this particular assessment, it was felt that outlining objects might be a specific strategic response to the difficulty of producing one-handed gestures, since outlining can be done with one hand only. The second analysis used the same system to count the number of object outlines produced by Ron and a new control group, who were asked to use only their non-preferred hands to gesture the same targets. Since the purpose of this analysis was simply to establish whether one-handedness made any difference to the number of outlines produced, the second control group was only asked to complete condition 1 (gesturing alone). Their details are summarised in Table 5.4. They included three men and seven women, ranging in age from 40 to 67 (mean = 54.3, S.D. = 7.76). The age at which they had left full time education ranged from 12 to 22 (mean = 18.4, S.D. = 3.53). Once again all ten were native English speakers, and none had any knowledge of sign language.

Participant	Age	Sex	Age on leaving full-time education	Most recent occupation
1	40	F	21	Not employed
2	44	F	17	Lecturer
3	53	F	22	Secretary
4	54	F	13	Administrator
5	54	M	18	Laboratory technician
6	54	M	21	Accountant
7	58	F	21	Lecturer
8	59	M	21	Lecturer
9	60	F	18	Student
10	67	F	12	Housekeeper

Table 5.4 Control participants for test of object outlining in one-handed gestures

5.5 Test of object gestures

As a counterpart to the investigations of action gestures, a final task explored Ron's production of gestures representing objects in isolation. This also helped to ensure that

differences caused by other aspects of Ron's aphasia (or indeed by his possibly just being an 'odd' gesturer) were not mis-ascribed to his conceptualisation of events. In this case the assessment designed for Marshall et al's (2004) study of gesture in users of British Sign Language was used. Both Ron and Carl were asked to complete this assessment. They were shown 40 pictures (photographs and line drawings) of common objects and asked to produce a gesture for each one. Their gestures were recorded on film, and were then coded by two independent scorers. As with the scoring of object outlines in the action gesture task, any disagreements as to coding were immediately resolved. In this case no disagreements subsequently remained. Control data was appropriated from the ten hearing control participants in the original study. These were all non-signing adults over the age of 50 from the South of England, whose preferred language was English.

The coding system devised for the original study codes gestures in terms of both hand use and degree of elaboration. The analysis of hand use, discussed above, considers the extent to which objects are shown as if being used within an action context. The most complete action context includes gestures in which objects are shown being both held and used (for example, holding a toothbrush to brush the teeth). These are distinguished from those in which the object is shown being used but not held (for example, pressing keys on a push-button telephone). A third category includes gestures that are more distanced from an action, where the object is abstractly represented (for instance, holding an extended finger in front of the mouth to convey a toothbrush). This still entails representing the object's use, or at least relating it to the relevant body part (for instance, representing a hand-held mirror by holding the palm of a hand in front of the face). The final category includes gestures in which the object is entirely isolated from an action and is simply outlined (for example, using an index finger to trace the outline of a clock face).

Elaboration was analysed by noting all examples of three techniques. The first was the use of facial expression (for instance, grimacing to convey effort during a *sawing* gesture). The second was the production of action sequences involving a narrative sequence of gestures (for example, removing a hammer from a tool box, choosing a nail and banging it into a wall). The final category included the use of repeated actions (for instance, putting two boots on one after the other). This did not include internal repetitions, such as a repeated hammering motion.

Gestures could be coded within more than one category for both hand use and elaboration. For instance, a gesture might represent the object being held and used and also include an

outline. The same gesture might similarly involve more than one element of elaboration; for example, it might include both facial expression and a repeated action.

Two different predictions might be entertained about Ron's object gestures. If the observed differences in his action gestures were caused by specific difficulties in conceptualising actions, then his object gestures might be predicted to be more like those of non-brain damaged controls. On the other hand, we might also expect to see some differences from the controls within Ron's object gestures. In particular, we might expect to see a larger proportion of 'purer' object gestures, with more examples especially of outlining. However, we would not necessarily expect a complete absence of more action-based techniques, since for many objects the typical and most conventionalised gesture shows it being held and used. For example, the most common gesture for 'glass' involves a 'glass-holding' handshape being tipped repeatedly towards the mouth. This is clearly a conventionalised gesture, based on an action schema that is far from a fully realised conceptualisation of a drinking event. It does not demand the same thinking for speaking decisions as would be required for a verbal description of the same event - for example, about perspective, role or relational information. While Ron may therefore have sufficiently preserved knowledge of this kind of action schema to produce some 'holding and using' gestures, a strong conceptual focus on objects might at the same time be expected to manifest in a large number of 'purer' object outlines or representations of static object forms.

5.6 Results of Action Gesture Test

Results of three analyses are presented in relation to the Action Gesture Test. The first (Section 5.6.1) examined the gestures produced by the non-brain damaged controls, investigating whether there was any difference in complexity between conditions. The second analysis (Section 5.6.2) did exactly the same for the participants with aphasia. The third (Section 5.6.3) compared the overall complexity of Ron's gestures with that of the non-brain damaged controls.

5.6.1 Non-brain damaged controls: Analysis of gestures by condition

The non-brain damaged controls were predicted to produce gestures that reduced in complexity the more they were mediated by language. So gestures produced in condition 1 were predicted to be more complex than those produced in either condition 2 or 3. Condition 3 was also predicted to elicit more 'pared down' gestures than condition 2, since here

participants would be even more reliant on linguistic cues. Mean ratings of the controls' gestures in each condition are shown in Table 5.6.1.

	Condition 1	Condition 2	Condition 3	All gestures
Mean	2.68	2.29	2.25	2.41
S.D.	0.84	0.65	0.61	0.67

Table 5.6.1 Ratings of gestures produced by non-brain damaged controls (scale = 1-7)

The ratings followed the predicted order, with a higher mean rating for condition 1 (2.68) than for condition 2 (2.29), which in turn was marginally higher than that for condition 3 (2.25). However, the absolute degree of difference between conditions appeared relatively small. A breakdown of the distribution of the ratings provides more detail. Figure 5.6.1 shows the number of ratings falling into each scoring bracket (1 to 7) for each condition.

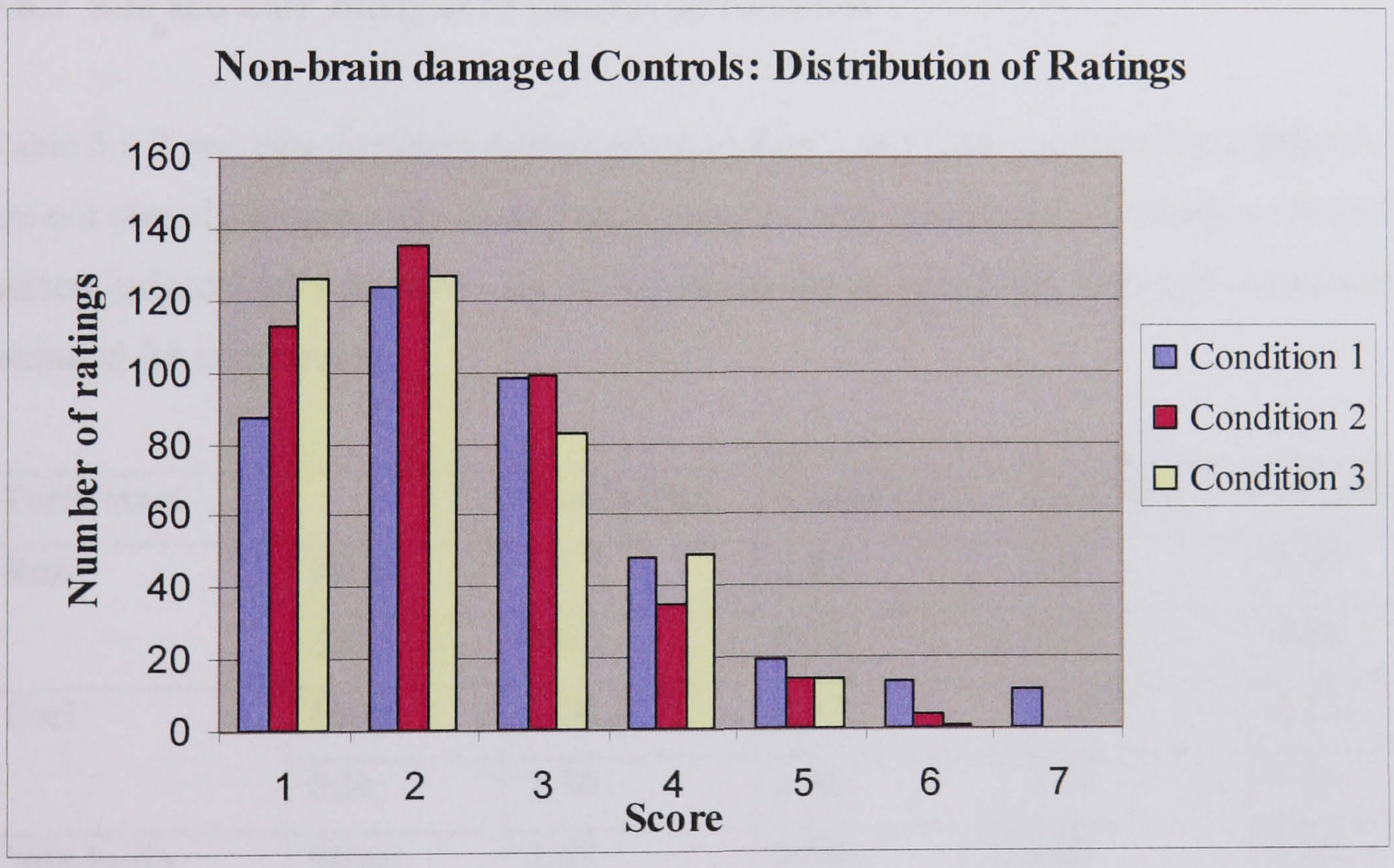


Figure 5.6.1 Distribution of ratings: Non-brain damaged controls

This breakdown suggests that the majority of the gestures produced in all conditions appeared to the raters to be relatively simple. Most of the ratings fell at the lower end of the scale in each case. However the breakdown also provides some support for the hypothesis about the relative complexity of gestures in the different contexts. In conditions 2 and 3,

where the stimulus was more explicitly language-mediated, the proportion of simple gestures (rated 1 or 2) increased, and that of complex gestures (rated 6 or 7) decreased. Indeed there were very few high ratings in conditions 2 and 3, with no gestures being rated at 7.

The difference between conditions was analysed using a one-factor within-subjects Analysis of Variance, in which the control participants were treated as subjects. The independent variable was condition, with levels corresponding to the three test conditions. The null hypothesis was that there was no difference in complexity between the gestures produced in each condition. The ANOVA yielded the following result: $F(2, 18) = 7.47$ ($p \leq 0.01$). This was followed up with planned comparisons of the individual conditions, in line with the predicted order of complexity. So condition 1 was compared with condition 2 and condition 2 with condition 3. These comparisons were not orthogonal but, following Keppel (1991), were justified on the grounds that they were limited in number, and were backed by a sound theoretical rationale. They indicated a significant difference between conditions 1 and 2: $F(1, 18) = 10.28$ ($p \leq 0.01$), but none between conditions 2 and 3: $F(1, 18) = 0.07$ (not sig.).

5.6.2 Ron and Carl: Analysis of gestures by condition

Table 5.6.2 presents the mean ratings given to Ron's and Carl's gestures by condition. These are not directly comparable, since Ron's gestures were rated by all 11 raters, while only one person judged Carl's gestures. The group means for the non-brain damaged controls are also included for comparison.

Participant		Condition 1	Condition 2	Condition 3	All gestures
Ron	Mean	3.13	2.83	3.00	2.98
	S.D.	0.62	0.54	0.73	0.62
Carl	Mean	2.18	2.33	2.175	2.225
	S.D.	1.34	1.46	1.32	1.36
Non-brain damaged controls	Mean	2.68	2.29	2.25	2.41
	S.D.	0.84	0.65	0.61	0.67

Table 5.6.2 Ratings of Ron's and Carl's gestures (scale = 1-7)

Ron's gestures were rated as more complex than those of the non-brain damaged controls in each condition. Moreover, the degree of complexity did not vary in the same way. Although

condition 1 was again rated as the most complex, condition 2 gained the lowest rating, with condition 3 achieving an intermediate score.

Carl's gestures were consistently rated as less complex than Ron's. They also varied less from condition to condition, with condition 2 achieving the highest score. Compared to the non-brain damaged controls, they were rated as less complex in condition 1, but scored very similarly in conditions 2 and 3. However, since Carl's scores came from a single rater, it remains possible that they reflect a quirk of that individual's response.

As with the non-brain damaged controls, Ron's ratings were also broken down by scoring bracket. Figure 5.6.2 provides details of this breakdown.

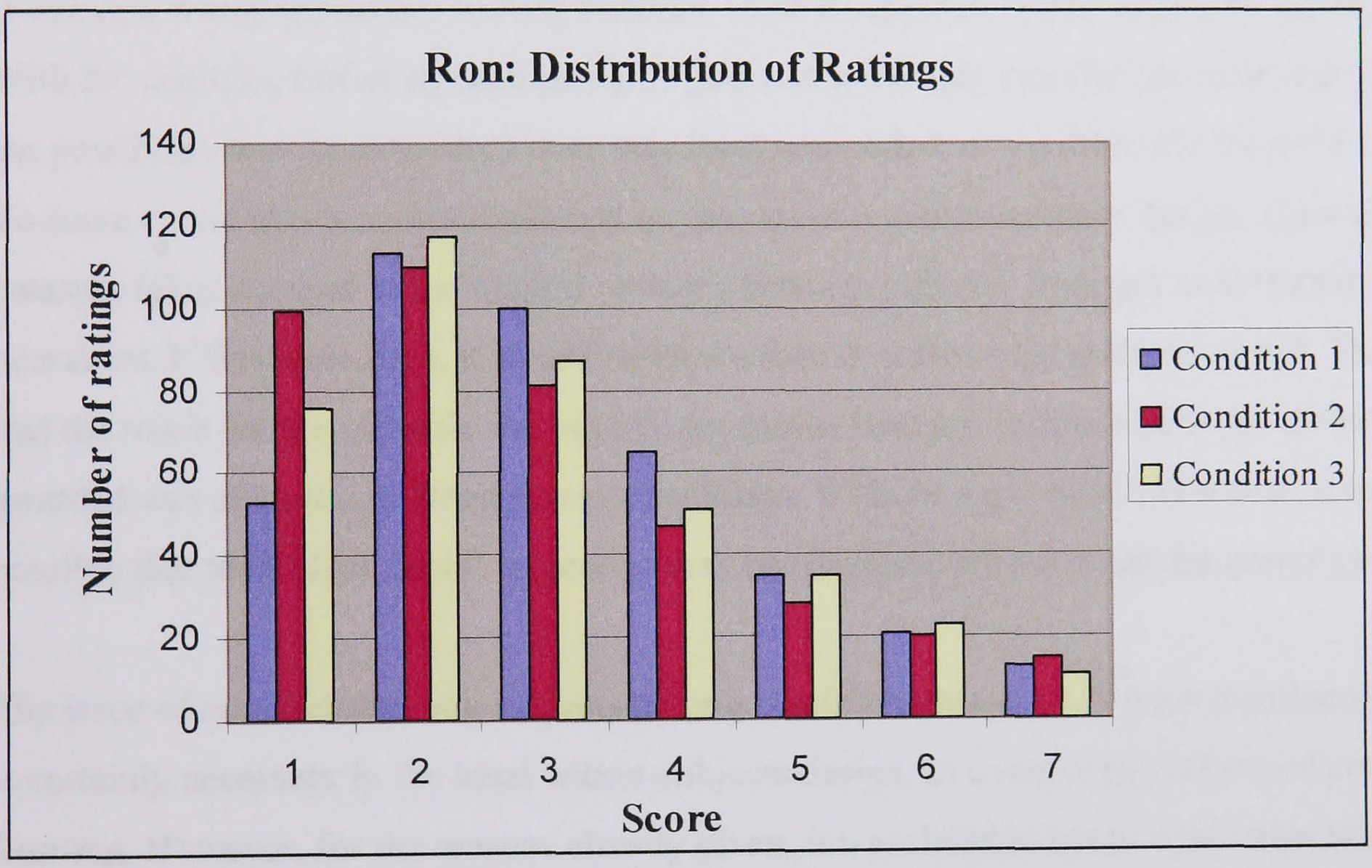


Figure 5.6.2 Distribution of ratings: Ron

In some respects this resembles the breakdown of the non-brain damaged controls' scores, with a general pattern of more lower-rated than higher-rated gestures. Still, there were clearly more higher-rated gestures overall than in the control set, and all three conditions elicited a number of gestures at the top end of the range. Condition 3 in particular elicited a different pattern from the controls, with a much smaller number of gestures rated at 1, and a larger number with ratings of 5-7.

Once again the difference between conditions was analysed using a within-subjects repeated measures Analysis of Variance. In this case the 11 raters were treated as subjects, the null hypothesis being that there was no difference between the ratings of Ron's gestures in each condition. This analysis yielded the following result: $F(2, 20) = 7.68$ ($p \leq 0.01$). In other words, just as with the controls, one or more of the conditions had a different effect from at least one other on the ratings produced. Planned comparisons of the individual conditions were carried out as for the controls. In Ron's case, the comparison of conditions 1 and 2 again indicated a very significant difference: $F(1, 20) = 15.31$ ($p \leq 0.001$). Interestingly, the comparison of conditions 2 and 3 also showed a significant difference, but in the opposite direction from that predicted, with condition 3 being significantly more complex than condition 2: $F(1, 20) = 4.66$ ($p \leq 0.05$).

One issue that must be raised in relation to these scores is that of inter-rater reliability. This is less of a worry in relation to Ron's scores, since his gestures were judged by all 11 raters. With the controls, however, each person's gestures were only seen by one rater, leaving open the possibility that an individual rater may have responded very differently from the others. To some extent this is counterbalanced by the use of a within-subjects design, since the Error measure takes account of the natural variance between subjects (ratings) on different occasions. If this were high, it would be impossible to achieve a significant result. The fact that the result for the controls was significant means that any variance between the ratings awarded was at least consistent across conditions. Without more raters, however, it is still possible that individual raters' responses may have consistently skewed the group's results.

The issue of counterbalancing subjects among conditions has already been mentioned. This is certainly necessary in the ideal within-subjects design, to counter any effects of practice or learning. However, for the reasons already given, it was decided not to counterbalance in this case. It is possible therefore that some of the differences seen between conditions may reflect the participants' memory of their performance on previous conditions.

5.6.3 Comparison of gestures produced by Ron and non-brain damaged controls

Table 5.6.2 (above) shows that Ron's gestures were rated as more complex in each condition than those of the non-brain damaged controls. The difference was analysed using a single sample t test, for which the null hypothesis was that there was no difference in complexity between Ron and the controls. A set of difference scores was calculated, each of which represented the difference between the rating given to a control participant's gesture and that

given to Ron's gesture for the same item. The mean difference score was compared to the difference score that would be achieved under the null hypothesis, i.e. 0.

Using a two-tailed test, the result narrowly missed significance at a level of $p = 0.05$ ($t = 2.23$). Although there was a trend towards greater complexity in Ron's gestures by comparison with those of the controls, the difference was not statistically significant.

5.7 Results for outlining of objects in action gestures

Table 5.7 (a) shows the number of the original action gestures that were judged to include the outlining of an object.

Participant		Condition 1	Condition 2	Condition 3
Ron		18	17	13
Carl		0	1	0
Non-brain damaged controls	Mean	2.1	1.1	1.1
	S.D.	2.60	1.91	1.66

Table 5.7 (a) Action gestures including an outlined object (N=40)

Ron's gestures involved a large number of outlined objects in each condition. Almost half of his responses to conditions 1 and 2 included an outline, while in condition 3 the number fell slightly to 13. Carl's gestures were very different, involving only one object outline across all three conditions. The non-brain damaged controls also rarely used the technique, producing a mean of 2.1 outlines in condition 1 and 1.1 in both conditions 2 and 3. The range was 0 to 7, with seven participants either using no outlines or producing only one across all three conditions. Ron's outlining was compared with the non-brain damaged controls by transforming his scores into standard scores. This yielded z scores of 6.12 for condition 1, 8.32 for condition 2 and 7.17 for condition 3. As indicated by the difference in raw scores, Ron's level of outlining was far outside the parameters of the control group.

Ron's gestures in condition 1 were then compared to the one-handed gestures produced by the second control group. Unfortunately, one of the participants in this group (no. 5) misunderstood the task, thinking he was being asked to gesture as if to a person with communication difficulties. He therefore had to be eliminated from the analysis. Table 5.7

(b) shows the number of gestures produced by the remaining nine participants that included an object outline. These are compared with Ron's gestures for the same condition.

Participant		Number of object outlines
Ron		18
Non-brain damaged controls	Mean	0.56
	S.D.	1.67

Table 5.7 (b) One-handed gestures including an outlined object (N=40)

Once again, Ron outlined far more than the control group. The new controls' gestures still included very few object outlines (with a range of 0-5), despite being produced with only one hand. In fact their mean score was lower than that of the previous, two-handed group. Use of one hand in itself did not therefore appear to lead to an increased rate of outlining.

5.8 Results for object gesture task

Table 5.8 presents the results of the coding analysis of Ron's and Carl's object gestures. The scores for the original study's control group are also reported.

	Ron	Carl	Non-brain damaged controls	
Hand use: number of instances				
Holds and uses object	22	24	Mean	24.2
			S.D. [range]	3.97 [14-29]
Uses object without holding	10	9	Mean	13
			S.D. [range]	1.05 [11-14]
Represents object	6	10	Mean	2.2
			S.D. [range]	2.63 [0-8]
Outlines shape	28	3	Mean	1.1
			S.D. [range]	1.1 [0-3]
Elaboration: number of instances				
Facial expression	23	8	Mean	4.8
			S.D. [range]	7.0 [0-21]
Action sequence	16	7	Mean	10
			S.D. [range]	3.16 [4-15]
Repeated action	0	4	Mean	2.1
			S.D. [range]	1.66 [0-5]

Table 5.8 Coding analysis of object gestures (N=40)

Like the non-brain damaged controls, Ron frequently gestured objects as if being both held and used. His score for this category translated to a z score of -0.55. Both Ron and the controls were less likely to show an object being used without being held; here his score fell just below their range ($z = -2.86$). Like the controls, Ron was even less likely to produce an abstract representation of an object, doing so on only six occasions ($z = 1.44$). The most striking difference was in his use of outlining. This technique was used very little by the controls, with a mean of 1.1 instances. Ron's score of 28 was far above their range, translating to a z score of 24.45.

