

# FOTINOPOULOU



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## **Using non-linguistic communication to investigate event processing: evidence from drawing production in adults.**

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## ABSTRACT

This research aimed to investigate aspects of the ‘thinking for communication’ process, which refers to event conceptualization for the purpose of communication. More particularly, a central aspect of ‘thinking for communication’ is perspective-taking when communicating about a situation. This was explored by examining participants’ foregrounding choices in non-linguistic communication of events and considering how conceptual/perceptual factors and output modality constraints may interact and ultimately affect their foregrounding decisions. The experimental investigation involved 12 participants, with no language/communication impairment, communicating events through the non-linguistic medium of drawing, in response to short video scenes. A detailed statistical and qualitative analysis of the entity drawn first, reflecting foregrounding choices, under different experimental conditions, was conducted.

It was found that participants mostly foregrounded the Cause entity, mirroring linguistic communication and thus suggesting that they appreciated the causal structure of the events and were able to identify the roles of the entities. However, it was additionally found that participants relied on the convergence of top-down conceptual factors and bottom-up perceptual factors, to direct their foregrounding decisions. Specifically, they relied on perceptual factors to guide their foregrounding choices, when conceptual cues to causality were less straightforward. This supported previous research which showed that foregrounding choices are dependent on the ease of identification of the Cause entity, which in turn depends on perceptual and conceptual factors, acting together to increase the salience of the Cause entity or acting against each other, making the identification of the Cause entity less clear-cut. Finding consistent patterns in the participants’ foregrounding decisions provides a useful point for comparison with individuals with aphasia who frequently face difficulties with the ‘language of events’. Conducting this drawing task on people with aphasia and comparing to control data will allow more specific hypotheses to emerge about aspects of the ‘thinking for communication’ process that are intact and those that may be problematic, thus providing more target-specific therapy. Perceptual/conceptual factors and output-modality constraints, found to affect performance of people with intact language suggests that these factors may have implications for the development of aphasia therapy/assessment materials.

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## 1. INTRODUCTION

*'Language is never a simple copy or reflection of how the world is- more often than not, it reflects how speakers want the world to appear to their listeners.'*

*(Black & Chiat, 2003a, p.126)*

Communicating what we see, assumes that we take a particular perspective on the situation, which determines not only what we include in our descriptions but also what aspect we give more prominence to. However, this process may be constrained by a number of factors, including the modality used to communicate a particular situation/event.

Event conceptualization for the purpose of communication involves the 'paring down' of complex information into a highly schematic form, regardless of the output modality used (Zacks & Tversky 2001, Gershkoff-Stowe & Goldin-Meadow 2002, Dipper, Black & Bryan, 2005). The term 'thinking for speaking' has been employed to describe this complex process (Slobin, 1996, 2003) of conceptualizing the event and considering how to communicate it using language. Sacchett (2005) adopted the term 'thinking for communication' to extend this idea to non-linguistic communication of events. She investigated the use of drawing as a means of communicating events in both normal language and aphasic speakers. One of the areas she investigated, involved participants' foregrounding choices in communicating events through drawing and found that these choices may be affected by output-constraints and further perceptual and conceptual constraints that may act to increase the salience of certain entities in an event.

This study aims to provide additional evidence to test her findings by investigating if normal language speakers' foregrounding choices in the graphic communication of events, specifically in drawing, mirrors foregrounding in linguistic communication, in response to video clips of events. It also focuses on how output-constraints alongside conceptual and perceptual constraints interact to affect these choices.

The first section of this chapter (1.1) will elaborate on the concept of 'thinking for communication' and will explain how foregrounding choices are reflected in drawing. Section 1.2 will explore how perceptual/conceptual factors and output constraints may affect foregrounding choices and the last section (1.3) will briefly discuss the implications of this study for people with aphasia.

## **1.1 ‘Thinking for communication’ and foregrounding in drawing**

As briefly mentioned above, the term ‘thinking for speaking’ is used to refer to the process of event conceptualization for the purpose of linguistic communication (Slobin, 1996, 2003). The intention, itself, to communicate guides us to focus only on communicatively-relevant aspects of a situation, allowing a conceptualization to emerge that is in line with the communication system used or, as Pinker (1989, p.358) puts it ‘one’s language does determine how one must conceptualise reality when one has to talk about it’. This suggests that experiences and thoughts intended to be linguistically communicated have to be filtered through language and structured in a language-appropriate way (Dipper et al, 2005). Cross-linguistic studies demonstrate how the different forms available in different languages play a role in selecting and shaping the message itself and in guiding speakers’ attention over a situation (Choi, 1997 cited in Black & Chiat, 2000, Slobin, 1996, 2003, Gennari, Sloman, Malt & Tecumseh Fitch, 2002).

However, it has been suggested that certain aspects of an event are communicatively relevant, regardless of the output modality used and therefore the ‘paring down’ process characterizes all forms of communication (Tversky, 1995, Gershkoff-Stowe & Goldin-Meadow 2002, Sacchett, 2005) bringing about the ‘thinking for communication’ (Sacchett, 2005), the theoretical stance taken in this study.

When describing an event, it is crucial to identify the entities involved, and to appreciate temporal as well as relational information (Croft, 1998, Dipper et al, 2005), for effective communication to take place, regardless whether it is through linguistic or non-linguistic forms of expression. Thus, some aspects of events can be thought of as ‘modality-general’ (Sacchett, 2005). However, as discussed above the conceptualization of an event for communication may be affected and constrained by the modality used to communicate it. This suggests that graphic communication may constrain the process of event conceptualization, just as language-specific differences constrain it, affecting the focus of attention on the situation to be communicated (Sacchett, 2005). Thus, although drawing allows some freedom, enabling the individuals to depict relations in events as they wish and to choose which aspects they foreground, specific output modality-constraints will still influence their performance. This will be discussed further in Section 1.2 below.



Perspective taking is central to the ‘thinking for communication’