Ron also made more use of elaboration than the controls, with scores above their range for both facial expression and action sequences. These would translate to z scores of 2.6 and 1.90 respectively. However, the use of a standard score for the facial expression category is problematic, since the control scores do not appear to be normally distributed: they cover a very large range and are clearly skewed, with a standard deviation greater than the mean. Like the controls, Ron preferred not to gesture repeated actions, with no instances of this technique ($z = -1.27$).

Carl's gestures appeared more like those of the controls in respect of both hand use and elaboration. His score for each coding category fell within the controls' range with only two exceptions: he was less likely to show an object being used without being held ($z = -3.81$), and more likely to represent the static object ($z = 2.97$).

5.9 Discussion

The various gesture tasks aimed to address a number of hypotheses, both about Ron's gestures and about those of non-brain damaged speakers. The action gesture task first addressed the effect of introducing language on the complexity of gestures produced. The gestures of non-brain damaged speakers were predicted to reduce in complexity the more explicitly language was involved. The same effect was not hypothesised for Ron, since the addition of language was not expected to help him pare down the complexity of the actions in the same way. Carl was not predicted to perform in the same way as Ron. Although he might be expected to have difficulty with the language-related aspects of the task (producing verbs to picture stimuli and matching spoken verbs to targets), this should not affect his conceptual paring down of the actions. Finally, Ron's gestures were compared for their overall complexity with those of the controls.

The first hypothesis was upheld. The complexity ratings of the gestures produced by the non-brain damaged controls reduced significantly in line with the predicted order. Gestures produced to the picture stimuli in condition 1, where language was not explicitly demanded, were rated as more complex than those produced in conditions 2 and 3. The mean ratings for the two later conditions were similar. One participant's responses to the item shown in Figure 5.9 (below) illustrate the kind of changes observed. In the Gesture alone condition he produced a sequence of actions, first setting the tea things out on the table, then picking up the teapot, pouring tea into the cup, putting the pot down and finally lifting the cup and drinking from it. This gesture was rated at 7. In condition 2, the same participant simply gestured picking up the teapot and pouring tea into a cup before putting both objects down. This gesture, and the gesture he produced in condition 3, achieved ratings of 2.

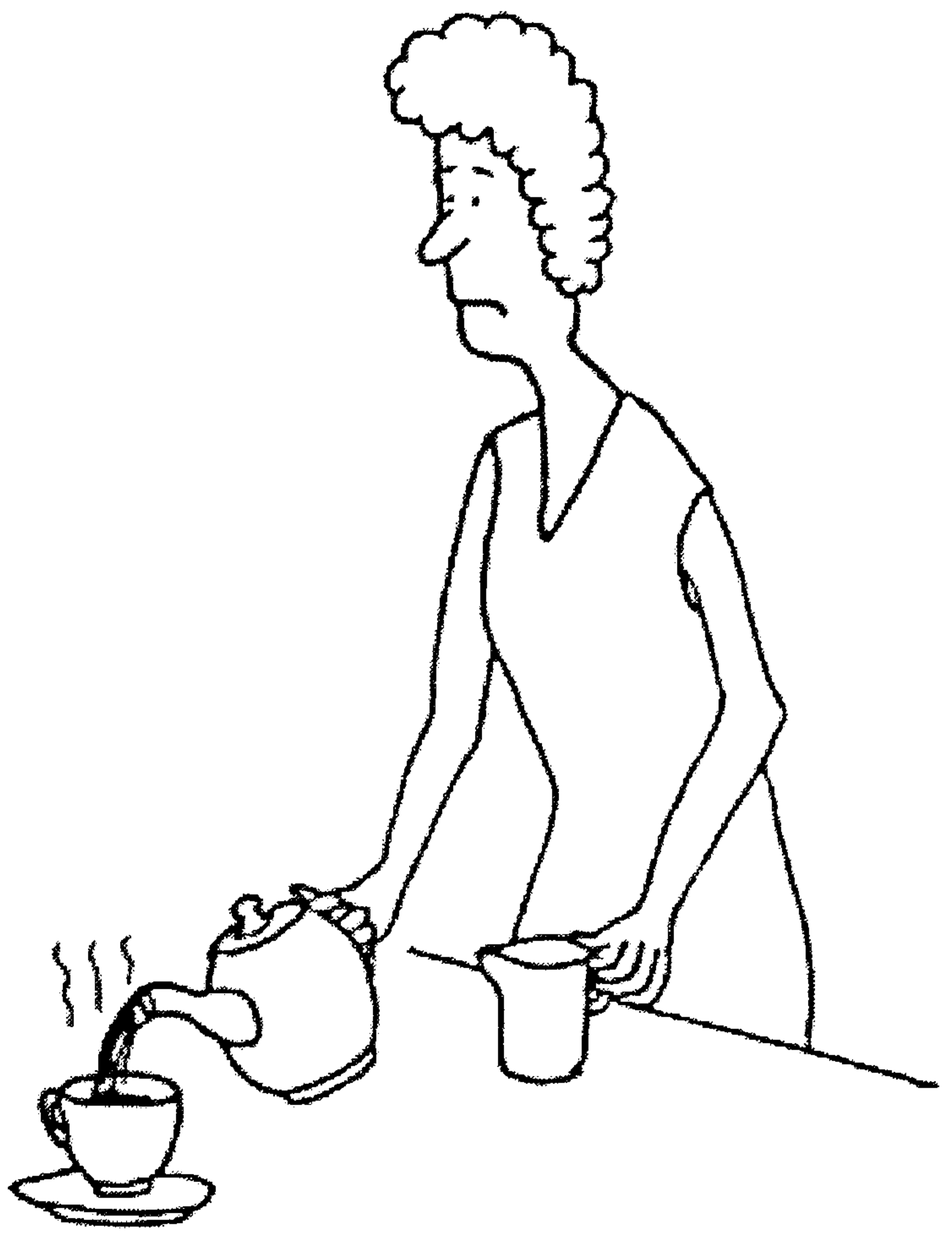


Figure 5.9 Stimulus for *pouring* item (reproduced by kind permission of Jon Hunt)

The results of the complexity analysis suggested that the controls' gestures reduced in complexity when language was involved, whether they produced that language themselves or had it provided for them. Language appeared to offer a conceptualisation of each action, in which its key features were already pared down and packaged together for output. When the controls' thinking was language-mediated, therefore, their gestures were likely to be correspondingly simplified. Language also appeared to dominate over visually-mediated conceptualisation since, once language was involved, the controls' gestures gained similar complexity ratings whether or not the stimulus picture was still present.

A less charitable explanation would be that the controls produced more simplified gestures as they got bored with the task. This is of course possible, and one way to put it to the test would be to ask a new control group to repeat condition 1 on three separate occasions, looking for a similar reduction in complexity. However, two pieces of evidence may be used to argue against this explanation. If boredom were the key, the controls would be expected to produce even more pared down gestures in condition 3 than in condition 2, which was not the case. Secondly, we would expect to see the same effect reflected in Ron's and Carl's gestures, which was again not evident.

Contrary to the initial hypothesis, Ron's gestures also varied significantly in complexity among conditions. However, in his case the variation was not in the same order as that shown by the controls. Like them, his most complex gestures overall were produced in response to condition 1. However it was condition 2 rather than 3 that elicited the least complex ratings. This initially seemed surprising, since in condition 2 the action must first be named before being gestured. Introducing language in this way was not predicted to help Ron pare down the complexity of the actions in the same way as for the controls. On the other hand, if he was still using the picture as the main stimulus for his gestures, their complexity would not be predicted to change.

One possibility was that, contrary to the hypothesis, the process of naming actions did in fact help Ron to focus more directly on the action element of the targets. According to this account, when Ron was able to access a verb this would also constrain the input to his gestures, which in turn would become more simplified. However, a range of evidence suggests that this was not the whole story. First, Ron found naming the actions extremely difficult, and in fact was able to access a verb for only ten out of the 40 targets. Nor was it the case that the named items achieved particularly low complexity ratings. In fact the mean rating for these ten items (3.18) was slightly higher than the overall mean for the second condition (2.83). The reduction in complexity seen in condition 2 cannot, therefore, be primarily owing to the constraint provided by the verb. Secondly, if language was helping Ron in the way hypothesised for the controls, then his gestures should be equally simplified (or become even more so) when cued with externally-produced verbs. Yet in condition 3, where the verb was provided, Ron's complexity ratings rose significantly once again. Finally, if language was helping Ron to focus on the key action elements, we might expect a corresponding decrease in his object focus. Yet the reduction in overall complexity in condition 2 was not accompanied by a reduction in the number of objects outlined.

In fact, as on other occasions when he was asked to name actions, Ron tended to name a number of the objects present in the stimulus. For example, his response to a picture of a man dressing was, "Bedroom, man, half way, shirt, chair". This could be seen as a reflection of his lack of action focus. However it could also be regarded as a cause. In other words, Ron's natural response when asked to name the actions may have been so far from focused on unitary action concepts that it could not help him in paring down the complex visual scenes. Nor was his object-naming simply a response to the difficulty of finding a verb. Even when he was able to produce a verb, he still tended to name the visible objects. For example,

shown a picture of a man cooking, he said, "Cooking, man, saucepans, potatoes, and mince, and cooking". If Ron's gesture was directly driven by the language he produced, we might even expect this 'invitation' to name objects to be reflected in an even larger number of object-outlines in his gestures. Naming before gesturing did not, however, appear to affect the strength of Ron's object focus. In other words, using language did not appear to mediate Ron's natural response to the action scenes.

An alternative explanation might consider the processing load imposed by the different conditions. Ron found the dual task of naming and then gesturing the actions in condition 2 very difficult. Producing the verbs was extremely time-consuming for him, and presumably involved a considerable increase in processing load. This may have led Ron to put less effort into his subsequent gestures, making them generally less lengthy and detailed than those in condition 1. In condition 3, where the verb was provided, he would again be able to put more effort into his gestures, leading to an increase in complexity. This would not rise to the level seen in condition 1, however, since Ron would no longer have the detail of the picture as stimulus.

It is difficult to assess the effect of processing load directly, since this was not part of the original test design. One response would be to remove the issue altogether, by comparing conditions 1 and 3 directly. However, this would necessitate an unplanned comparison, since it was not part of the original analysis. While it is legitimate to mix planned and unplanned comparisons, it is problematic in a situation, as here, where the combination equates to comparing all possible conditions. One possibility would be to treat all the analyses of Ron's responses as if unplanned. Using a Newman-Keuls test, the comparison of conditions 1 versus 2 is still significant at a level of $p \leq 0.01$, while that of conditions 2 versus 3 remains significant at $p \leq 0.05$. The third comparison, of conditions 1 and 3, is not significant. In other words, once the additional processing load of condition 2 was factored out, condition 3 was not significantly less complex than condition 1. This suggests that the addition of language to the task did not in itself lead Ron to gesture in a less complex way.

Carl's gestures could not be analysed statistically since they reflected the judgment of only one rater. However, they appeared to present a rather different picture from either Ron or the other controls, since they elicited similar ratings in all three conditions. They were also consistently rated at the lower end of the scale, at approximately the same level as those of the non-brain damaged controls in the language-mediated conditions. This may simply be a reflection of Carl's natural gesturing style. Alternatively we might argue that a tendency to

produce scantier rather than more detailed gestures might be more typical following brain injury. In condition 1, Carl's gestures were already fairly simple, scoring a little below the mean of the other controls. When language was added, Carl's language difficulties made the task very problematic. He found it impossible to name most of the targets in condition 2. His gestures were therefore probably still driven by primarily visually-mediated constraints. When the actions were named for him in condition 3, the language-mediated aspects of conceptualisation might be expected to kick in, perhaps leading to even more pared down gestures. However, Carl frequently had difficulty in understanding the target verbs, despite the preceding rehearsal exercise, and often needed confirmation or repetitions. This may possibly have led him to fall back on his intact non-verbal conceptualisation of the actions to drive his gestures. Alternatively, he may have been relying on his memory of the gestures already produced in the two previous conditions.

Ron's action gestures were finally compared for their complexity with those of the non-brain damaged controls. Despite his hemiplegia, his gestures were rated as more complex in each condition. However, the overall difference was not statistically significant. One possible contributory factor was the considerable range of complexity within the controls' gestures. One person in particular produced much more elaborate 'pantomimes' for many items than the rest of the group. Although it would be wrong to draw any conclusions about his relation to a wider population from such a small group, his performance may reflect the artificial nature of the task, which required people to gesture in a very unnatural way, entirely divorced from real communication. Of course, the same objection may also be raised in relation to Ron. A useful further investigation might compare the spontaneous gestures produced by both Ron and the controls alongside descriptions of action scenes.

Looking back at Ron's gestures, however, it was clear that a major source of elaboration was the degree of detail with which he represented the objects involved in the actions. This was not a factor that the original raters had been asked to consider in judging the complexity of the gestures. The second analysis of the action gestures explored this factor by counting the number of object outlines included. The control participants were very unlikely to use outlining. Ron, on the other hand, did so on a large number of occasions. One possibility was that this was a strategic response to his hemiplegia, which limited him to the use of one hand for most gestures. However, when the second control group gestured the same actions using only their non-preferred hands, they were found to be no more likely to outline than the first. As with the analysis of overall gesture complexity, it was also possible that Ron's outlining reflected some general facet of his aphasia. However, Carl's response to both action and

object gesture tasks suggested that this was not so since, like the non-brain damaged controls, his gestures contained very few instances of outlining.

An alternative interpretation is that Ron's tendency to outline may once again reflect a difficulty in adopting a clear conceptual focus over actions. As with his 'hypernaming' of objects in action descriptions, the level of object detail shown in Ron's gestures may suggest a disproportionate conceptual focus on objects. For example, when gesturing *motorcycling*, he not only outlined the form of the motorbike in detail, but also showed the shape of the helmet and sideburns worn by the rider. The object gesture task offered another means of exploring this possibility.

The coding analysis of Ron's object gestures indicated both some similarities and certain differences from the controls. Both he and they frequently represented objects as if being held and used, suggesting that Ron was at least able to extract this aspect of action knowledge from objects. The most striking difference lay in his use of outlining, the 'purest' form of object representation available, which far outstripped that of the controls. This perhaps points to a similar conceptual focus on the form of objects as suggested by Ron's action gestures, and hinted at in his action descriptions. In fact he frequently used the two techniques of 'holding and using' and outlining side by side: on 14 of the 22 occasions on which he gestured an object being held and used, he also provided an outline. This was extremely unusual by comparison with the controls. In general Ron's gestures also displayed a greater degree of elaboration than those of the controls.

All in all, Ron presented a mixed picture. He undoubtedly focused more strongly on the visuo-spatial form of the objects than the controls. However his production of 'holding and using' gestures showed that he was also able to conceptualise the typical use of many objects. In fact it is possible that Ron's focus on the objects' form may have helped to constrain his thinking in the way required for this type of gesture. As suggested previously, representation of the typical use of an object requires a very different kind of action knowledge from the full conceptualisation that underlies event description. In particular, it is possible to gesture the use of many objects on the basis of 'action schemas' that do not involve thinking about, for example, perspective or role information. According to this account, proposed initially by Riddoch and Humphreys (1987) in relation to the gestures of a person with optic aphasia, objects are said to 'afford' particular actions. A picture of a corkscrew, for example, elicits a *turning* gesture because the viewer naturally imagines the action of manipulating its 'thread' shape. JB (Riddoch and Humphreys, 1987) was able to

produce very precise gestures for visually presented objects, despite a significant impairment in object naming. For example, he would not only represent the correct use of objects such as knives and forks but would use the appropriate hand to do so. One possibility was that JB's gestural ability stemmed specifically from analysis of the objects' visual features, rather than from knowledge of their semantic properties. It is possible that, when Ron produced 'holding and using' gestures to represent the actions typically associated with common objects, his thinking was constrained in a rather similar way.

5.10 Summary and implications

For non-brain damaged speakers, involving language in the process of gesturing led to more simplified gestures. This finding supports the Right Shift hypothesis made on the basis of Kendon's continuum: gestures mediated by language appear to be relatively less pantomimic, and more pared down, than those driven by visuo-spatial processing. It is possible that (already pared down) language helped the controls to conceptualise actions in terms of 'pre-packaged' sets of concepts. One interpretation of Carl's gestures is that his language difficulties may have made it difficult for him to switch between visually- and verbally-mediated conceptualisation. He therefore had to rely on his (already relatively pared down) non-linguistic conceptualisation of the targets in every condition. Despite initial appearances, Ron's action gestures were not overall significantly more complex than those of the non-brain damaged controls. It was not entirely clear whether or not the addition of language supported his thinking. Although the overall complexity of his gestures reduced when he was asked to name the actions, the large number of unnamed targets suggests that it was not language itself that led to this reduction. Externally-cued gestures once again increased in complexity, which again points to some other causal factor. One possible candidate is the degree of processing load imposed by the naming task. Introducing language also did not appear to lessen Ron's conceptual focus on objects. This was consistently demonstrated, both in his outlining of objects within action gestures and in the complexity of his gestures of objects in isolation.

It is important to sound a note of caution about these conclusions, since they represent data from only ten non-brain damaged controls and 11 raters. It would clearly be necessary to replicate the findings with a larger control group and more raters before drawing firmer conclusions about any differences between Ron and the wider population. However, even from this small sample it is possible to point to some interesting potential implications for both theory and therapy. The various investigations provide further evidence for a close

connection between the conceptual systems serving language and gesture. For the non-brain damaged controls, encouraging them to switch from visually to verbally-mediated conceptualisation led to consistent effects on the complexity of their gestures. The apparent similarities between Ron's gestures and his talking about actions similarly point to shared conceptual features underlying both modalities. Both of these findings provide support for the Sketch model of gesture production (de Ruiter, 2000), in which a single Conceptualizer generates both linguistic *message* and non-linguistic *sketch*. However, they also point to the existence of links between the two mechanisms. They therefore additionally suggest, as proposed by Kita and Özyürek (2003), that there is feedback between the conceptual processes governing the production of language and those driving gesture.

On the other hand, Ron's performance in condition 2 showed that his gesturing and his naming of actions could dissociate. It was clear that, like Marcel (Kemmerer et al, 2007), Ron was able to gesture actions that he could not name. Production of action gestures did not in itself appear to facilitate Ron's naming, nor did naming make his gestures more language-like. In contexts that for non-brain damaged speakers appeared to be largely language-mediated, Ron's gestures were not constrained in the same way. These findings suggest that gesture production and lexical access are supported by underlying systems that are at least to some extent functionally distinct. The linguistic influences that were observed in the controls' gestures were therefore not seen in the same way in those produced by Ron.

Whatever the precise nature of the relationship between the conceptual systems underlying each modality, the finding of cross-modality effects has obvious implications for therapy. As pointed out in Chapter 1, these have already been exploited in a number of intervention studies. However, the differences demonstrated among Ron, Carl and the non-brain damaged controls also suggest that the implications need careful thinking through. For someone like Carl, the visual aspects of conceptualisation already appeared to provide a relatively pared down input to his gesture system. Gesture might therefore be a fruitful target for therapy as an alternative modality, and possibly even as a support for language. Ron's gestures were not naturally pared down in the same way. While the effect of asking Ron to gesture actions before naming them was not assessed, it seems unlikely that his 'un-pared down' gestures would provide a useful support for language production.

If feedback between gesture and language indeed occurs at the level of the Conceptualizer, then therapy aiming to exploit Ron's gestural ability would need to work explicitly on the conceptual focus it reflects. Ron's conceptualisation appeared to engender an object-focus in

both language and gesture. For gesture to be used as a support for the production of language about actions, his conceptualisation would therefore need to be moulded more closely to a language-ready form. For example, like EM (Marshall et al, 1998; Marshall, 1999), Ron might be encouraged to use gesture to break down complex actions into focused, unitary concepts. This might indeed be useful, since it was generally much easier for him to gesture than to produce spoken verbs, and his gestures would offer a longer-lasting visual record of his thinking. For Ron, much of the discussion within therapy would presumably also focus on the degree of object detail that was essential to the expression of each key action concept.

5.11 Investigation of drawing

The final non-verbal investigation considered Harry's drawing of events. Drawing was Harry's preferred medium of communication, and one he often used successfully in conversation. However, although he frequently drew objects, maps or representations of places (e.g. a concert hall), he rarely used drawing to communicate events. Drawing events is obviously quite a complex task, since it demands the representation of a dynamic situation through an essentially static medium. Because of this complexity, and because the investigation of Harry's drawing was not intended to form a major part of the current study, an already-available task was used. The Event Drawing Task (Sacchett, 2005) was designed to explore the drawing of events by people with severe aphasia, who had very little access to language output. While not specifically designed for Harry, therefore, it offers at least potential insights into the particular constraints affecting his event drawing.

The main question addressed by the Event Drawing Task is, 'How do people (both with and without aphasia) draw Caused Change of Location events?' The stimuli are deliberately limited to this one type, since Caused Changes of Location necessarily specify the movement of an object along a Path from a Source to a Goal, which should be relatively easy to translate into drawing. Situations of this type also involve a number of identifiable entities with clear roles that can be readily analysed:

i. CAUSE (the initiator of the movement of the Theme)
ii. THEME (the object that moves from Source to Goal position)
iii. SOURCE (the starting position of the Theme)
iv. GOAL (the final position of the Theme)

In order to ensure that the stimuli are as easy to draw as possible, all of the objects involved are also of high familiarity, with a simple form and few distinctive features (e.g. *ball*, *box*).

One of the aims of the Event Drawing Task is to explore the specific constraints on output afforded by the drawing medium. It analyses participants' event drawings in terms of a number of factors: the number of referents depicted, the use of conventions such as arrows to represent movement, the position in which the Theme is shown, the spatial orientation of the main referents, and the temporal order in which they are drawn. The latter two categories are included in acknowledgment of the fact that, just as the highlighted entity is accorded the position of syntactic subject in language, so it tends to be drawn first and (amongst English-speakers, at least) on the left of the page (Chatterjee, Maher and Heilman, 1995; Chatterjee, Southwood and Basilico, 1999).

In addition to probing the constraints imposed by the process of drawing, The Event Drawing Task also explicitly acknowledges the importance of the relationship between language and the drawing system. It therefore also aims to shed light on the linguistic and perceptual constraints that come into play as events are processed for drawing. The task explores participants' responses to situations presented in two different (verbal and visual) modalities. In the verbal condition, the stimuli take the form of 32 spoken sentences, while in the visual condition (administered on a later occasion) they are short silent video clips of the same events. For each item, participants are asked to draw 'the main thing that happens so as to get it across as clearly as possible to another person'. Each response is drawn on a separate sheet of paper. Symbols such as arrows (but not written words) are permitted. The complete list of verbal stimuli is given in Appendix 14.

The test was designed to explore the effect of a number of different variables on drawing. Apart from the stimulus condition, the type of situation presented and the role played by the Causal agent are also manipulated. Half of the stimuli present reversible change-of-possession situations involving a girl, a boy and an object (for example, the situation described as '*Mary sells the book to Bill*'). The other half present non-reversible changes of position involving a single person and two objects (for example, '*Bill lifts the box off the table*'). In half the items the Causal participant plays the role of Source (as in '*Mary gives the flower to Bill*'/'*Bill puts the flower in the vase*'), while in the other half he or she plays that of Goal (for example, '*Bill buys the book from Mary*'/'*Mary takes the apple out of the bowl*'). A number of further checks were also built into the design. For example, '*Mary*' and '*Bill*' each act as Cause in half of the items, balanced across stimulus groups. In the visual

condition, the spatial orientation of the stimuli is also balanced, with the Causal participant appearing on the left of the screen in half of the clips. Distracting movement and background detail are kept to a minimum, in order to help participants attend to the key action elements.

While this design allows for a detailed exploration of the constraints exerted over event drawing across a group of participants, the large number of variables makes it difficult to draw firm conclusions about any individual's performance, since each sub-group of stimuli is very small. Rather than investigating the possible effects of each variable on Harry's drawing, therefore, his drawings will simply be considered in relation to the strongest response patterns produced by a group of non-brain damaged controls.

Just as in the assessment of Ron's gestures, it was possible that Harry might draw differently from control participants because of some facet of his aphasia, rather than because of any difference in his event processing skills. In fact this may be even more likely in relation to drawing than with gesture, since even less is known about the processes of drawing production in non-brain damaged individuals, and since drawing events is probably even more unnatural. However, as in the gesture study, the inclusion of a control participant with aphasia aimed to lessen the risk of ascribing more general aphasia-related difficulties to specific problems in conceptualisation. Jack, who was not hypothesised to have difficulty in analysing events, but who had similarly severe language output difficulties, was therefore asked to complete the drawing task as well as Harry. Even with the inclusion of Jack, it is still possible that any differences between Harry and the controls may simply reflect his being an 'unusual' drawer. One potential cause of drawing difficulty may at least be ruled out. Harry was asked to complete the 'Drawing to Command' subsection of the Boston Diagnostic Aphasia Examination (BDAE, Goodglass et al, 2000) in order to probe for any constructional difficulties or visual agnosia. On this test he scored 13/15, having difficulty only in drawing a cube in perspective. This score equated to the top of the range of the 227 people with aphasia sampled for the BDAE (mean = 6.1, S.D. = 3.8). Harry's performance on the Raven's SPM and on the Pyramids and Palm Trees Test provides further evidence of his intact visuo-spatial and object recognition skills.

Harry and Jack's responses on the Event Drawing Task were compared to those of the 12 non-brain damaged control participants in Sacchett's (2005) study. These were eight men and four women, ranging in age from 46 to 79 (mean = 58.67, S.D. = 11.99), and in the age at which they left full-time education from 15 to 23 (mean = 18.17, S.D. = 2.72). Although

they were recruited to match the participants with aphasia in the original study, they were also good matches for both Jack and Harry.

5.12 Results for non-brain damaged control participants

A number of clear tendencies emerged from the responses of the non-brain damaged controls. First, they represented all three main referents in all but a very small proportion of their drawings. For example, one item shows a boy putting a book onto a chair. Here the three main referents are clearly the boy, the book and the chair. Secondly, the controls almost universally used arrows to represent the Theme's movement. Over 80% of each person's responses to the verbal condition included the use of arrows, while ten out of the 12 individuals used them to the same degree in the visual condition. Third, they showed an overall tendency to represent the Theme in its starting position, especially in the verbal condition. Fourth, the spatial orientation of their drawings differed depending on condition, with a significant preference for drawing the Causal participant on the left in the verbal, while in the visual condition they consistently reproduced the orientation of the stimuli.

The final analysis relates to the order in which the controls drew the three main referents for each item. Although the pattern of responses was complex, a number of tendencies again emerged. In the verbal condition, the most striking finding was that there was a very strong preference for drawing the Cause first (with a mean of 27.67 out of 32 responses of this type). One interpretation of this finding would be that the controls' drawings reflected the order of mention of the referents within the stimulus sentences. This was always consistent, maintaining the order (1) Cause (2) Theme (3) Source or Goal. However, not all responses in which the Cause was drawn first followed this order. Approximately 35% of such responses (mean = 9.58) deviated from it, especially in response to sentences in which the Causal agent played the role of Goal (e.g. '*Mary takes the book from Bill*' or '*Bill picks the flower from the vase*'). Here the pattern (1) Cause (2) Source (3) Theme was equally common. In addition to the main constraint to draw the Cause first, therefore, there appeared to be an additional, lesser preference for representing Source before Theme. There was no overall tendency to draw the Source first in preference to the other referents, however.

In the visual condition, there was still a tendency to draw the Cause first (accounting for a mean of 20.82 responses overall). Source also attracted some attention, being drawn first in response to a mean of 18.99 items. There was still a strong preference for following the most natural sentence order, but only in relation to the items in which the Cause and Source

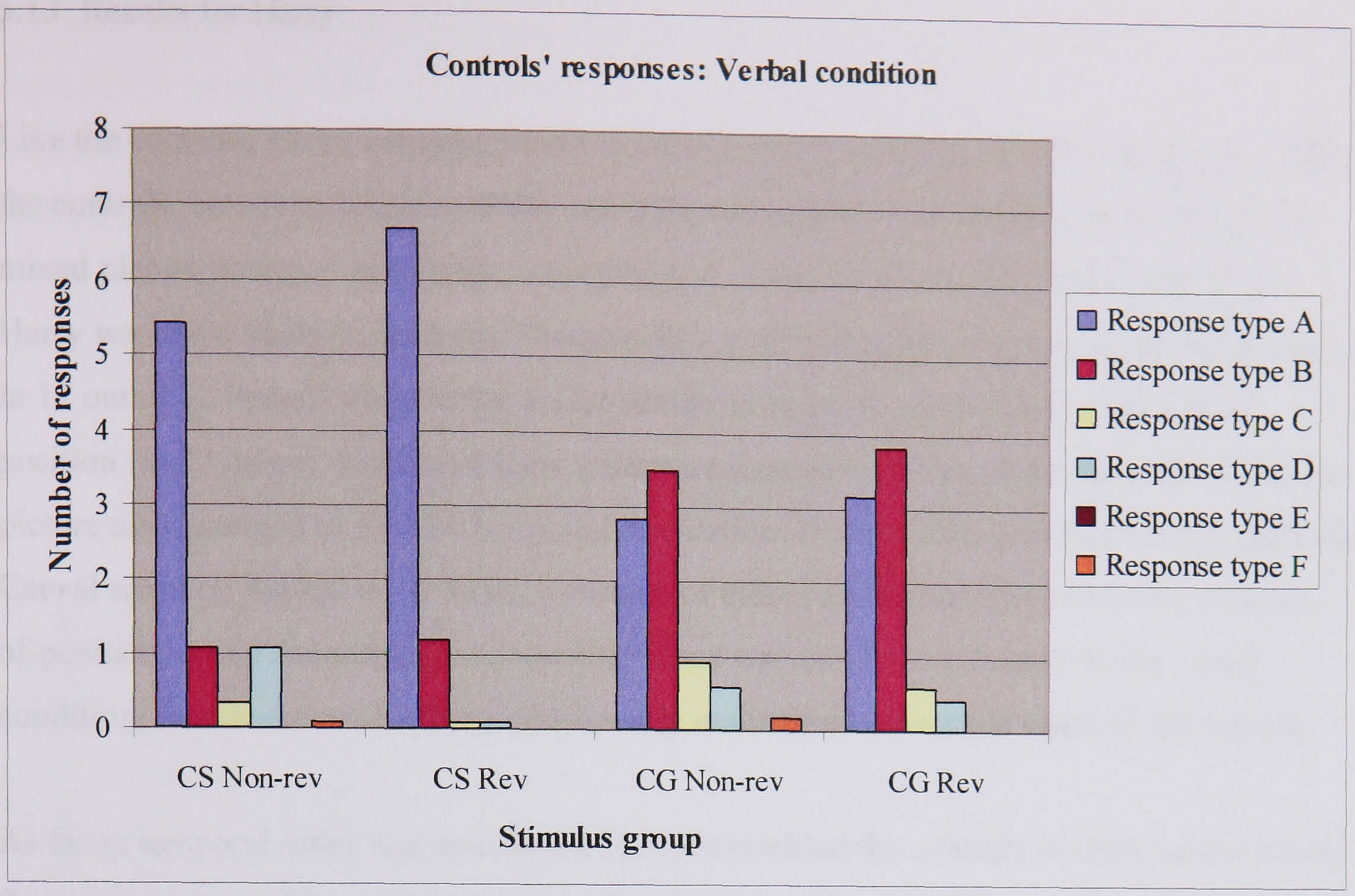
participants were the same (i.e. in *giving* or *putting* situations). Where Cause and Source participants conflicted (in *taking* or *picking* situations), no single pattern was dominant, with a spread of scores across response types and fairly high standard deviations in each case. However, reversible (*taking*) situations elicited a larger mean number of responses of the order (1) Source (2) Theme (3) Cause. This may be related to the nature of the situation type, since in *taking* situations attention is divided between the two animate participants playing the roles of Cause (the *taker*) and Source (the *giver*). Sacchett (2005) suggests that other factors more specifically related to drawing may also come into play here, including a tendency to draw the Source before the Theme.

In summary, the controls showed a strong preference for representing a situation's Cause first, with an additional lesser bias towards its Source. Their responses to each condition are represented in Figure 5.12. Responses are broken down according to both stimulus group and response type. For the sake of clarity, the stimulus groups are coded slightly differently from the system used in Sacchett's (2005) study. Groups are coded as follows:

CS Non-rev = Cause as Source, non-reversible, change of position situations (e.g. *put*)
CS Rev = Cause as Source, reversible, change of possession situations (e.g. *give*)
CG Non-rev = Cause as Goal, non-reversible, change of position situations (e.g. *pick*)
CG Rev = Cause as Goal, reversible, change of possession situations (e.g. *take*)

The six response types represent the following temporal orders of drawing:

Type A = (1) Cause (2) Theme (3) Source or Goal
Type B = (1) Cause (2) Source or Goal (3) Theme
Type C = (1) Source or Goal (2) Theme (3) Cause
Type D = (1) Source or Goal (2) Cause (3) Theme
Type E = (1) Theme (2) Cause (3) Source or Goal
Type F = (1) Theme (2) Source or Goal (3) Cause



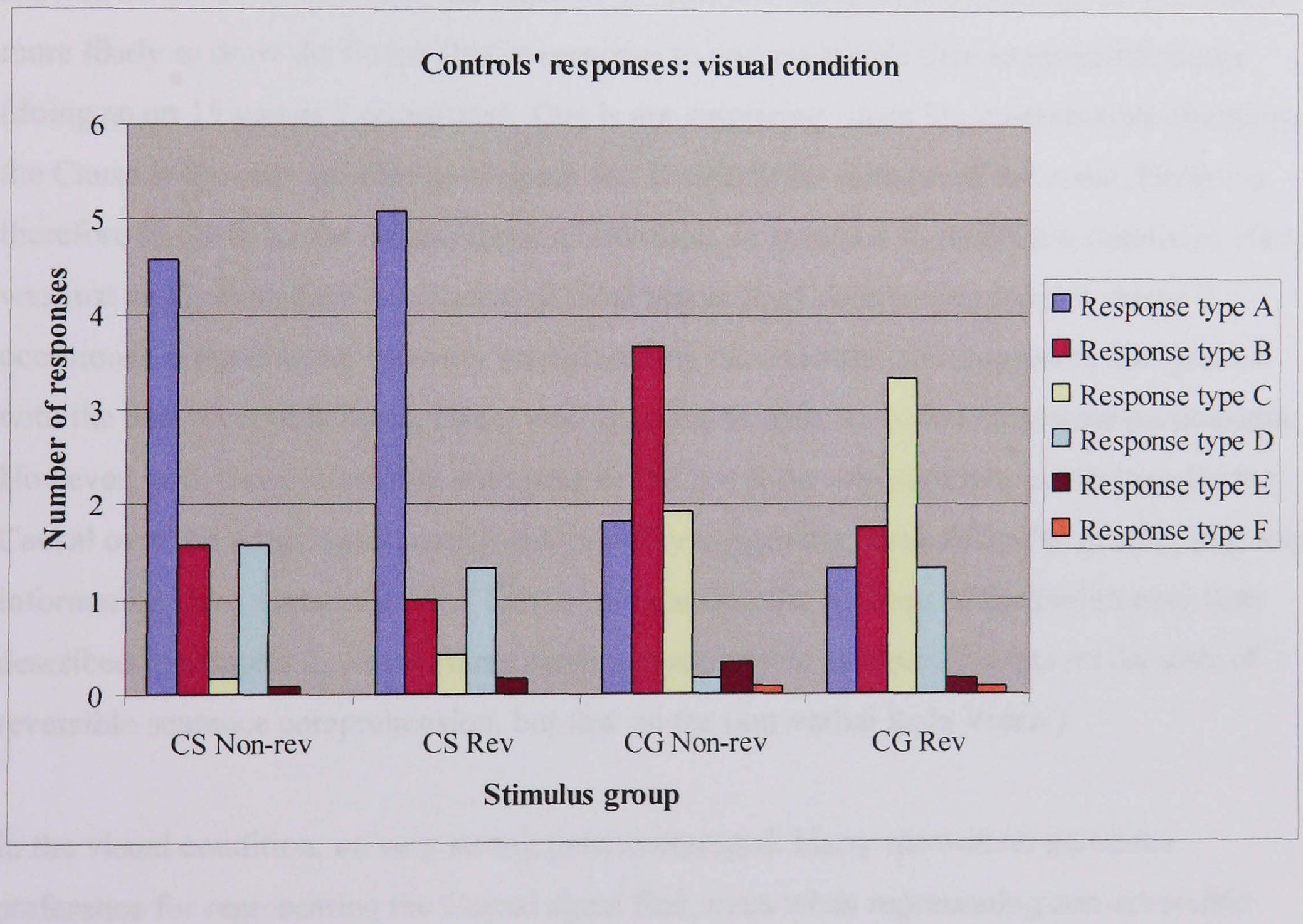


Figure 5.12 Breakdown of control participants' responses to (a) verbal and (b) visual conditions by response type (mean scores)

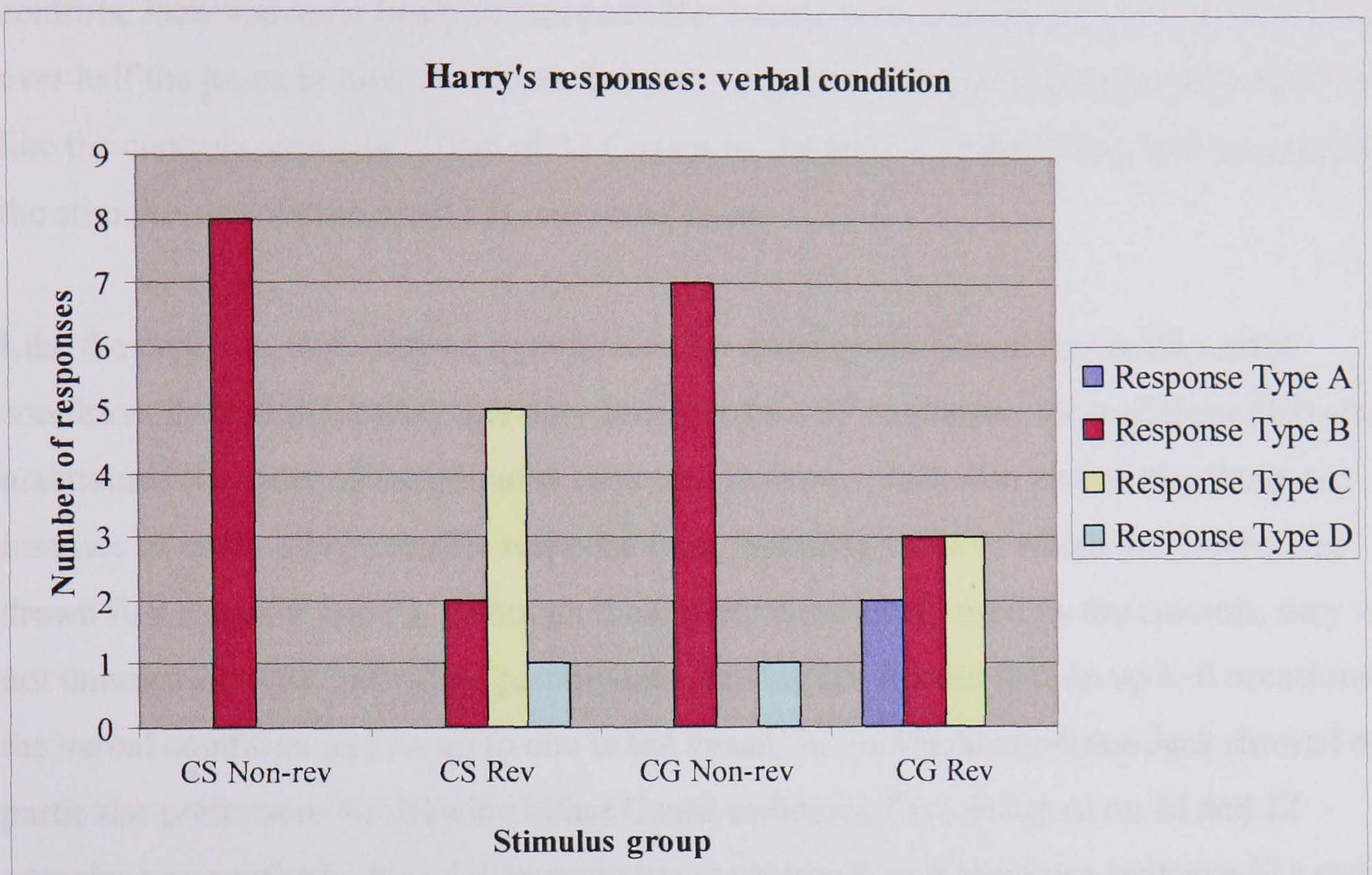
5.13 Results for Harry

Like the controls, Harry consistently drew all three main referents in both conditions. Unlike the controls, however, he never made use of arrows to show the direction of movement. A mixed picture emerged in relation to the position of the Theme. In the verbal condition, Harry was most likely to draw the Theme mid-way between the other two referents (doing so in 17 out of 32 items), while in the visual condition he preferred to show it in its final position (in 27 items). Neither of these patterns accorded with that of the controls. A mixed picture also emerged in relation to spatial orientation. In the verbal condition, Harry drew the Causal agent on the left in 18 items. Fourteen of these represented non-reversible changes-of-position, while the pattern for reversible items was much more mixed. In the visual condition, like the controls, Harry consistently maintained the spatial order of the stimuli.

As far as temporal order was concerned, Harry resembled the controls in drawing the Cause first in response to 22 out of 32 items in the verbal condition. However, unlike them he showed no tendency to follow the order of the stimulus sentences. Moreover, he was much more likely to draw the Cause first in response to non-reversible than to reversible items (doing so on 15 versus 7 occasions). This is not surprising, since in non-reversible situations the Cause is the only animate participant and is clearly the initiator of the event. He/she is therefore likely to be the natural focus of attention. In response to reversible situations, Harry was just as likely to draw the Source or Goal before the Cause (doing so on 9 versus 7 occasions), a pattern that was very rarely used by the controls. This suggested that, just as with the non-reversible items, Harry was focusing on animate before inanimate participants. However, with these reversible sentences he did not show any particular preference for the Causal over the non-Causal participant, possibly suggesting some difficulty in analysing role information from verbal stimuli. (This would confirm the findings of the preliminary tests described in Chapter 2, where Harry made a considerable number of errors on the tests of reversible sentence comprehension, but few on the non-verbal Role Video.)

In the visual condition, no very strong pattern emerged. Harry showed no particular preference for representing the Causal agent first, even when representing non-reversible situations. Overall he drew the Cause first in 16 out of the 32 items. He was also no more likely to start with the Cause than with the Source, doing so in response to 16 and 18 items respectively. Where there was no conflict between Cause and Source (i.e. in *giving* or *putting* situations), Harry differed markedly from the controls in that he showed no tendency to follow a sentence-like order by producing responses of type A. Where Cause and Source

conflicted (i.e. in *taking* or *picking* situations), Harry resembled the controls in producing a more mixed pattern, although he was more likely to use the order (1) Source (2) Theme (3) Cause (type C). Figure 5.13 presents Harry's responses in graph form, using the same coding of stimulus and response types as for the controls.



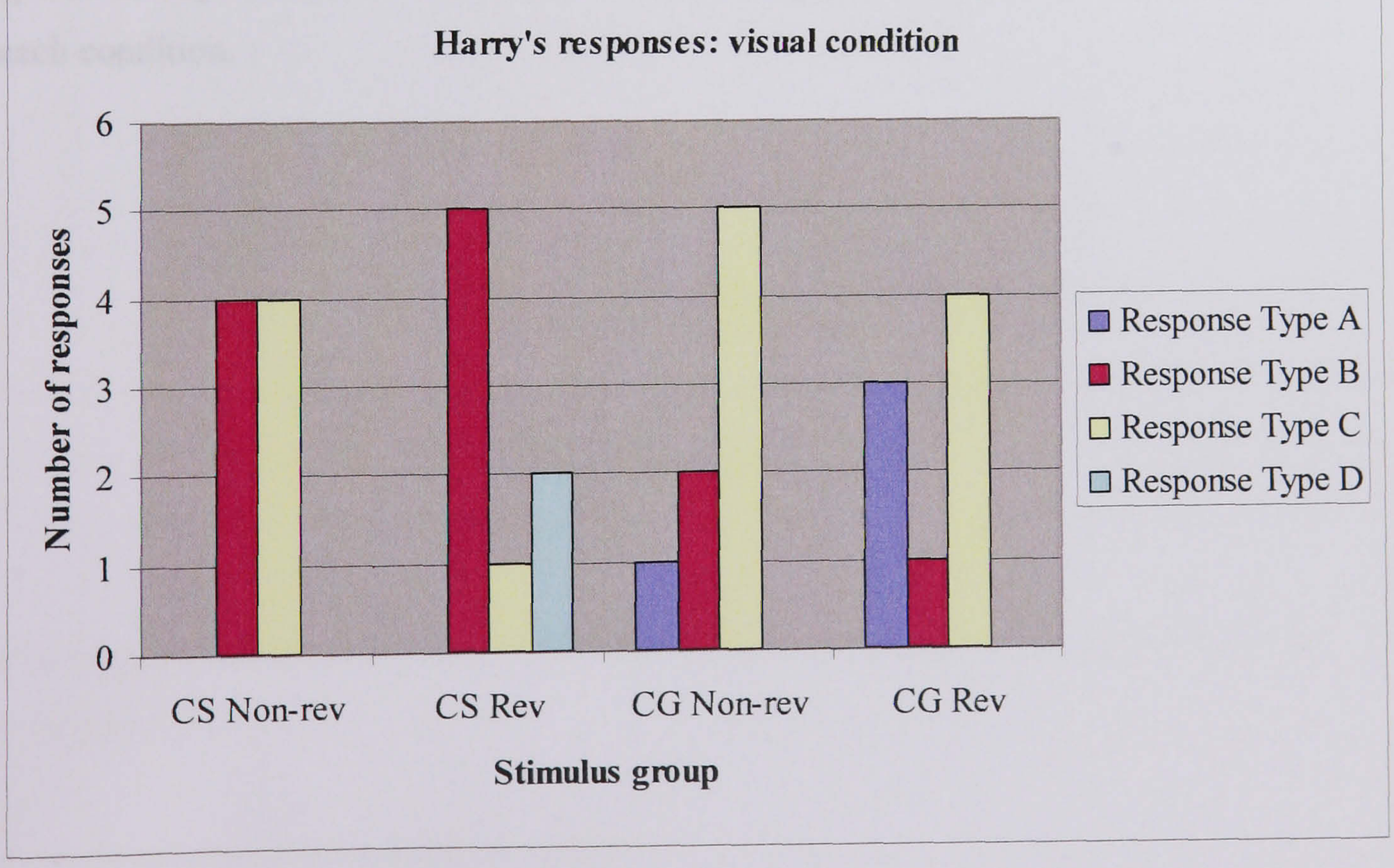
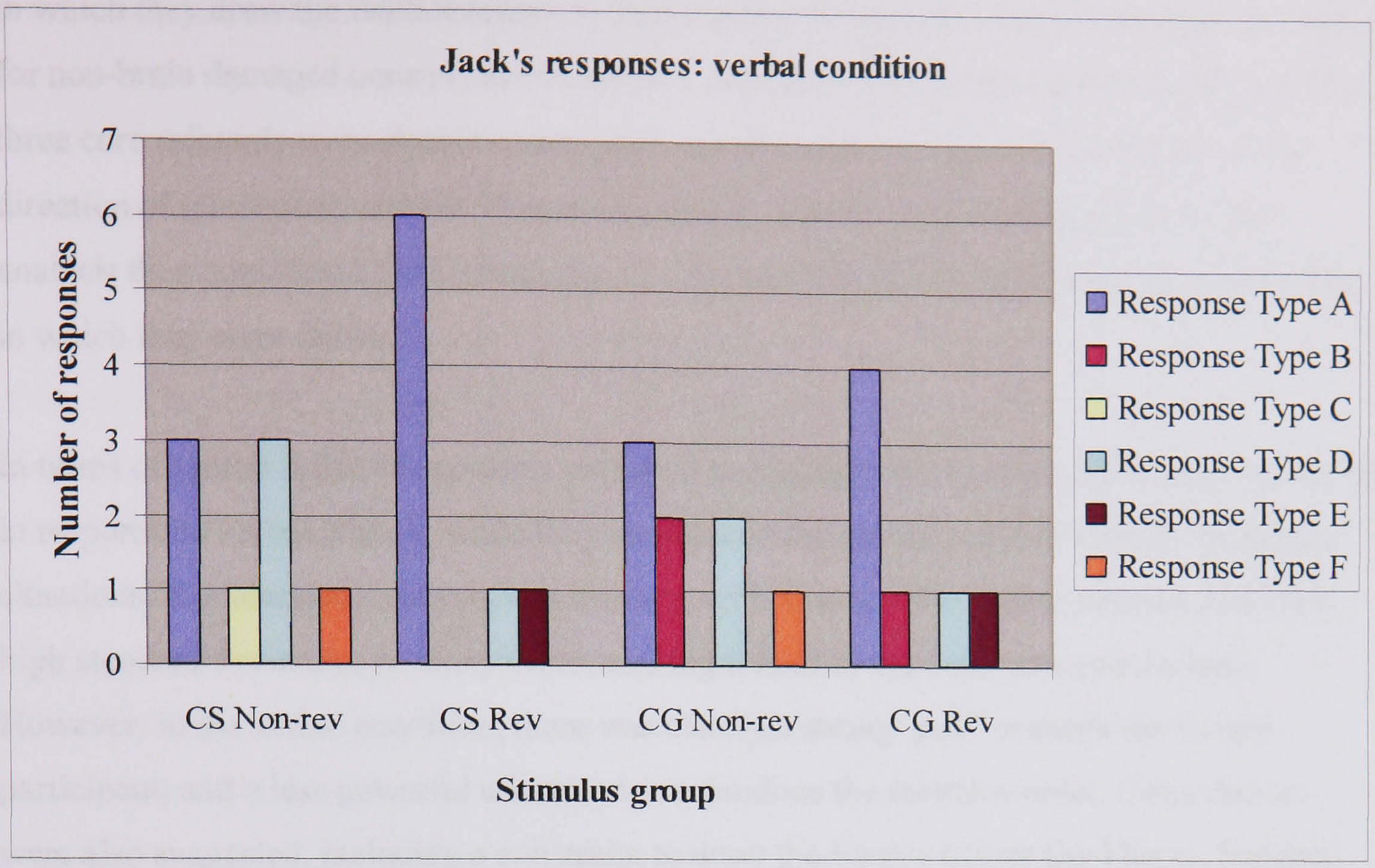


Figure 5.13 Breakdown of Harry's responses to (a) verbal and (b) visual conditions by response type

5.14 Results for Jack

Unlike Harry, Jack omitted either the Source or Goal referent on four occasions, once in the verbal and three times in the visual condition. He used arrows on only one occasion. Like the controls, Jack was most likely to represent the Theme in its starting position, doing so on just over half the items in each condition. In terms of spatial orientation he also performed very like the controls, drawing 30 out of 32 Causes on the left for verbal items, and maintaining the stimulus orientation in all but one visual item.

Like the controls, Jack showed a preference for drawing the Cause first in the verbal condition, though in his case this only accounted for 19 responses. Most of these (16) also maintained the order of the stimulus sentence. However, Jack also produced at least one instance of every other possible response type, including those in which the Theme was drawn first (types E and F). Although these types were rarely used by the controls, they were not unheard-of, with individual participants drawing the Theme first on up to 6 occasions in the verbal condition and on up to one in the visual. In the visual condition Jack showed no particular preference for drawing either Cause or Source first, doing so on 14 and 12 occasions respectively. Nor did he resemble the controls in following a sentence-like order for the items where Cause played the role of Source. However he did produce a similar spread of responses to the Cause-as-Goal items. Figure 5.14 illustrates Jack's responses to each condition.



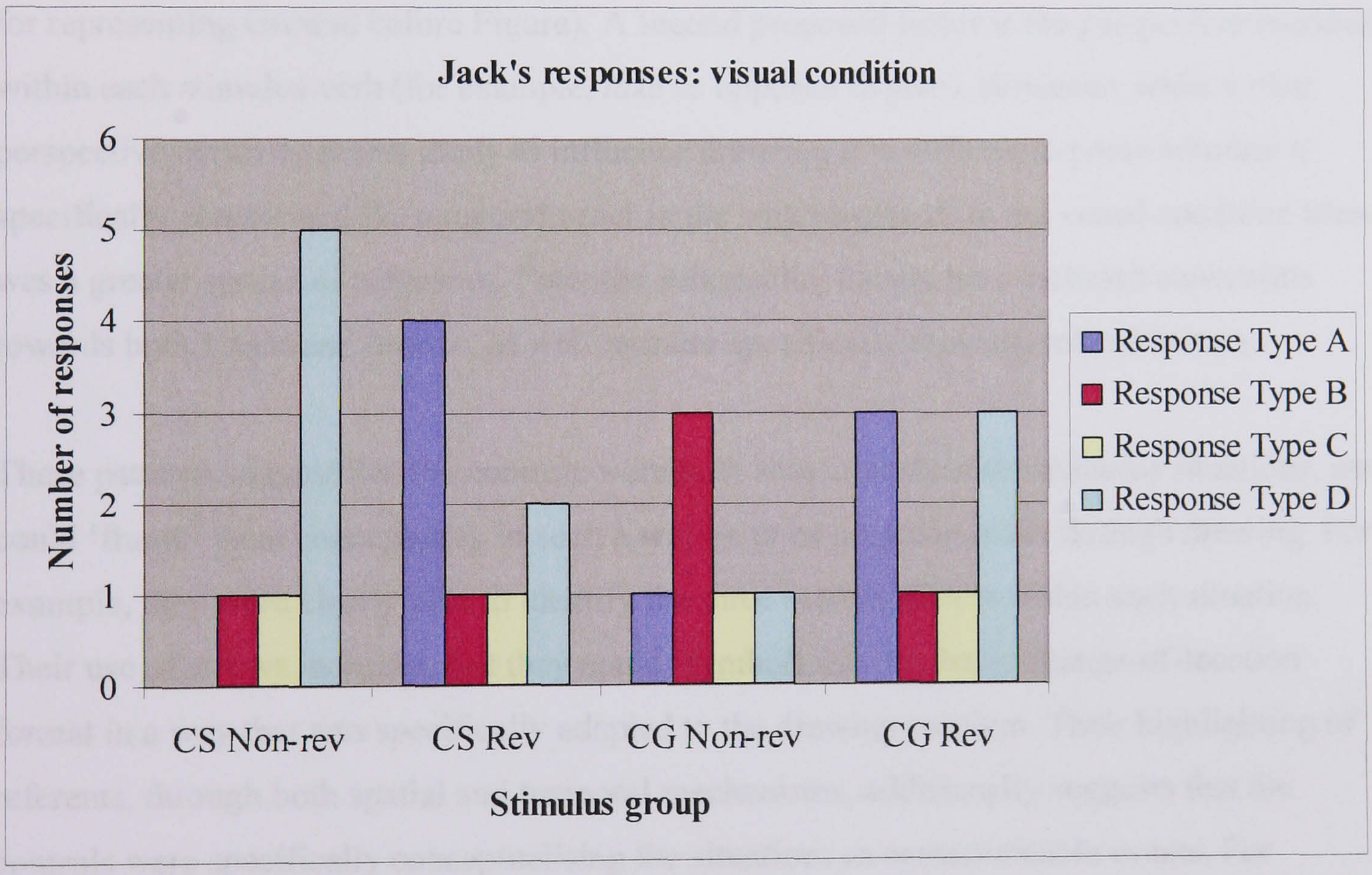


Figure 5.14 Breakdown of Jack's responses to (a) verbal and (b) visual conditions by response type

5.15 Summary of results and discussion

The Event Drawing Task aims to shed light on the constraints imposed by verbal and visual stimuli on people's conceptualisation of events for drawing. It does so by analysing the way

in which they draw the main referents within change-of-location events. Although the results for non-brain damaged controls were complex, a number of common patterns emerged. The three core referents were always represented, arrows were consistently used to show the direction of movement, and the Theme was usually shown in its starting position. The analysis then considered the highlighting of referents through the spatial and temporal order in which they were drawn.

In terms of spatial order, the controls preferred to highlight the Cause by placing it on the left in response to verbal stimuli, while they maintained the spatial order of visually-presented situations. The temporal analysis was messier, with a range of response patterns and fairly high standard deviations in many cases, making it hard to draw definite conclusions. However, in the verbal condition, there was clearly a strong 'pull' towards the Causal participant, and a less powerful constraint to reproduce the stimulus order. Other factors were also suggested, including a constraint to draw the Source before the Theme. Sacchett (2005) argues that this reflects the need to draw a reference object first (like the preference for representing Ground before Figure). A second proposed factor is the perspective encoded within each stimulus verb (for example, *take* as opposed to *give*). However, while verbal perspective certainly seems likely to influence drawing, it is difficult to prove whether it specifically constrained the temporal order in the way proposed. In the visual condition there was a greater spread of responses. Potential influencing factors here included constraints towards both Cause and Source, as well as more specifically drawing-related factors.

These patterns suggest that the controls were both able to analyse the stimulus situations, and could 'frame' them conceptually in such a way as to be communicable through drawing. For example, they were clearly able to identify the three main referents within each situation. Their use of arrows indicates that they could 'symbolicise' the basic change-of-location format in a way that was specifically adapted to the drawing medium. Their highlighting of referents, through both spatial and temporal mechanisms, additionally suggests that the controls were specifically conceptualising the situations as communicable events. For example, the syntactic foregrounding of causal agents within the spoken stimulus sentences was matched by the spatial and temporal highlighting of Causes when drawing in the verbal condition. In the visual condition the analysis of temporal order pointed to conceptual influences of both Cause and Source, but there was an additional constraint to maintain the configuration of the stimuli. While there is clearly some interaction between linguistic and visual constraints on drawing, the controls' responses also show that they were able to

analyse such situations for communication through drawing. In other words, they could 'think-for-drawing'.

Jack's drawings demonstrated both a number of similarities to those of the controls and several differences. Perhaps most striking among the differences was his occasional omission of a key referent. He also made very little use of arrows to represent the direction of the Theme's movement. However he resembled the controls in his positioning of the Theme, and in his drawings' spatial orientation. The temporal analysis of Jack's responses to the verbal condition also indicated a similar 'pull' towards the Causal agent, and a tendency to reproduce the sentence order. This was not true of the visual condition, however, where Jack did not particularly favour either Cause or Source. In general his responses were also more widely spread among response types in both conditions than those of the controls. Figure 5.15 (a) illustrates Jack's drawing of a visually-presented item.

Figure 5.15 (a) Jack's drawing of visual target: *A boy throws a ball into a bucket*

Jack was included in the test as an aphasic control for Harry, since he was not hypothesised to have any difficulty in conceptualising events for communication, despite his severe language output difficulties. Without any more formal analysis it is difficult to say just how similar or different from the controls Jack's performance was. There were certainly some indications that he was performing some level of event analysis in a similar way. For

example, both the spatial and temporal analyses of his responses to the verbal condition suggested a focus on Causal agents, as well as a degree of sensitivity to the 'framing' order provided by the stimulus sentences. Jack's responses to the visual condition, on the other hand, suggested that here he may have been more strongly constrained by the visual properties of the stimuli.

Like the controls, Harry consistently represented all three core referents, indicating that this area of relational analysis was intact. However, his drawings also showed some clear differences from the controls. He never used arrows, and he did not tend to draw the Theme in its starting position. Both the temporal and spatial analyses of the verbal condition indicated that Harry was not following the stimulus sentence order. While he showed some tendency to draw Causes first, this was only in response to non-reversible (change of position) situations, pointing to a focus on animate over inanimate participants rather than a specific 'pull' towards Causal agents. Harry's response to verbally presented reversible situations involving two animate participants was much more mixed, suggesting that in these cases he may have been less able to identify a clear focus. With visual stimuli Harry showed no strong tendency to focus on either Cause or Source. Most strikingly, he also showed no tendency to draw in a sentence-like order, while the spatial analysis indicated that, like the controls, he was strongly influenced by the films' spatial orientation. This was perhaps not surprising given the nature of Harry's language difficulties.

Figure 5.15 (b) provides an illustration of Harry's drawing of a verbally presented item.

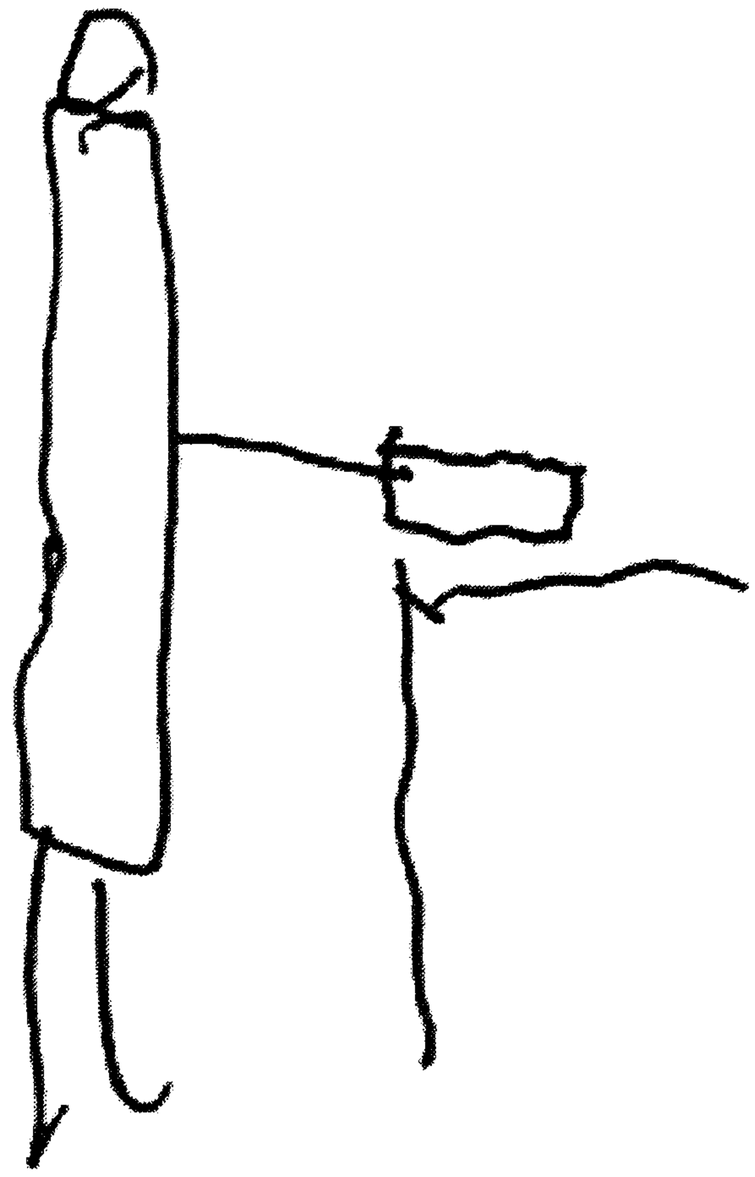


Figure 5.15 (b) Harry's drawing of verbal target: '*Mary picks the book off the table*'

Overall, the analysis of Harry's responses suggests that he had more difficulty than the controls in conceptualising the stimuli as events for drawing. While he was able to represent the three main referents accurately and in the correct configuration, his drawings did not essentially appear to 'symbolicise' the change of location involved in each event. There was no clear indication that Harry was framing the events in terms of a clear path, temporal profile or, perhaps most significantly, sense of causal agency. The fact that, particularly in the visual condition, he most often represented the Theme in its end position may possibly also be indicative, suggesting that he was conceptualising each situation in terms of a finished state rather than a dynamic event.

A number of interpretations are possible. The fact that Harry did not focus on the Cause in reversible change-of-possession situations in the verbal condition may simply reflect his difficulty in processing thematic role information within reversible sentences. Another possibility is that his drawing may reflect a more basic underlying difficulty in identifying or representing causal agency, a possibility that would have huge implications for Harry's ability to use language as well as drawing to communicate events. Finally, a more hopeful interpretation is that Harry retained an essentially intact understanding of causal structure at a more 'primitive' conceptual level, but simply failed to demonstrate this through the temporal or spatial organisation of his drawing. Harry's success on the role-related aspects of

the Role Video supports the latter interpretation. There, he demonstrated a basic understanding of the cause and effect relationships and role structure involved in visually presented events. In order to tease apart the possibilities with more certainty, a test specifically targeting causal reasoning would be required. Varley and Siegal (2000) describe a task in which participants are asked to select the cause of a pictured event from semantic distractors. For example, an event in which a car has crashed into a tree is shown alongside pictures of an alcoholic drink (the target), an axe and a helicopter. This might be combined with a task in which Harry was asked to identify the causal agent of an event involving more than one human participant, like the reversible events targeted in the Event Drawing Task.

Interestingly, Harry was more likely to focus on the Cause in response to verbally rather than visually presented stimuli, even if only in relation to (more easily comprehensible) non-reversible items. This recalls his improved response with language cues on a number of the preparatory tests reported in Chapter 2. Dipper (1999) has argued that language, through its 'paring down' properties, is able to do some of the thinking for speaking work for us, thus reducing the demands of processing visually presented situations. It is possible that Harry's drawing was demonstrating something of the same effect.

A number of caveats should be raised in relation to the interpretation of the results on this task. First, it would be wrong to suggest that people who differ from the controls necessarily have difficulty in drawing, since we still know so little about how non-brain damaged individuals draw, or about what constitutes a 'normal' pattern. In particular, it would be a mistake to draw firm conclusions about the implications of such differences for people's event processing skills. For any individual, there may be many other factors at play, which must clearly be ruled out before his or her drawing performance can be properly analysed. For example, visuo-spatial or constructional difficulties or problems with auditory memory would clearly have a considerable effect on a person's performance on the task.

Secondly, while the test is carefully designed, it aims to test the effect of a large number of variables from a fairly small number of stimuli covering only one situation type. Given the crude level of our knowledge about the processes influencing drawing production, and the complexity of those processes, it is not surprising that even for non-brain damaged individuals the data are rather messy. A number of interpretations are suggested, but it is difficult to identify definitively influential factors, beyond the natural 'pull' towards Causal agents. In particular, just as with other assessments that employ apparently non-verbal stimuli, it is difficult to say with certainty to what extent this is truly a non-verbal test, even

in the visual condition, since it is not clear how far language is being used in processing the stimuli. As a result, just as with the Action Gesture Test, pulling out clear causal links between findings on this task and those of other tests is problematic. It is therefore best seen as suggesting possible connections between patterns of performance, providing evidence to support or refute previous hypotheses, rather than offering absolute conclusions about a person's processing.

None the less, the responses of some of the participants in Sacchett's (2005) study pointed to possible similarities between their drawing and their performance on other assessments of event processing. Differences between individuals also suggested that the test could at least help in distinguishing people who had trouble in conceptualising the language-relevant aspects of visual events from those who did not. The main reason for using the Event Drawing Task in the present study was to shed further light on Harry's skills, by investigating his output in a medium that he already used, with a task that he was able to achieve. Some of the findings did hint at possible differences between his conceptual focus over change-of-location situations and that shown by the non-brain damaged controls, as well as, arguably, between Harry and Jack. The most striking indication was that, while Harry was naturally constrained to focus on animate over inanimate participants, he demonstrated no strong focus on causal agents.

Chapter 6 Discussion

6.1 Introduction

The aim of this study was to contribute to the body of evidence about possible links between conceptual processing and talking about events in aphasia. While it is generally recognised that talking involves 'thinking-for-speaking', the relationship between such thinking and the language of people with aphasia remains less clear. Rather than primarily aiming to contribute to the specification of the processes governing conceptualisation at an abstract level, this study adopted an empirical approach to the relationship between conceptual deficits and impairments in language processing. Its main aim was to build on points of consensus within current proposals about the nature of conceptual processing, in order to investigate whether some people with aphasia have associated difficulty in thinking for language. Given that many people with non-fluent aphasia have difficulty in processing verbs and sentences, and that difficulties in conceptual processing are likely to be most marked (or at least most testable) in relation to language about events, it focused specifically on thinking about actions. A group of individuals was identified who shared broadly similar language difficulties, with poor action naming and limited access to verb argument structure, alongside some impairment in verb and sentence comprehension. The relation between language and event conceptualisation was explored through a combination of available assessments and three newly-designed tasks. These aimed to explore the skills of particular individuals, and to identify pointers to cueing mechanisms that might help people to constrain their thinking about events in a language-relevant way.

The Discussion chapter is divided into a number of sections. The first (section 6.2) summarises the study's findings in relation to both non-brain damaged control participants and people with aphasia. This leads on to a general discussion of the process of testing at the conceptual level and its implications for the event processing hypothesis (section 6.3). Section 6.4 considers the potential for more detailed insight offered by combining structured assessment techniques with discussion of the test process. The implications of the study's findings for therapy are then considered in section 6.5. Section 6.6 offers some final conclusions.

6.2 Summary of main findings

The screening tests identified six individuals who had no significant cognitive or visuo-spatial impairment, and no marked general difficulty in deriving semantic information from pictures. They were all significantly better in confrontation naming of objects than of actions. Five of the six also had difficulty in accessing verbs and in constructing verb-argument structures in continuous speech, as well as making errors in verb comprehension. Only Melvyn performed within normal limits in these areas. All but Jack similarly had trouble in understanding reversible sentences.

These preliminary assessments suggested that any of the participants apart from Melvyn might potentially have some difficulty in conceptualising events for language. Melvyn's strength in verb production and comprehension did not fit with this pattern, suggesting that he should not demonstrate a conceptual difficulty. These predictions were followed up with a number of available event processing assessments. These targeted a range of skills relating to actions, including retrieval of core conceptual and pragmatic information (the Picture Attribute Knowledge Test), distinguishing events from non-events (the Event Video), understanding role and relational structure (the Role Video), manipulation of semantic knowledge (the Kissing and Dancing Test) and analysis of the features that drive verb selection (the Event Perception Test).

Carl, Jack and Helen only made a significant number of errors on the Event Perception Test, where actions must be processed in terms of the features that would lead them to be described by a particular verb. In addition, these three participants showed a consistent pattern of strengths, despite having very different language impairments. (For example, Jack had extremely limited access to spoken output, whereas Helen performed well in naming tasks but produced very limited predicate-argument structure in narrative or conversation.) These three individuals were therefore not hypothesised to have primary event processing problems. Their strong performance also showed that people with aphasia can do these kinds of tests, and that their success is not dependent on language ability, since Jack and Carl both had significant difficulties with language production. Melvyn's performance was more anomalous, since he made a larger number of errors on the event processing tasks despite his relative strength in producing verb structures. This led to the hypothesis of a later stage executive difficulty, particularly affecting his responses on less constrained tasks. This is not entirely convincing, however, since it is not clear why his performance on some of the earlier assessments was not also affected.

Ron and Harry demonstrated some difficulty across the range of event-related tasks, making the hypothesis of an event processing difficulty at least plausible in their case. It is difficult to be definitive about when it is or is not appropriate to hypothesise that a person has difficulty at a conceptual level. For example, although Ron and Harry both made errors on most of the available event-related assessments, the number of errors on any one test was still fairly low. However, most of these tests target basic levels of processing which most control participants, as well as a large number of people with aphasia, can achieve without difficulty. While a score of more than two standard deviations below the mean of non-brain damaged speakers is taken to indicate a significant level of impairment on any one test, to be confident of an event processing difficulty we would expect to see a pattern of impaired performance across a number of different tasks. In particular, it was suggested that significant numbers of errors on the Role Video, Kissing and Dancing and Event Perception Tests seem most likely to be linked with a general difficulty in conceptualising events for language. Of course, any individual's pattern of skills will undoubtedly be more complex than this. Still, clinicians need some way of distinguishing an impaired from an unimpaired performance, in order to be able to target interventions at the people who most need them. For clinical purposes, a pattern of moderate impairment across a range of such tasks is therefore sufficiently indicative to make further investigation of event processing skills worthwhile. For the present study, the pattern of errors shown by Ron and Harry made more precisely-targeted assessment worth a shot, and was the spur behind the design of the novel tests.

6.2.1 The Order of Naming Test

The Order of Naming Test was designed with Ron in mind, exploiting his strength in naming to probe his event focus. In one condition, participants named the entities involved in pictured events, while in the second they named the same entities presented in non-relational arrays. In the third condition they produced sentences to describe the original scenes. The analysis considered the relationship between the order of naming from events or arrays and the order of the later-produced sentences.

Control participants named the entities in the 'Event' condition in an order that was strongly related to their sentences, suggesting that even in naming they were automatically processing the structure of the events. There are two possible reasons for this finding. One is that they had formulated a sentence in 'inner speech' and so named the entities in the order dictated by

that sentence. The second, more interesting proposal is that their 'pre-speech' thinking was already propositionally structured, so determining ordered naming. While it is difficult to tease these proposals apart, both indicate a level of structured, propositional analysis even when the task is non-sentential. Helen's response supports the second interpretation. She shared Ron's naming strength, but was not hypothesised to have trouble in conceptualising events. Despite considerable difficulty in forming sentences her order of naming was very similar to that of the non-brain damaged controls. Her performance also demonstrated that the task was achievable by people with aphasia (so long as they had the requisite naming skills), and could pick up differences between individuals.

Ron's response was different. Unlike the controls, his naming was not limited to the three main entities within each scene. Instead he named a large number of both visible and invisible entities. His naming also did not appear to be driven by event structure in the same way, since it bore little relationship to typical sentence order. The order was closer when items on which Ron had made errors were removed. However, this also removed a major source of his hypothesised difference from the controls, since many of the error items were those on which he had either omitted target entities or named peripheral entities instead. One possibility is that Ron named in this way because of difficulty in accessing the targets' names. However, the fact that he named more entities (many of them of lower frequency) than the controls suggests otherwise. His performance may also reflect difficulty with various aspects of event analysis. For instance, he may have had trouble in precisely isolating each core event from more peripheral details, or in fully analysing its relational and role structure in the way required for sentence formulation. One point of similarity between Ron and the other participants was his tendency to name the causal entity first, suggesting that this fundamental aspect of event analysis was still intact. Ron's focus on Causes did not, however, appear to help his sentence construction. In other words, he was not able to capitalise on it in shaping his thinking for event description.

6.2.2 The Sharon and Paul Test

The Sharon and Paul Test investigated people's processing of situations in which there is an obvious perspective dilemma: where the choice of perspective is not clearly constrained by perceptual cues. The thinking for speaking involved in processing such situations relies even more strongly on linguistic knowledge. For example, in order to decide which perspective to adopt over a scene in which a gift changes hands between two people, a speaker needs to understand the perspective-taking properties, as well as the associated syntactic constraints,

of the available verbs. The test asked how both non-brain damaged speakers and people with verb difficulties respond to this type of situation. In the initial condition participants produced verbs to describe a range of perspective-dilemma situations presented neutrally, i.e. without any obvious perspective bias. Subsequent conditions presented the same situations with the addition of visual and combined visual-and-linguistic perspective cues. Both types of cue were hypothesised to constrain the complexity of the perspective choices, helping the participants with aphasia to produce a larger number of relevant verbs, and (at least potentially) encouraging all participants to produce more verbs that matched the stimulus perspective.

The control participants unsurprisingly had no difficulty in producing verbs to describe each situation. The analysis of perspective indicated that they were strongly constrained by their appreciation of a situation's Cause or Source, in that most of the verbs favoured in the Neutral condition took the perspective of the Cause or Source participant. However, different situations exerted different degrees of constraint. The controls were also very loyal to their naturally more dominant perspective, only being consistently diverted from this when cued by both filming and language. The participants with aphasia responded in the way predicted in terms of the number of relevant verbs they produced. This increased across conditions in the hypothesised order, although the only individual comparison that reached statistical significance was that between the initial Neutral and the maximally-cued Perspective plus Language condition. This suggested that the stimulus manipulations had some effect, although it was clear that different participants were helped to different degrees. For some, it was clearly the language cues that were most helpful.

The participants with aphasia were much less strongly constrained by the controls' dominant perspective in the Neutral condition, possibly because they found it harder to analyse the causal and role structure of the stimulus situations. They were also less likely to follow the stimulus perspectives in the manipulated conditions, though they were not entirely unresponsive to perspective cues. Nor did the dominant-perspective stimuli elicit a larger number of verbs overall, or more verbs that were marked as to perspective in either direction, than the non-dominant. This rather paradoxical finding made it difficult to know how the stimulus cues were working, since they were clearly facilitating verb production despite not constraining the perspective of the responses. It seemed most likely that both visual and combined cues functioned by paring down the complexity of the perspective choices required, providing a conceptual 'anchor' which allowed participants to eliminate peripheral detail from their analyses and focus on each core event. Even the linguistic cues did not

appear to function simply by providing a syntactic frame, since a number of them were very minimal (e.g. '*Paul* ...'). It was suggested that these too offered a guide to perspective, as well as a reminder that a verb was needed. However, while the stimulus cues supported participants' access to a set of broadly relevant verbs (as opposed to inappropriate, 'light' or peripheral choices), they did not necessarily cue production of verbs of matching perspectives.

6.2.3 Tests of non-verbal modalities

The final two tasks explored Ron and Harry's non-verbal communication of events, and probed the relationship between their use of non-verbal modalities and their hypothesised event processing difficulties. Each task explored a modality that the person used naturally in conversation, allowing event processing skills to be investigated without demanding access to language. The Action Gesture Test first explored the nature of the gestures produced by Ron, Carl and a group of non-brain damaged participants. Action gestures were produced in three conditions, all of which were deliberately removed from the constraints of natural communication: gesturing from a picture alone, gesturing from a picture after naming, and gesturing from a verbal cue. The gestures of the non-brain damaged speakers were predicted to become less pantomimic and more 'pared down' when mediated by language. This prediction was upheld: their gestures were rated as significantly less complex when the action was named, either by the participants themselves or by another person. The 'paring down' properties of language also seemed to take precedence over visually-mediated conceptualisation. Once language was involved, their gestures achieved similar complexity ratings, whether they were produced with the stimulus picture still present or to a verb cue alone.

Carl's gestures achieved consistently low complexity ratings. This may simply reflect a quirk of Carl as a gesturer, or of the person who rated him. However, it may also reflect the severity of his language difficulties. When verbs were involved, he may have continued to rely on an already 'pared down' non-verbal conceptualisation of the targets. Ron was not predicted to show the same pattern as the non-brain damaged controls, since language was not predicted to have the same paring down effect for him. In fact, his gestures did become less complex when he also had to name the actions. However, his difficulty in accessing verbs meant that this was not a very fair test. When the verb was provided, his gestures were just as complex as those produced to pictures alone. It therefore seemed unlikely that Ron was responding to the verbs' paring down properties. It also seemed unlikely that naming

helped him focus on the core nature of each action since, as in previous assessments, he tended to name a large number of (sometimes peripheral) objects. Another possibility was that naming the actions imposed an increased processing load. While this was not part of the original test design, there was some evidence to suggest that this may have led Ron to gesture in a less complex way.

Ron also made far more use of outlining, a technique that separates the object as far as possible from its action context, than the controls. This was not simply a response to his hemiplegia or to aphasia in general, since neither a group of 'one-handed' controls nor Carl outlined to any significant degree. The same tendency was also evident when Ron gestured objects in isolation. However, his object gestures were not entirely separated from thinking about actions since they also tended to show the objects being held and used. What was different was the frequency with which Ron combined the two techniques. One suggestion was that it was in the process of thinking about the form of the objects that Ron was able to conceptualise their typical use. Ron's attention to the detail of objects echoed both his spontaneous speech and his performance on the Order of Naming Test, and possibly pointed to a similar conceptual focus.

In the Event Drawing Task (Sacchett, 2005), Harry's event drawings were compared to those of Jack and of a group of non-brain damaged controls. The task elicited drawings of simple events from spoken sentences and film clips. Both reversible (change of possession) and non-reversible (change of position) events were included; for example, '*Mary gives the flower to Bill*'/'*Bill lifts the box off the table*'. The control participants' responses clearly indicated that they were able to 'think-for-drawing', by conceptualising the targets as events that could be communicated visually. They always represented the three main entities, and consistently used arrows to show the path of movement. Their drawings also suggested a degree of event analysis, with the Cause in particular being highlighted either by being drawn first or positioned on the left. In the visual condition, there was also some tendency to draw the Source first, as well as to reproduce the configuration of the stimulus.

Harry and Jack presented a mixed picture, both showing some similarities to the controls as well as some clear differences. Jack occasionally omitted one of the key referents and made little use of arrows, but like the controls tended to draw the Cause first and on the left in the verbal condition. In the visual condition he was less likely to highlight either Cause or Source than the controls, but like them tended to maintain the films' spatial orientation,

suggesting that the visual stimulus may have influenced him more than any linguistic or event analysis.

Harry drew all three main referents, but made no use of arrows. Unlike the controls, he tended to draw the Theme in its final position, possibly pointing to a conceptualisation of the stimuli in terms of static states rather than dynamic events. He also did not tend to draw Causes first, only consistently doing so in response to non-reversible verbally-presented situations (e.g. '*Mary puts the book on the table*'). This suggested that he was distinguishing animate from inanimate, rather than causal from non-causal entities. Harry's drawings of visual situations did not tend to highlight either Cause or Source by temporal or spatial means. Instead they consistently reproduced the configuration of the stimuli, suggesting that they were driven primarily by a visual rather a linguistic conceptualisation of the situations. Overall, while Harry was clearly able to represent certain aspects of the stimuli (such as their relational structure), some key elements of event representation appeared to be missing from his drawings. In particular, he seemed to have no way of demonstrating his understanding of an event's path, temporal profile, or causal structure.

The severity of Harry's language impairment made it even more difficult to assess the degree to which conceptual-level difficulties were implicated, since tasks that rely on any kind of language production were out of the question. This made the use of a non-verbal test all the more attractive, despite the difficulties of interpretation. The differences observed between Harry and the other participants on the Event Drawing Task at least point to some potentially significant differences in the way they were processing the target situations. It was only by using a task whose basic output demands Harry could meet, that these could be teased apart from intact aspects of event processing (such as analysis of relational information). In particular, Harry's drawing suggested that he may not be focusing on causal entities. This may reflect a general difference of conceptual focus, and a difficulty in analysing the causal structure of events, which would clearly have a major impact on Harry's thinking for language as well as for drawing. Alternatively he may, like Ron, retain a basic conceptual understanding of causal agency, but unlike him have no way of demonstrating it, either verbally or in drawing.

6.2.4 General summary of test findings

The novel assessments offer some interesting findings about the processing of events by non-brain damaged speakers. By and large, the non-brain damaged control participants performed

in line with the predictions made in relation to each test, giving a degree of psychological reality to both tests and findings. Most strikingly, their responses confirmed suggestions from previous studies (e.g. Sridhar, 1988, 1989; Oakes and Cohen, 1990; Fisher et al, 1994; Corrigan and Denton, 1996; White and Milne, 1997; Schlottmann and Surian, 1999; Clark, 2001) that we have a very strong and fundamental bias towards the cause of an event. This was repeatedly demonstrated through the controls' order of naming of event participants, their preference for verbs that adopt the perspective of the causal agent, and their highlighting of causal entities through the spatial and temporal order of their drawings. There was also some suggestion – for example, once again from the temporal order of their drawing - of a lesser bias towards the perspective of an event's Source.

The robustness of the controls' basic event conceptualisation was reflected in the consistency with which they adopted a dominant perspective in the Sharon and Paul Test, and in the difficulty of shifting them from this perspective. It seems that we are quick to conceptualise situations in terms of event (causal, relational and role) structure, and that this conceptualisation drives processes such as naming of participant entities as well as verb selection. This again confirms previous findings, this time from studies of event analysis using eye tracking (Zacks et al, 2001; Griffin and Bock, 2000; Meyer and Dobel, 2003), although just as in the eye tracking studies it is not clear to what extent language is itself implicated in shaping our basic conceptualisation. Evidence from the Action Gesture Test suggested that, as far as gestures were concerned, language played a significant role in paring down the controls' thinking about the targets (or at least that gesturing a verb was different from gesturing a pictured action). It is also clear that we are able to adjust our conceptualisation of events to fit with particular language frames, even when, as in the Sharon and Paul Test, these lead us in the opposite direction from our natural biases. Such glimpses of the thinking for speaking and 'thinking for gesturing' processes provide further support for the notion that conceptual and linguistic processing are not separate entities, but interact in complex and subtle ways (Black and Chiat, 2000; Dipper et al, 2005).

For the participants with aphasia, the assessments provided further evidence that people with apparently similar language performance can show a range of different impairments when underlying processing is further probed (see, e.g. Nickels et al, 1991; Byng et al, 1994; Schwartz, Saffran, Fink, Myers and Martin, 1994; Dipper, 1999; Webster, Franklin and Howard, 2004). While all six participants had some trouble with verbs and sentences, only Ron and Harry were hypothesised to have an underlying difficulty in conceptualising events. The performance of the other four participants usefully indicated that tests of event

processing are manageable by people with even severe language impairments, and clearly showed that it is possible to have verb and sentence difficulties without associated problems at a conceptual level. However, the available tests also highlighted the difficulty of definitively ascribing errors to impairments in event conceptualisation, since one person, Melvyn, made a large number of errors despite relatively strong verb processing.

The novel assessments brought to light some processing strengths which may otherwise have remained hidden. In Ron's case, a strongly preserved appreciation of causal agency emerged, while Harry demonstrated an intact understanding of relational structure. Interestingly, both Ron and Harry also performed in line with the hypothesised order of conditions in the Sharon and Paul Test. This suggested that, like other participants who did not share their proposed event processing difficulties, they both had some difficulty in responding to perspective dilemmas, and were helped at least to some extent by the perspective cues. Taken together, the new tasks also highlighted a number of differences between Ron and Harry's response to event stimuli and that of the controls (both with and without aphasia). Ron differed most strikingly in his consistent focus on objects rather than actions, and in the apparent relative lack of influence of linguistic structure on his basic event conceptualisation. For Harry, the most obvious differences shown in his drawing were his lack of focus on Causes or Sources and his degree of reliance on visual constraints. These differences make it at least reasonable to maintain the hypothesis that both Ron and Harry were processing events differently from the controls, although, particularly in Harry's case, the details remain very under-specified.

The findings in relation to Ron and Harry provide further support for the 'psychological reality' of the concept of event conceptualisation. Like LC and MM, discussed in Chapter 1, it is not easy to explain their patterns of performance without reference to difficulties in aspects of event analysis. Chapter 1 also raised the question of the nature of the relationship between event conceptualisation and damage to the language system. Three possibilities were outlined. According to the first, 'separatist' view, event conceptualisation and language production are separate but sequential processes. Individuals may be impaired in both aspects, or in language production alone, but event conceptualisation is not in itself affected by language processes. According to this view, we would not expect to see people with difficulties in event conceptualisation but with intact language abilities. A second viewpoint suggests that language and conceptual processing are not separate, but rather are interacting processes. For example, Dipper et al (2005) propose that in production, conceptual representations must be pared down to fit language, but that this process is itself crucially

shaped by linguistic principles. According to this 'interactive' view, an impaired language system will lead to deficits in the paring down process. This means that poor language will inevitably associate with some impairment in conceptualisation. A third, midway view proposed that conceptualisation is open to influence from language, but not in an all-or-nothing fashion. Rather, the relation between the two can vary between different individuals, so that some people with verb and sentence difficulties also have difficulties in conceptualising events, while others do not (or at least not ones that are picked up by our rather crude tests of the relevant processes). In some ways this seems the weakest proposal, in that it allows for a range of different patterns of association and dissociation between language and conceptual processing. On the other hand, it still would not predict a pattern of impaired conceptualisation but intact language skills.

While the findings from this study cannot definitively answer the question of the relation between language and event conceptualisation, they do offer some additional evidence. Some of the participants had clear deficits in verb and sentence production, but performed well on tests of event conceptualisation. This makes the strongest 'interactive' view difficult to sustain, since it is not easy to explain why some people with aphasia have trouble on event processing assessments while others with a similar language profile do not. There was, however, some evidence for the influence of language on individuals' processing of events. For instance, the Order of Naming Test suggested that, for non-brain damaged speakers and for some people with aphasia, their processing of the entities involved in situations was structured in a way that was at least closely related to language structure. The Sharon and Paul Test further indicated that, for speakers both with and without aphasia, their perspective over situations could be directly constrained by the provision of a language frame. Finally, the Action Gesture Test suggested that the degree to which people's conceptualisation of events was driven by language had a direct effect on the nature of the gestures they produced. All of this evidence points to the midway rather than the 'separatist' position. In other words, while the processes of event conceptualisation are not automatically affected by damage to the language system, the way is still left open for particular, perhaps quite subtle interactions between the two. One possibility is that the degree of vulnerability to language impairment depends on factors such as the strength of the established associations between concepts and linguistic terms.

One reason for the difficulty of pinpointing conceptual-level deficits is that event conceptualisation is not a single all-or-nothing process. This was explicitly recognised by Dipper (1999), who attempted to break the process down into a number of separable,

theoretically motivated layers. However, although the six participants in Dipper's study showed dissociations which suggested that her tasks tapped different skills, it still proved difficult to establish a clear hierarchy. For example, one person (JD) demonstrated a pattern of responses that went against the proposed order of complexity, prompting an alternative hypothesis of a Short Term Memory deficit. It seems that people who (at least potentially) have trouble at the conceptual level do so in different ways, and it remains difficult to identify individuals who are so impaired at this level that they completely fail on any task. Even with the best-designed tests it is difficult to be sure that differences in performance actually reflect differences in conceptual processing. Other factors may always be implicated, even after heroic attempts to limit the influence of confounding variables. The challenges of testing at this level, and the implications of the study's findings for the event processing hypothesis, are discussed further in the following section.

6.3 Testing event processing

A key challenge to the identification of people with event processing difficulties is the difficulty of designing robust, reliable and valid assessments. Most event processing tests, it must be admitted, are fairly crude. For example, many are open to contamination from other processing levels. Tasks that demand language output, such as the Order of Naming Test, or Dean and Black's (2005) picture description task, are obviously influenced by potential lexical difficulties. Those that use a selection format, such as Dipper's (1999) Perspective task, are open to accusations of priming or of unfairly penalising certain error types, as well as inevitably including a significant chance element. Even tasks that are ostensibly non-verbal, like the non-linguistic conditions of the Gesture and Event Drawing Tasks, may be fairly criticised for not sufficiently constraining the way in which people respond. For example, individual participants may automatically frame a linguistic response to the stimuli which then drives their response in the target modality. Different stimulus formats also bring their own pitfalls. Film formats (as in the Role Video, the visual condition of the Event Drawing Task, or the Sharon and Paul Test) are arguably closer to the demands of real-life talking. They are also harder to control, since the more realistic they are, the greater the degree of background detail they include, and the less constraint they offer to respondents' thinking. Picture-based stimuli are more easily constrained – for example, the amount of peripheral detail may be deliberately controlled – but may be harder to interpret. For instance, they may rely on pictorial conventions to illustrate aspects such as path or manner of motion. As suggested in relation to the Event Perception Test, participants may then base their decisions on such uncontrolled visual cues or on other non-targeted parameters.

One possible response would be to admit that conceptual processes are just too covert to be testable. An alternative is to assess a much larger number of people with verb and sentence difficulties, in the hope of identifying a larger pool of potential candidates. This becomes more realistic the more tests of conceptual processing are available. At the same time it runs counter to the basic premise of the current study, which was to assess a smaller number of likely individuals with more individualised tasks that could reveal more about their particular abilities. A third possibility is to carry on testing individuals, but in an appropriately tentative way, and with our eyes open about the likelihood of achieving resounding results. This means being clear about the processing demands of any test, as well as the kind of effect it could be expected to yield. It also means considering the possible influence of other factors; for example, demands on visual-spatial processing, Short Term Memory, executive function, and, of course, language.

With such a tentative approach, we are unlikely to uncover large numbers of individuals with remarkable event processing impairments. In truth only a small number of people have been shown with certainty to have difficulty at the conceptual level. This is partly because there have been few really robust attempts to identify them, which, in turn, is partly owing to the difficulty of doing so. Another possible explanation (difficult to prove either way) is that some of the people identified as having impairments at 'later' stages of language production may in fact also have had some conceptual difficulties. Equally, the therapies that have been carried out with them may have been based on conceptual principles. As Black and Chiat (2000) point out, "When we consider some of the verb and 'mapping' therapies that have been employed with some success with aphasic adults we find that many of them, in different ways, are exercises in thinking for speaking" (p. 76).

The therapy carried out with NS (Webster et al, 2005) provides an example. NS had difficulty in forming predicate-argument structures, which was treated through therapies targeting verb access as well as argument structure production. The verb therapy led to improved production of treated verbs but no generalisation to untreated targets. However, NS's post-therapy sentences and narrative showed an increased use of verbs and better specification of argument structure. The authors argue that the therapy "seemed to encourage NS to think about the action and what information was needed alongside the verb" (p. 760). This 'thinking-therapy' is argued to have led to an increased appreciation of the role played by verbs in sentences, which in turn supported the production of predicate-argument structure. Whether or not NS had any fundamental difficulty in the conceptual processing of

actions remains unclear, but the mechanism by which therapy is proposed to have functioned certainly appeals to thinking processes that are close to those discussed in the event processing literature.

The tasks designed for the present study are inevitably also open to the kinds of criticism outlined above. The Order of Naming Test, for example, both relies on participants' naming skills and may elicit responses that are reached through automatically-accessed sentences. However, there are also a number of respects in which these tasks differ from previous event processing assessments. Given the caveat that it remains very difficult to design watertight tests in this area, each one aimed for a certain degree of 'robustness'. Each probed a deliberately limited number of variables over a reasonably large number of stimuli, making the use of statistical analysis possible. Each test also aimed to establish a clearer idea of how non-brain damaged speakers respond to such tasks. Whereas some previous tests have either lacked control data or included only a limited analysis of the controls' performance, the response of non-brain damaged speakers on the present tasks was given considerable weight, both in its own right and as a baseline for comparison of the participants with aphasia.

A further difference between this and previous studies of event processing is that two of the three new tests were designed with Ron in mind. This meant that (unlike Dipper's (1999) tasks, for instance) their primary aim was not to distinguish universal levels of conceptual processing. Instead the Order of Naming Test and the Action Gesture Test aimed to identify differences between Ron, a group of non-brain damaged speakers and a person with aphasia who was not hypothesised to have an event processing difficulty. While this is also a limitation of the tests themselves (particularly since it makes them less applicable to other potential event processing candidates), it allowed Ron's skills to be probed more deeply than would otherwise have been possible. The fact that each of these tasks (as well as the Event Drawing Task) used a processing strength to explore an area of suspected difficulty also enabled potential links between assessment and therapy to be highlighted. The Sharon and Paul Test was even more explicitly linked to intervention, since it directly explored the effect of various stimulus manipulations on language production. This task was completed by all six participants with aphasia, since it assessed a core aspect of conceptual processing (perspective-taking) that was hypothesised to be problematic not only for people with conceptual-level impairments but for those with a wide range of verb difficulties.

Each test is still undoubtedly open to the criticism that we do not know *how* participants were approaching it. For example, as already suggested, we do not know how far

respondents were influenced by an unexpressed sentence structure in the Naming from Events condition of the Order of Naming Test. It is difficult to know how to get around this problem, since all such tests assess a level of processing that (a) is generally hidden from public view, and is not readily open to introspection, and (b) is some distance removed from a measurable output modality. One possibility would be to combine different methods of assessment, for example by developing a qualitative method, based on discussion of participants' responses, that might be used alongside more structured testing. This possibility is the focus of section 6.4.

6.4 Talking about aphasia: Event processing and conceptualisation

There are two main reasons for proposing that certain assessment processes should be discussed with participants. One, as suggested above, is that such discussion might offer more insights into how people approached each test, which aspects of the stimuli or cues helped or hindered their responses, and more generally, what they thought the test was about. This could help us to understand more about how such assessments work (or don't work) for people with aphasia, and whether, for example, participants are in fact using the cues and constraints in the way intended. There might also be implications for the design of future assessments and for the way in which they are used in therapy, for example if discussing assessments in this way was found to help participants perform better. A final useful aspect might be the potential for comparing participants' perceptions with the test results and with the 'tester's view'. This kind of comparison might also be significant for therapy, representing an explicit attempt to acknowledge potential differences between our perceptions of language processing and impairment.

The second spur behind this kind of discussion comes from a number of recent calls for researchers to take more account of people's perceptions of their own language (e.g. Black, 2000; Jacyna, 2000; Black and Ireland, 2003). Black (2000) points out that accounts of their language by people with aphasia are rare: "One has to go back to the writings of the great researcher-clinicians like Pick or Luria to read what people with aphasia say about their condition and experiences. Nowadays, a deep dividing line has been drawn between the theoretical, clinical and professional literature and the 'witness accounts'" (p.161). While in-depth interviewing has been used to explore the psychosocial experience of people with aphasia (e.g. Parr, Byng, Gilpin and Ireland, 1997), the number of such studies that have seriously considered the linguistic experience of having aphasia is much smaller (e.g. Ireland and Black, 1992; Black and Ireland, 2003). Duchan and Black (2001) further describe the

therapeutic power of analysing one's own language as a means to access thoughts and feelings. Drawing on Jackendoff (1997), they frame this process as the use of language as an anchor for thoughts – "a set of forms and structures to help the person access, order and creatively control her thoughts – to communicate with herself in the widest possible sense" (p. 6).

It is much more difficult to know how to go about such discussions. One possibility would be to use a classic in-depth interview, with a carefully drawn-up topic guide. However, it would be very difficult to devise an appropriate guide to probe an individual's responses to a structured assessment. Questions would risk either over-constraining or leading responses, or else being so open as to be impossible to answer. A possibly more appropriate technique is that of Cognitive Interviewing, or Verbal Protocols. These have long been used in Psychology (for example, to test survey questions, or to explore responses on measures of quality of life), as well as in other spheres such as ergonomics and information science (eg. Anderson, 1987; Kuusela and Paul, 2000; Branch, 2000; Karsenty, 2001).

Cognitive Interviewing essentially asks people to 'think aloud' by reporting on their thinking processes as they do a particular task. The reporting can either be concurrent with the task or retrospective. The technique has inevitably inspired much criticism and argument. For example, Nisbett and Wilson (1977) analysed the difficulties inherent in asking someone either to think aloud whilst thinking, or to revisit their thinking after the event. They argued that there were very few circumstances in which the technique could produce a valid representation of real cognitive processes, to which we normally have little access. Ericsson and Simon (1980, 1993) responded by delineating the true scope of the verbal protocol method. They made a clear distinction between the information generated by cognitive processes (such as information perceived and recognized, retrieved from long-term memory, or generated by inference) which can be verbalised in a report, and the processes themselves (perception, recognition, retrieval and generation) which cannot. Just like behavioural test responses, data from verbal reports do not directly reflect cognitive processes; these must be inferred. Ericsson and Simon further argued that retrospective reports should only be used to ask participants to report *what* they were thinking as they did the task, and not to explain *why*. They should also take place as soon as possible after the task in question, in order to minimise the risks of forgetfulness and fabrication.

A possible precedent for the use of cognitive interviewing with people with aphasia comes from the study of second language learning. For example, Cumming (1990) describes an investigation in which language learners were trained to think aloud while at the same time writing compositions in their second language. Several aspects of their response seem plausible in relation to the way that people with aphasia might respond to certain task demands. For instance, most people reported that they thought more about the precise matching of meaning and language when doing a task that was more cognitively demanding (writing an argument as opposed to writing a letter). Their most frequent cognitive activity was devoted to searching for what they saw as the right word to express an idea, by rehearsing and evaluating different options. They spent much less time consciously reasoning about rules of syntax or morphology. The implication was that they did so when they lacked automatic access to their knowledge about the target language.

However, even when completed with the greatest care, cognitive interviewing is still difficult to carry out and to analyse. The difficulties are clearly many times magnified in relation to people with aphasia. Use of a concurrent protocol runs the risk of affecting an already fragile test process, or of leading the person to approach the task in a different way, while a retrospective approach may either access limited information or encourage participants to re-frame or rationalise their thinking. There are obviously also particular difficulties relating to the linguistic demands of the technique, especially with people with more severe language problems. In theory, only minimal cueing and clarification is allowed, which is clearly unrealistic for people with aphasia. On the other hand, a virtue of the technique is that the basic probe question ('*Can you remember what you were thinking as you did this item?*') does not vary. As noted above, participants are asked to report *what* they were thinking, which is possibly less linguistically demanding than justifying *why* they did so. Once it had been established that they could understand the probe question, the main challenges would be to think of some more imaginative methods by which they could respond, particularly if they had more severe output difficulties, and to find a reliable way of clarifying their responses.

One possibility might be to ask participants to point to the element within an action picture that had first drawn their attention. (This technique might in fact have been useful in relation to the Order of Naming Test, where participants who lacked the necessary naming skills might have been asked simply to point to three entities within each picture. This would also have offered a means of limiting Ron's response to the three entities that most strongly drew his attention, rather than allowing him to be waylaid into naming everything he saw.)

Alternatively, people might be asked to point to the event participant whom they considered most responsible for a particular outcome (for example, in the Role Video), or to indicate aspects of different pictures that led them to be classed together (as in the Event Perception Test). Despite the undoubted problems of this kind of technique, it is surely worth pursuing in a future study as at least a recognition of participants' own perceptions of their language and thinking. One promising possibility would be to build up a more complete picture by taking a multiple approach, combining structured assessment and a Cognitive Interview protocol with other automatic 'reflexive' techniques, such as on-line eye tracking or measurement of reaction times.

By combining a wide enough range of well-thought out measures, and drawing on the insights offered by existing studies, it still remains possible to ask useful questions about the possible contribution of conceptual-level difficulties to the language profile of particular individuals with aphasia. Another reason for continuing the search is that the event processing hypothesis itself simply won't die, but remains sufficiently convincing at a theoretical level (and sufficiently intriguing to somewhat obsessive PhD students) to justify further clinical investigation. More specifically, a small number of people remain (like MM, Marshall et al, 1993, or LC, Byng et al, 1994) for whom no other explanation of their language difficulties is entirely convincing. Even if none of them can be definitively shown to have a deficit in conceptualising events, the fact that the event processing hypothesis can also not be disproved makes further investigation worthwhile. One way in which this could be done is by exploring its potential application to therapy. This is the focus of section 6.5.

6.5 Implications for therapy

The potential of the event processing hypothesis for therapy has received very little specific attention in the literature, although a number of studies (e.g. Dipper, 1999; Dean and Black, 2005; Sacchett, 2005) have discussed the therapeutic implications of their findings. A therapy route would be particularly appropriate at this stage, given the difficulty of firmly establishing the theoretical status of the hypothesis. This is not to suggest that intervention does not require clear underlying premises. Rather there would be value in establishing positive therapy results, even without a full understanding of the mechanisms by which they were brought about, or of precisely which aspects of conceptualisation were affected.

A second reason is that such therapy might be widely applicable. A number of findings suggest that therapy based on establishing solid event conceptualisation skills may be useful

not only to people with specific conceptual impairments, but to those with a broad range of verb and sentence difficulties. (This is somewhat analogous to the use of semantic therapy for naming, even when the person does not have 'pure' semantic difficulties.) For example, like the therapy carried out with EM (Marshall et al, 1998; Marshall, 1999), it may help the person to maintain a useful focus by 'anchoring' their attention to an aspect of a situation while they access useful language. EM's therapy helped her to think about situations in a way that was better fitted for language, by analysing complex events into more focused unitary actions. Gesturing each key action before trying to attach language to her gestures provided an 'anchor' for her thinking-for-speaking. Together with specific work on a vocabulary of treated verbs, this thinking-based therapy had a significant impact on the comprehensibility of EM's narrative. One possibility that might be explored in relation to this kind of therapy is that of developing a more widely applicable therapy 'package', including an element of event analysis, along the lines of the modular mapping and syntactic therapy packages proposed by Schwartz et al (1995).

The final aim of the current study was to identify cueing mechanisms that might help in reducing the thinking for speaking difficulties faced by people with aphasia. The Sharon and Paul Test suggested that manipulations of perspective through visual and combined visual-and-linguistic cues helped participants to access a larger number of useful verbs. Interestingly, for some individuals the most helpful cues were those that offered a linguistic frame to their verb production. It may be that carefully structured language in fact provides the best prop for thinking for speaking, in so far as it touches on the interaction between language and event conceptualisation. The test findings again suggested that such cues can be applicable to a wide range of individuals, not only to those with specific event conceptualisation difficulties. While some people showed more improvement than others, no-one's responses indicated that the cues were detrimental, for example by causing a cognitive overload.

As already suggested, a key part of the potential for improvement offered by the event processing hypothesis is the imposition of constraint on a person's thinking about events. The notion of constraining input to support language production is familiar from many clinical studies. For instance, picture stimuli have been used to help in 'paring down' the complexity of target events (e.g. Byng et al, 1994; Marshall et al, 1993; Mitchum, Haendiges and Berndt, 1993). A similar conclusion was drawn in relation to Dipper's (1999) Objects and Actions Video. This required participants to describe filmed events in which different forms of salience were manipulated. All participants responded positively to the more

constrained stimuli, in that they produced better word order and/or more predicates than they had in less constrained contexts. Dean and Black's (2005) study of the event descriptions produced by people with aphasia to line drawings and photographs highlighted a similar effect. Line drawings showed only the key participant entities. They elicited descriptions that were closer to the modal descriptions of non-brain damaged controls than photographs that included additional peripheral details. In the case of the Sharon and Paul Test, it was argued that the cues functioned by introducing constraint to the process of adopting a perspective over inherently problematic situations.

Other potentially powerful forms of constraint may be provided by the conceptual and linguistic structure of the targets; for example, the number of participant entities involved, the number of perspective possibilities available, or the number of arguments required by a particular verb (Thompson et al, 1997; Kim and Thompson, 2000). The therapy carried out with MM (Marshall et al, 1993; Marshall, 1994) may be interpreted as having combined the potential of constrained stimuli and task design to guide her event focus. Stimuli that presented deliberately constrained two-argument situations were presented alongside questions that constrained MM's thinking (focusing on the agent, the object changed and the nature of the action involved in each event). This combination brought about changes in her descriptions of similarly constrained two-argument events. However, talking about more open situations (those with three arguments or multiple perspectives) did not improve. Nor did her production in unconstrained contexts such as narrative or spontaneous speech. This recalled the outcome of therapy achieved with LC (Byng et al, 1994). Therapy helped LC to conceptualise events involving a single animate agent. However, she still had trouble in identifying events and in distinguishing participant from non-participant entities in more complex situations where more than one event was involved.

The implication from both of these studies is that the use of constrained tasks, while therapeutically very powerful, can only go so far in helping people to express events more successfully. As Schwartz et al (1995) argued, therapy also needs to consider the challenges of carry-over to unstructured production and open-ended discourse. More complex situations like these require tasks that directly address the greater conceptual demands they impose (Marshall and Cairns, 2005). They may additionally require specific attention to the processes of 'Macroplanning' (Levelt, 1989, 1999), by which a speaker sequences a number of propositions in order to guide the listener's attention over what he or she is saying. One way in which the issue of carry-over to real-life conversation might be addressed is through the intervention of a trained conversation partner. Therapy might help conversation partners

to introduce an appropriate degree of constraint to the speaking process, for example through questions and prompts that aim to reduce the thinking for speaking demands of real-life talking. These might help the person with aphasia to focus on the key action within a complex situation, to identify its causal agent as a support to the adoption of perspective, or to order a number of different actions within a complex sequence. Another potentially useful form of constraint, as suggested above, is that offered by a linguistic frame. Conversation partners might, for example, use such frames to highlight the need for a verb within an event description. Alternatively, by naming key event participants, they might be able to reduce the complexity of the perspective-related decisions faced by a speaker with aphasia.

A final important pointer for therapy comes from the uncovering of hidden skills by some of the tasks in the present study. It was possibly only by focusing on Ron's strength in naming objects that his appreciation of causal agency came to light. The assessments of non-verbal modalities similarly uncovered latent skills that may not have surfaced with tasks tapping only thinking related directly to language. In Ron's case the gesture task highlighted a number of apparent conceptual differences between him and controls, but also pointed to an ability to integrate the form and use of objects presented in isolation. For Harry, using a task that targeted drawing allowed him to demonstrate his preserved understanding of relational structure. However, it was also clear that therapy needs to work hard to exploit such latent strengths in a way that is helpful for language. For example, Ron was not able to capitalise on his understanding of causal agency to help him build sentences. Therapy would need to bring his understanding to a more conscious level before it could be used as the basis for developing his appreciation of thematic role structure. This might be used in turn as a 'framework' from which to hang his language. For instance, Ron might first be asked to identify an event's causal agent in response to questions such as '*Who's responsible for what's happening*?', before identifying other key participants as distinct from peripheral entities.

Similarly, despite Ron's strength in gesturing, his gestures could not be directly exploited as cues for language about events, or as 'anchors' for event-based thinking. For this to happen, his gestural 'sketches' would need to be brought closer to a message form that could be readily expressed in language. This might initially involve encouraging Ron to produce a very pared down gesture representing the core action, before including any representation of key object participants. For example, a basic *hammering* motion might be elicited before the inclusion of nails, etc. This might entail a similar kind of thinking therapy to that described above, aiming to help Ron focus on core objects (in this case the hammer), rather than on

peripheral entities such as the wall, the picture, and so on. In other words, therapy would have to shape Ron's 'thinking-for-gesturing' to a more language-ready format. At the same time, as pointed out by Marshall (2006), it would be a pity to eliminate Ron's ability to pantomime actions entirely. In the Action Gesture Test his depiction of a Hell's Angel, complete with detailed representations of his motorbike leathers, helmet and sideburns, was in many ways far richer and more expressive than a pared down *motorcycling* gesture could ever be. For Ron, the most useful aim for therapy might be to help him understand the difference between the two kinds of gesture, and when each would serve him best.

6.6 Conclusions

This study started from the observation that many people with aphasia have trouble with the language of events. For some, their difficulties are not entirely explained by reference to impairments at the functional or positional levels of models such as Garrett's (1988, 1992), but appear to point to the possibility of difficulty at a conceptual level. However, investigating such conceptual-level difficulties is inevitably problematic, since conceptualisation is never directly visible, but only reveals itself obliquely through observable behaviours (Pederson and Nuyts, 1997). The study therefore took a practical approach, inspired by Levinson's (1997) call for the relationship between linguistic and non-linguistic conceptualisation to be explored empirically: "Let us roll up our sleeves and investigate whether a difference in linguistic conceptualisation is or is not correlated with a difference in pattern of thinking" (p. 13). Of the six participants with aphasia who took part, Harry and especially Ron showed that it is still reasonable to propose the existence of a similar correlation between certain individuals' conceptualisation of events and their language difficulties. However it remains difficult both to operationalise the event processing hypothesis into watertight tests and to interpret those tests' findings with certainty. The study therefore ends with the proposal of a similar sleeve-rolling approach to therapy. While the best-designed assessments in the world will never access the real online processes of thinking and communicating about events, a therapy study focusing on the application of the event processing hypothesis to the real-life language of people with aphasia could do just that. What's more, such a study is becoming increasingly overdue.

Thinking for speaking

A research project on how people with aphasia express their thoughts

Information leaflet

Contents

Can you help with a research project?

Please take time to look at this leaflet.

Please ask any **questions** you like.

Decide in your **own time** if you want to take part.

Thank you.

What is the purpose of the project?

After a stroke, some people have APHASIA.

This can mean they have trouble with **language**, **talking** and **writing**.

Some people have trouble getting their **thoughts out**.

They find it hard to **organise** their thoughts.

This makes it hard to express their ideas.

We want to find out what happens when you put your **thoughts** into **words**:

- What **processes** are involved?
- What makes it **hard**?

- What **helps**?

- What is it like **for you**?

This will help us to understand more about aphasia.

It may help us to design better **therapies** for people with aphasia.

We are asking 10 people with aphasia to take part.

Do I have to take part?

No. It is up to you.

If you take part, we will ask you to sign a **consent form**.

You can **stop** at any time.

You don't have to give a reason.

This is OK. It will not affect any therapy you are having.

What will happen, if I am interested?

Deborah Cairns will meet you and talk to you about the project.

Not everyone has the right 'type' of aphasia for this project.

We will do a few **tests** to find out if you do.

Deborah will talk about this with you.

We also need to find out some details about your **stroke,** and about your **Speech and Language Therapy.**

We need to contact
your **GP**,
or your hospital **Consultant**,

and your **Speech and Language Therapist.**

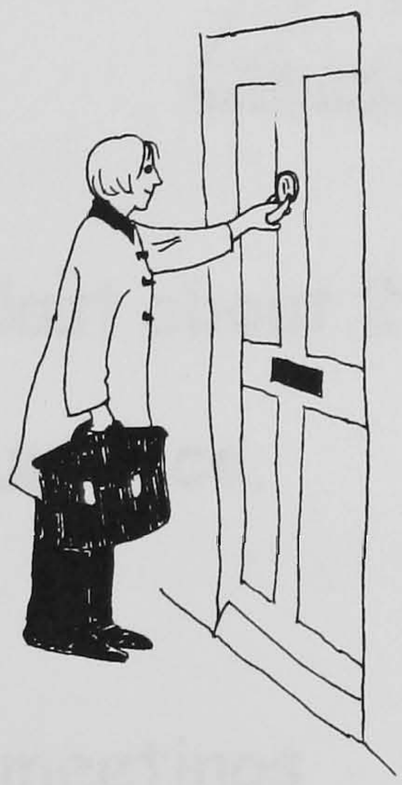
Everything will be **confidential.**

If you decide to take part, Deborah will arrange to see you again.

We will need **up to 10 sessions**.

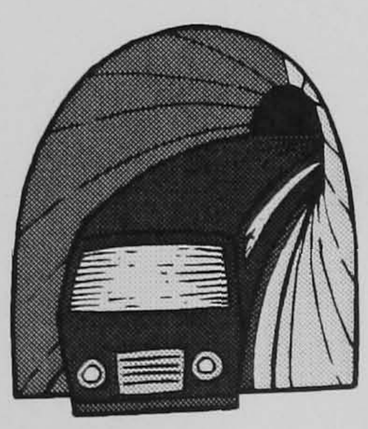
They will be at times that suit you.

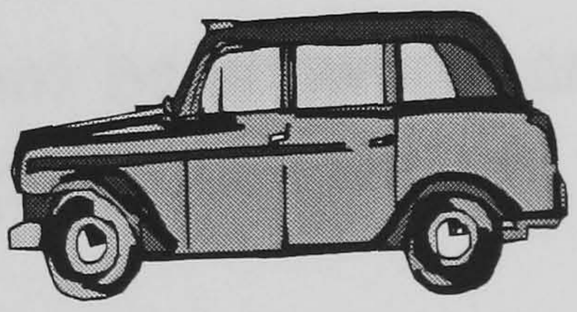
We can meet at your home,



or at **City University**,
whichever is best for you.

We will pay any **travel costs**.





What do I have to do?

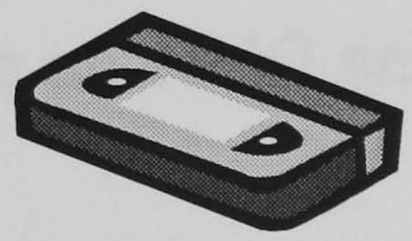
Deborah will do some **tests** with you.
She will talk with you about your **aphasia** and **what you think**.

Each meeting will last about **2 hours**.

They will go at **your pace**.

If you agree, the meetings will be recorded on **video**.

We may watch sections of the video together, and talk about them.

The video  will not be shown to anyone else without your consent.

You can STOP or take a break at any time.

What are the benefits?

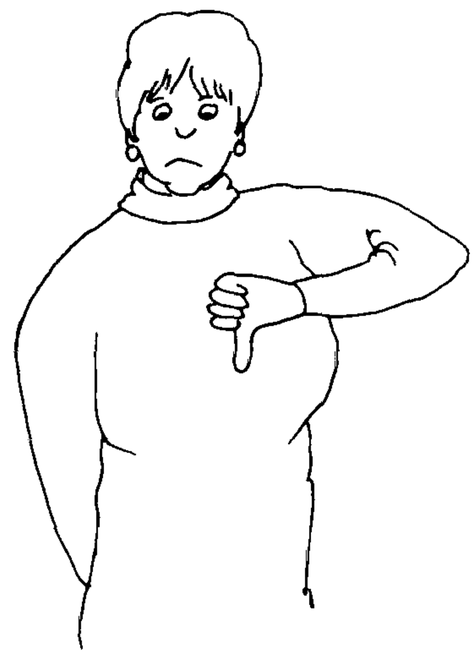
The research will help us to understand more about aphasia.

It will tell us about how people **think** and **communicate**.

It will tell us more about what **helps** you.

This will help us to design better **therapy** in the future.

What are the disadvantages?



This is NOT therapy... it won't help you to talk better.

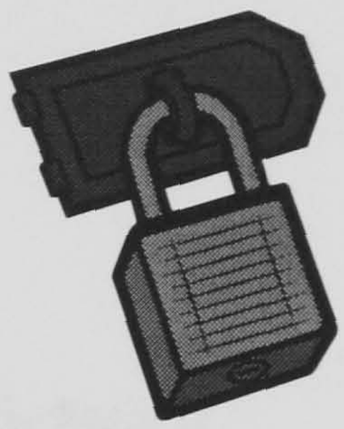
We will need quite a lot of your time.

There will be up to 10 sessions.

What if I have a complaint?

You can talk to the project supervisor: Dr Jane Marshall,
Dept. of Language and Communication Science, City University, London
EC1V 0HB.

Will everything be confidential?



Yes.

Everything will be kept in a **locked cupboard**.

We will not put your name or address on any tests.

After the project, we would like to keep the tests and videos.
We may use these for teaching or more research.

But if you wish, we will destroy the information about you.

What will happen to the research?

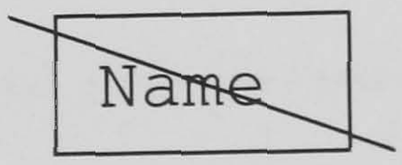
The results of the project will be written up.

Parts of the project may be:

- Published
- Used in teaching or conferences

We will give you a summary of the results.

We will NOT use your name
at any time,
unless you want us to.



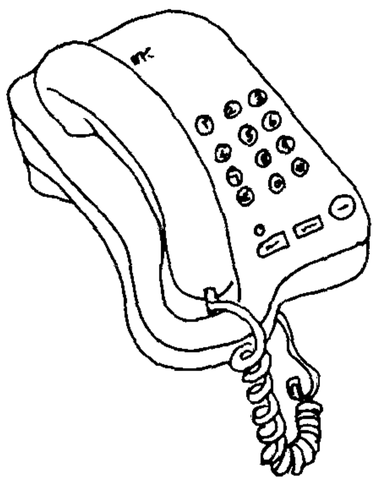
Who is organising the project?

The project is supervised at **City University.**

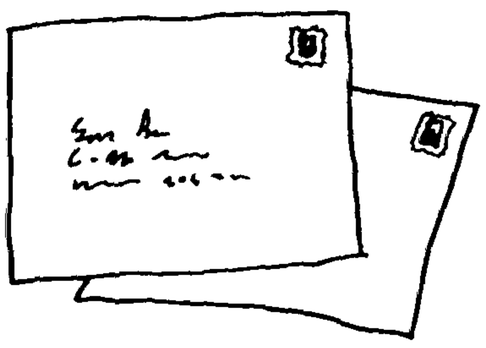
It is funded by **Connect**, the Communication Disability Network.

If you are interested:

... or if you have any questions, please contact **Deborah.**



Telephone: 020 7040 4668



Deborah Cairns

Dept of Language & Communication Science,

City University

London EC1V 0HB

E-mail: d.k.cairns@city.ac.uk

Thank you very much

Deborah Cairns

Appendix 2 Consent form for participants with aphasia

Consent form

Thinking for speaking research project

I have seen the information booklet about this project

☐ Yes ☐ No

I have talked with Deborah Cairns about the project. She has answered my questions.

☐ Yes ☐ No

I understand what is involved

☐ Yes ☐ No

I know that I can stop at any time. This will not affect my therapy.

☐ Yes ☐ No

I agree to take part in the study. This is my free choice.

☐ Yes ☐ No

I am happy for the researchers to contact my GP, Consultant and Speech and Language Therapist for information.

☐ Yes ☐ No

Name: Date:

Signature:

Video Consent form

Thinking for speaking research project

I agree to be recorded on video tape

☐ Yes ☐ No

I agree that the tapes may be used for teaching and research.
My name will not be used.

☐ Yes ☐ No

Name:

_____

Date:

_____

Signature:

_____

Appendix 3 Narratives produced by non-brain damaged control participants

Participant 1 (aged 50)

Laurel and Hardy were walking down the path, well, road – unmade road, with a donkey. The donkey had a backpack. And Hardy was on actually the back of the donkey, on the trailer, laying on it. And er, he was starting to go to sleep and suddenly they hit a river and he carried on walking Hardy, with the donkey and him on the back and he lost him in the river. He carried on walking to the other side and up to the path. He still carried on walking without realising that he'd left him behind. And Hardy meantime's now laying in the river ready to roll over and go to sleep and suddenly realised he was getting wet, woke up and started shouting at Hardy to go back and get him. And then Hardy went to go back and the donkey sat down. He walked back down the path, got to the river, got to Hardy, went to help him out, brushed him down, got a handkerchief out, wet it, um, tried to tidy him up, and then they both stood up and carried on to walk across the river, and suddenly Hardy disappears down a massive hole. And Hardy – er Laurel carried on walking and Hardy called out after him, so he went back to get him yet again, and then they both got up and carried on walking across the river and up the path.

Participant 2 (aged 60)

Chap leading donkey, um … with behind it something that looks like a sort of mattress. Um … it's not quite clear what it's made of, it's pretty rough and ready. Um … being dragged behind looks uncomfortable at the best of times. Er … not taking much notice, chap complains at being bumped about, apparently asleep. Er … arrives at river, um … chap leading goes straight ahead, um … without noticing, without thinking. Mattress follows after and for some unknown reason detaches itself. Um … chap on mattress doesn't wake up, stays asleep, apparently extremely comfortable while bloke with donkey goes on. After a little decides to get himself more comfortable, turns over, after some considerable time realises that something is not quite right. When he discovers that he is in the river he sits up and generally sort of starts making gestures – I think he whistles – er … having spotted chap with donkey still within sight some distance away. Um … bloke with donkey turns round, shows a small amount of surprise, and starts stomping back. Donkey takes one look at the situation and lies down – this is obviously going to take some time. Um … goes back to river, comes across to friend, quite oblivious of the fact – they both seem completely oblivious of the fact they're getting wet, to anything beyond the minimum extent. Um …

rather endearingly buttons his coat up for the job and then gets out his handkerchief and starts brushing down the by now upright and quite irate original bloke on mattress. Um … this is obviously totally ineffectual. He then wrings out his hanky, which has not acquired enough water from chap's lapels to get itself properly wet. He thinks this must be wrong, so dips his hanky in the river to get some water on it so he can wring it out properly. After which they decide to go on again. So chap who was leading the donkey starts off first as before. Almost immediately other chap, who was presumably following a different route, or else a trap door has opened – disappears into a large hole. After a while our first chap turns round, fairly quickly this time, notices there's nobody there. Um … bloke who's fallen into hole surfaces again, blows water, at great length, out, and that's about it.

Participant 3 (aged 72)

Laurel is walking along beside a mule which has got traces which are pulling a sort of raft affair, woven logs, and the raft is covered with animal skins, and Hardy is lying dozing on the animal skins. And the um road is rough so Hardy is upset when the raft goes over a big stone and says "Watch where you're going" and Laurel does his usual idiot thing and doesn't watch where he's going. When they get to a river he just walks straight through beside the mule and the raft slips from the traces, and Hardy lies there, apparently not aware of the fact he's three quarters wet. Eventually he wakes up and whistles for Laurel to come back, which Laurel does. And he pulls him up and gets his hanky, and wipes down his scruffy old morning coat and shirt and then finds that he hasn't actually taken much water off so he can't wring any water out of his hanky. So he dips it in the river again and wrings it out and is very satisfied 'cos he's got some water out of it. And then Laurel walks back towards the mule and is not in any trouble at all crossing the river at the ford, but Hardy steps into a sudden deep place where he's completely covered by the water. And eventually he emerges again and that's the end of the story 'cos they've got past the river.

Participant 4 (aged 72)

Stan and Olly are prospectors going along prospecting. Stan is carrying the tools in a pack on his back and the rest of their provisions are loaded on a mule which Stan is leading. Olly is being transported on a travois. It looks very uncomfortable but Olly is lying relaxing in the sun and Stan is leading the mule dragging him along. They come to a river and Stan marches steadily into the river leading the mule. Part way across the travois becomes detached from the mule and Olly is left floating in the river while Stan and the mule march on down the

road all unaware that Olly has been left behind. Olly becomes aware that all is not well and sinks into the water and almost disappears. He gives a whistle to attract Stan's attention. Stan turns round and becomes aware of Olly's predicament. He takes off his pack and lets it rest in the road and retraces his steps. The mule sits down in the middle of the road with an expression of disgust. Stand helps Olly to his feet and then attempts to wipe Olly down with his handkerchief. This does not have much effect in drying Olly who seems to be very cross with Stan. Stan becomes aware that his handkerchief is soaking wet so he wrings it out and expects Olly to approve of his facility with drying. The pair then advance towards the bank in the direction of the mule. Stand is a little ahead of Olly who then steps into a very deep hole in the bed of the river and that I think completes the entertainment.

Participant 5 (aged 75)

Just watched a short film clip Laurel and Hardy – do you want me to say what happened in the film? I always get the two mixed up, Laurel and Hardy. So we just watched Laurel trotting along the road, country road, with a donkey. Pots and pans and looked like bedding. And Hardy was resting on something being pulled along by the donkey, which he fell off as they got to the river. And laid in the river for a little while, till he realised where he was. And Laurel came back for him, got him out of the water, but then Hardy fell in deeper. Was there any more? Have I missed a bit?

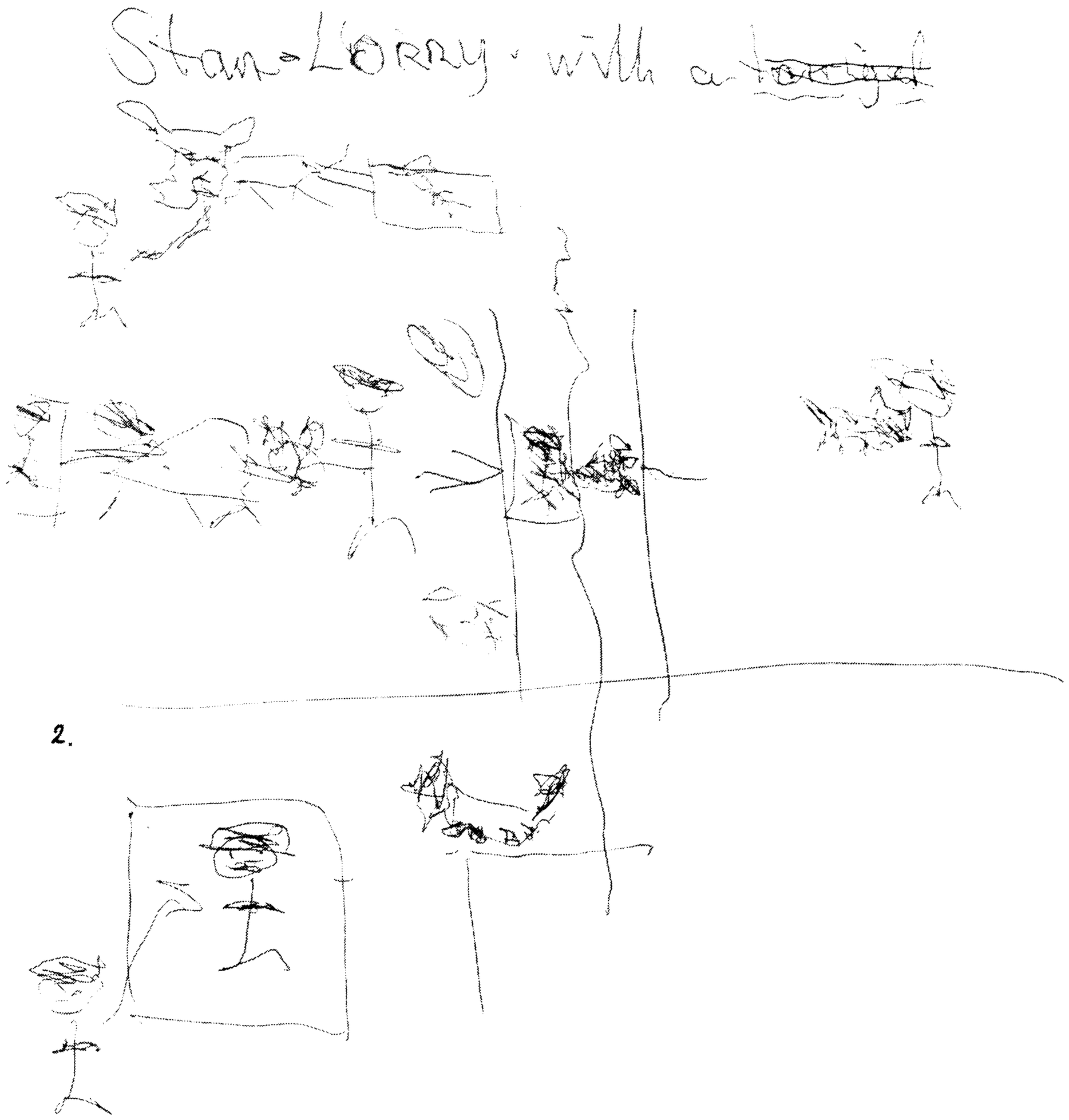
[D: There was the bit where Laurel went back for him.]

He went back for him, yeah, and um... but that's when he fell in, he fell deeper.

[D: That's right. But do you remember Laurel was getting out his...]

Yeah. And poor little Hardy tried to dry him off, no, poor little [Lorry] sorry, tried to dry him off with a handkerchief, but actually he was getting nowhere. But, um, so then they started walking up the road again. But Hardy as far as I can remember had to walk because he'd lost his, lost his lift, you might say. And hopefully he dried off towards the end. Did I miss anything?

Appendix 4 Jack's drawing of Laurel and Hardy narrative

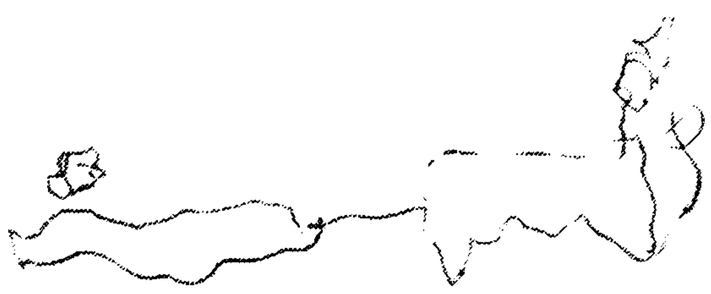


3.

4.

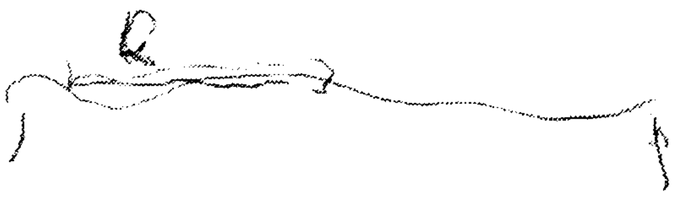
Appendix 5 Harry's drawing of Laurel and Hardy narrative

1

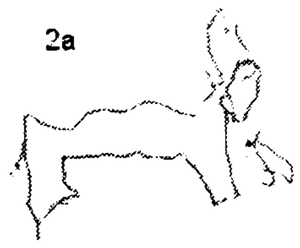


7

2

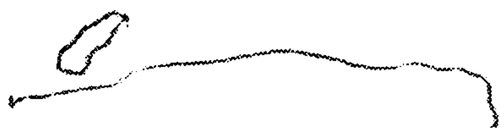


2a



3

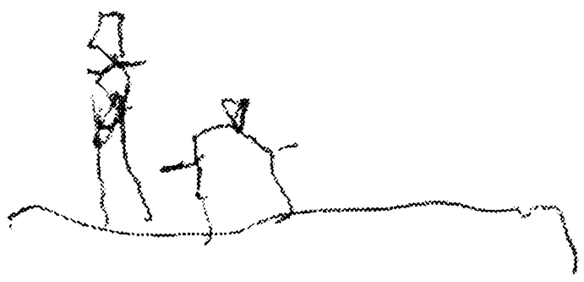
4



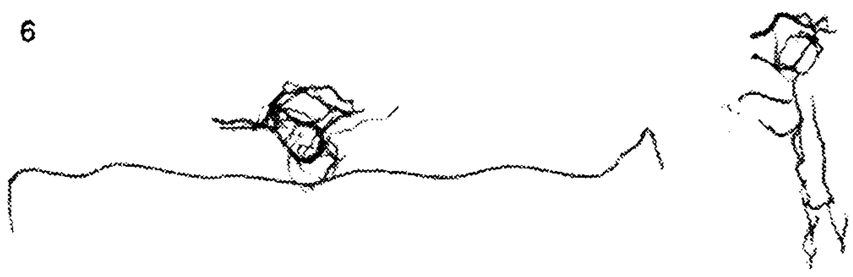
4a

4b

5



6



Appendix 6 Analysis of Event Perception Test stimuli

No.	Top picture	Target	Distractor	Carl	Jack	Helen	Ron	Harry	Melvyn	Judge 1	Judge 2	Judge 3
1	Peeling apple	Peeling potato	Eating bread							Sem	Sem Vis	Sem Vis
2	Burning trousers	Burning newspaper	Cutting sandwich							Sem	Sem Vis	Sem Vis
3	Throwing ball	Throwing pram	Passing baton	*		*				Vis		Sem (distractor) Vis (target)
4	Opening tin	Opening boot	Carrying chair				*	*				
5	Giving boat	Giving present	Lending book		*					Vis	Sem Vis	Vis
6	Pushing car	Pushing wheelbarrow	Washing window							Sem	Sem Vis	Sem Vis
7	Singing	Singing	Playing music							Sem Vis	Sem Vis	Sem Vis
8	Dropping newspaper	Dropping boat	Burning trousers							Vis	Vis	Vis
9	Pouring water	Pouring milk	Breaking window							Sem Vis	Sem Vis	Sem Vis
10	Opening window	Opening boot	Closing door	*		*	*	*	*	Sem (distractor)	Sem Vis (distractor)	Sem (distractor)
11	Giving boat	Giving picture	Opening door							Vis	Sem Vis	Vis
12	Car rolling	Stone rolling	Cake burning							Vis	Sem Vis	Vis

13	Pulling pram	Pulling horse	Pushing wheelbarrow					*	*	Sem (distractor)	Sem Vis (distractor)	Sem Vis (distractor)
14	Washing trousers	Washing car	Drying hair							Sem	Vis	
15	Throwing bone	Throwing pram	Pushing pram							Vis		Vis
16	Pouring paint	Pouring water	Dripping paint				*	*		Sem (distractor) Vis (target)	Sem Vis	Sem (distractor) Vis (target)
17	Pulling horse	Pulling rope	Feeding dog							Sem	Sem Vis	Sem (distractor) Vis (target)
18	Peeling potato	Peeling orange	Mashing banana					*		Sem	Sem Vis	Sem Vis
19	Spattering chair	Spattering man	Spraying flowers		*					Sem Vis	Sem Vis	Sem
20	Burning wheelbarrow	Burning paper	Pushing car							Sem	Sem Vis	Sem Vis
21	Chasing horse	Chasing girl	Leading man							Vis	Vis	
22	Car falling	Stone falling	Ball rolling	*	*			*				
23	Painting table	Painting wall	Polishing car							Sem	Sem Vis	Sem Vis
24	Eating dinner	Eating apple	Feeding dog	*					*	Sem	Sem (distractor)	Sem (distractor)
25	Pouring milk	Pouring water	Spraying car	*						Sem Vis	Sem Vis	Sem Vis
26	Opening box	Opening window	Cutting trousers			*	*	*				

27	Pushing pram	Pushing car	Pulling rope					*		Sem		Sem
28	Ball rolling	Car rolling	Top spinning			*				Vis	Sem (distractor) Vis (target)	Sem (distractor)
29	Covering car	Covering wheelbarrow	Washing trousers							Sem Vis	Sem Vis	Sem Vis
30	Dropping boat	Dropping glass	Chest sinking				*			Vis	Vis	Vis
31	Woman singing	Man singing	Women talking							Sem Vis	Sem Vis	Sem Vis
32	Reading letter	Reading newspaper	Writing list		*		*	*	*	Sem	Sem Vis	Sem Vis
33	Breaking glass	Breaking chair	Carrying box							Vis	Sem	
34	Throwing ball	Throwing bone	Opening door							Vis	Vis	Vis
35	Eating banana	Eating bread	Drinking tea							Sem	Sem Vis	Sem Vis
36	Giving picture	Giving present	Showing neck							Vis	Sem Vis	Vis
37	Pushing wheelbarrow	Pushing pram	Throwing pram							Sem Vis	Sem Vis	Sem Vis
38	Stone rolling	Ball rolling	Car falling			*				Vis	Sem Vis	Sem Vis
39	Boy singing	Woman singing	Opening tin							Sem Vis	Sem Vis	Sem Vis
40	Reading newspaper	Reading book	Burning trousers							Sem	Sem	
41	Breaking window	Breaking glass	Opening box	*						Sem Vis	Sem	Sem

42	Eating apple	Eating banana	Cutting sandwich							Sem	Sem Vis	Sem Vis
43	Pulling rope	Pulling pram	Loading lorry				*					
44	Covering chicken	Covering wheelbarrow	Filling bucket							Sem Vis	Sem	Vis
45	Washing window	Washing trousers	Ironing shirt	*					*			
46	Dropping glass	Dropping newspaper	Scattering				*			Vis	Vis	Vis
47	Reading book	Reading letter	Giving present				*			Sem	Sem	
48	Breaking chair	Breaking window	Sawing wood							Vis	Sem (distractor)	
49	Washing car	Washing window	Pushing pram							Sem (distractor)		Sem
50	Painting chair	Painting table	Breaking window							Sem	Sem Vis	Sem Vis
51	Kite falling	Plane falling	Rocket rising							Vis	Sem Vis	Sem Vis
52	Chasing man	Chasing dog	Following man							Vis	Vis (distractor)	Vis (distractor)
53	Cake burning	Car burning	Chop cooking					*	*	Sem (both) Vis (target)	Sem (distractor)	Sem Vis
54	Spattering man	Spattering wall	Bucket dripping		*	*				Sem Vis	Sem Vis	Sem Vis
55	Covering car	Covering chicken	Loading lorry							Sem Vis	Sem	Sem Vis
56	Painting wall	Painting chair	Paint dripping					*		Vis	Sem Vis	Sem Vis

57	Car falling	Kite falling	Cake burning							Vis	Vis	Vis
58	Chasing dog	Chasing girl	Giving present							Vis	Vis	Sem Vis
59	Spattering wall	Spattering chair	Sawing wood							Sem Vis	Sem Vis	Sem Vis
60	Peeling apple	Peeling orange	Cutting sandwich		*			*		Sem	Sem Vis	Sem Vis
Predicted errors				5	1	4	6	8	5			
Predicted correct responses				2	5	2	3	4	1			

Key

Items on which all judges identify either a Semantic or Visual link with the target

Items on which all judges identify a link with the distractor

Items on which the judges do not agree

Items on which a judge identifies links with both target and distractor

* Errors

Appendix 7 Order of Naming Test: Frequency and familiarity ratings of target entities

Frequency was established using Francis and Kucera (1982), familiarity (where ratings available) using Toglia and Battig (1978)

Item	Entity	Frequ.	Fam.
1	judge	81	6.32
	baby	80	6.61
	flower	78	6.5
2	magician	7	6.02
	trousers	7	5.65
	scissors	1	6.35
3	pilot	54	-
	queen	51	5.74
	camera	46	6.24
4	bride	40	-
	jacket	39	6.7
	iron	46	6.03
5	fireman	6	-
	clown	6	5.93
	sponge	6	6.12
6	builder	60	-
	shoe	58	6.43
	cloth	43	6.35
7	cook	22	6.42
	bishop	20	5.41
	fork	20	6.24
8	teacher	152	6.77
	window	172	6.66
	ball	123	6.42
9	ghost	16	6.17
	balloon	13	5.81
	pump	15	5.81
10	blacksmith	2	5.48
	horseshoe	0	-
	hammer	6	6.28

Item	Entity	Frequ.	Fam.
15	knight	25	5.79
	candle	23	6.18
	match	24	6.32
16	policeman	36	-
	mayor	47	5.62
	fan	34	5.94
17	doctor	349	6.59
	girl	374	6.85
	light	306	6.42
18	priest	33	5.9
	leaves	21	6.27
	brush	36	6.22
19	jockey	5	5.67
	banana	5	6.5
	spoon	6	6.53
20	wizard	3	5.47
	mermaid	1	5.42
	telescope	4	6.08
21	thief	18	6.05
	rug	17	6.54
	cigar	12	6.07
22	painter	35	-
	angel	45	-
	pencil	38	6.4
23	cyclist	8	-
	bicycle	7	-
	paintbrush	1	-
24	referee	1	6.08
	footballer	1	-
	whistle	3	6.22

11	nun	6	5.88
	beggar	5	5.76
	razor	15	-
12	dancer	63	6.09
	box	82	6.62
	key	71	6.67
13	fairy	6	5.82
	swimmer	3	-
	hose	11	-
14	sailor	13	-
	anchor	17	5.32
	rope	19	6.42

25	farmer	67	-
	wheel	77	6.34
	chain	60	6.07
26	cowboy	21	-
	cake	16	6.6
	sword	12	5.44
27	soldier	98	6.13
	king	98	6.0
	newspaper	104	-

Appendix 8 Order of Naming Test: Permitted synonyms

(Frequency established using Francis and Kucera, 1982)

Target	Frequency	Response	Frequency	Number of times produced	Frequency: Higher/Lower
Beggar	5	Tramp	1	2	Lower
Bicycle	7	Bike	0	22	Lower
		Cycle	30	1	Higher
Builder	60	Labourer	12	1	Lower
		Worker	123	1	Higher
Brush	36	Broom	2	1	Lower
Cloth	43	Towel	17	4	Lower
Cook	22	Chef	9	14	Lower
Dancer	63	Ballerina	2	10	Lower
Jacket	39	Coat	52	6	Higher
Knight	25	Warrior	12	2	Lower
Light	306	Lamp	24	9	Lower
Newspaper	104	Paper	208	6	Higher
Pencil	38	Pen	18	1	Lower
		Paintbrush	1	2	Lower
Priest	33	Vicar	4	3	Lower
Pilot	54	Astronaut	2	1	Lower
Rope	19	String	34	1	Higher
		Chain	60	1	Higher
Rug	17	Mat	7	11	Lower
		Carpet	17	2	Equal
Teacher	152	Professor	78	1	Lower
		Scholar	42	2	Lower
Thief	18	Burglar	3	23	Lower
		Robber	8	3	Lower
Wizard	3	Magician	7	3	Higher

One abbreviation was also allowed:

Paintbrush	1	Brush	36	14	Higher

Excluded substitutions

Target	Response	Number of times produced
Bride	Fairy	1
	Fairy godmother	1
	Veiled lady	1
Builder	Workman	1
	Man	1
Cigar	Candle	2
Dancer	Fairy	1
Fairy	Angel	1
Farmer	Gardener	2
Footballer	Runner	1
	Football match	1
Jacket	Blouse	1
Pencil	Palette	1
	Notebook	1
Priest	Monk	1
Scissors	Hole	1
Spoon	Fork	1
Telescope	Periscope	1
Wizard	Witch	1

Appendix 9 Order of Naming Test: Final stimuli

One-animate entity items

1. The magician cuts the trousers with scissors
2. The bride irons the jacket with an iron
3. The builder cleans the shoe with a cloth
4. The teacher breaks the window with a ball
5. The ghost inflates the balloon with a pump
6. The blacksmith forges the horseshoe with a hammer
7. The dancer opens the box with a key
8. The sailor pulls the anchor with a rope
9. The knight lights the candle with a match
10. The priest sweeps the leaves with a brush
11. The jockey eats the banana with a spoon
12. The thief burns the rug with a cigar
13. The cyclist paints the bicycle with a paintbrush
14. The farmer pulls the wheel with a chain
15. The cowboy cuts the cake with a sword

Two-animate entity items

1. The judge tickles the baby with a flower
2. The pilot photographs the queen with a camera
3. The fireman washes the clown with a sponge
4. The cook feeds the bishop with a fork
5. The nun shaves the beggar with a razor
6. The fairy sprays the swimmer with a hose
7. The policeman fans the mayor with a fan
8. The doctor examines the girl with a light
9. The wizard watches the mermaid with a telescope
10. The painter draws the angel with a pencil
11. The referee stops the footballer with a whistle
12. The soldier hits the king with a newspaper

Appendix 10 Sharon and Paul Test: Final stimuli

Item	Stimulus situation	1st Perspective plus Language cue	2nd Perspective plus Language cue
1	give/take	Sharon … the flowers from Paul	Paul … the flowers to Sharon
2	push/pull	Paul … the box	Sharon … the box
3	pour/fill	Paul … the glass with milk	Paul … milk into the glass
4	feed/eat	Sharon … Paul yoghurt	Paul … yoghurt
5	chase/flee	Paul … from Sharon	Sharon … Paul
6	throw/catch	Sharon … the ball to Paul	Paul … the ball
7	award/accept	Paul … a medal from Sharon	Sharon … a medal to Paul
8	kill/die	Sharon … Paul	Paul …
9	sell/buy	Paul … a radio to Sharon	Sharon … a radio from Paul
10	impress/admire	Paul … Sharon with his cake	Sharon … Paul's cake
11	teach/learn	Sharon … from Paul	Paul … Sharon
12	lend/borrow	Sharon … the cutters from Paul	Paul … the cutters to Sharon
13	push/fall	Paul …	Sharon … Paul
14	offer/accept	Sharon … a glass of wine to Paul	Paul … a glass of wine from Sharon
15	lead/follow	Paul … Sharon	Sharon … Paul
16	show/examine	Sharon … Paul's ear	Paul … Sharon his ear
17	donate/collect	Paul … money to Sharon	Sharon … money from Paul
18	ask/tell	Sharon … Paul the time	Paul … Sharon the time
19	amuse/enjoy	Sharon … Paul	Paul … Sharon

Appendix 11 Details of Sharon and Paul Test CD

The accompanying CD illustrates three items from the Sharon and Paul Test. Each item is shown in all three versions (Neutral, Perspective and Perspective plus Language). In the case of the perspective-manipulated versions, the two perspectives are shown consecutively. (In the test itself, they are separated by the other 18 items.)

1. Buy/sell
   i. Neutral version (item 9)
   ii. Perspective version (item 9): target *buy*
   iii. Perspective version (item 30): target *sell*
   iv. Perspective plus Language version (item 30): target *buy*
   v. Perspective plus Language version (item 9): target *sell*

2. Push/pull
   i. Neutral version (item 2)
   ii. Perspective version (item 2): target *pull*
   iii. Perspective version (item 23): target *push*
   iv. Perspective plus Language version: (item 23): target *pull*
   v. Perspective plus Language version (item 2): target *push*

3. Pour/fill
   i. Neutral version (item 3)
   ii. Perspective version (item 3): target *pour*
   iii. Perspective version (item 24): target *fill*
   iv. Perspective plus Language version (item 24): target *pour*
   v. Perspective plus Language version (item 3): target *fill*

Appendix 12 Sharon and Paul Test: Additional credited verbs

1. Verbs credited as synonyms of control verbs

Item	Control Verb	Synonym
1	receive	get
	give	share
2	shift, move	lift
4	spoon	shovel
	feed	keep
5	run	scarper
	retreat	recede
7	receive	take
	present	put
	receive	have
8	shoot	fire
9	sell	deal
	sell	offer
	accept	take, get
10	receive, take	get
	give, present	feed
11	advise	tell
	learn	know
	learn, ask, enquire	see
	help	assist
12	clip	prune, lop
	cut	chop
	take	get, grasp, have
13	joke	fool, laugh
	push	throw
	tumble	jump
	hit	bump, smash
14	taste	try
	take, receive, accept	get
15	follow	go
	invite	ask

	persuade	get
16	examine, investigate	probe
	hold	take
	inspect	see
17	receive, accept, take	get, have
	ask, request	beg
	give	feed
18	tell	speak
	explain, point	show
	inform, explain	teach
	check	note
19	perform	sing

2. Verbs accepted by the naive rater

Item	Target	Accepted verb
2	push / pull	struggle
7	award / accept	anoint
8	kill / die	attack
9	buy / sell	want
13	push / fall	surprise
16	examine / show	help

3. Noun/verb homonyms credited as verbs

Homonym	Verb frequency	Noun frequency
catch	146	5
chase	7	7
check	88	53
collapse	18	6
drink	93	75
fight	155	58
grasp	23	7
jump	58	10
offer	217	13
pull	145	13
push	102	8
share	105	100
shove	16	0
surprise	76	49
swallow	20	7
throw	150	7

4. Excluded homonyms

Homonym	Verb frequency	Noun frequency
award	22	60
clown	0	6
exchange	13	72
gun	2	142
mistake	24	45
spoon	1	6
time	16	1901
water	12	486

Appendix 13 Action Gesture Test: Final stimuli

1. writing	32. ironing
2. tearing	33. weight lifting
3. swimming	34. smelling a flower
4. watering	35. throwing a ball
5. karate	36. brushing teeth
6. playing darts	37. cutting
7. pegging washing	38. smashing a window
8. juggling	39. tinkering
9. carrying	40. painting
10. motorcycling	
11. climbing a ladder	
12. cooking	
13. conducting	
14. packing	
15. dressing	
16. washing up	
17. chopping	
18. blowing	
19. hitchhiking	
20. pushing	
21. cycling	
22. flying	
23. pouring	
24. sleeping	
25. telephoning	
26. showering	
27. window cleaning	
28. sawing	
29. drinking	
30. reading	
31. driving	

Appendix 14 Event Drawing Task (Sacchett, 2005): List of verbal stimuli

1.	Mary gives the flower to Bill	CS	Rev
2.	Bill takes the ball out of the box	CG	Non-rev
3.	Mary puts the book on the table	CS	Non-rev
4.	Bill passes the box to Mary	CS	Rev
5.	Mary takes the apple out of the bowl	CG	Non-rev
6.	Bill buys the book from Mary	CG	Rev
7.	Mary takes the flower from Bill	CG	Rev
8.	Mary throws the ball into the bucket	CS	Non-rev
9.	Bill gives the flower to Mary	CS	Rev
10.	Mary lifts the vase off the table	CG	Non-rev
11.	Bill places the box onto the chair	CS	Non-rev
12.	Mary sells the book to Bill	CS	Rev
13.	Bill picks the flower from the vase	CG	Non-rev
14.	Mary drops the apple into the bowl	CS	Non-rev
15.	Bill grabs the ball from Mary	CG	Rev
16.	Mary picks the book off the table	CG	Non-rev
17.	Bill takes the flower from Mary	CG	Rev
18.	Bill throws the ball to Mary	CS	Rev
19.	Mary buys the book from Bill	CG	Rev
20.	Bill grabs the cushion off the chair	CG	Non-rev
21.	Mary places the vase on the table	CS	Non-rev
22.	Bill sells the book to Mary	CS	Rev
23.	Mary takes the box from Bill	CG	Rev
24.	Bill lifts the box off the table	CG	Non-rev
25.	Mary throws the ball to Bill	CS	Rev
26.	Bill puts the flower in the vase	CS	Non-rev
27.	Bill takes the box from Mary	CS	Rev
28.	Mary grabs the ball from the bucket	CG	Non-rev
29.	Bill drops the ball into the box	CS	Non-rev
30.	Mary passes the box to Bill	CS	Rev
31.	Mary grabs the ball from Bill	CG	Rev
32.	Bill throws the cushion onto the chair	CS	Non-rev

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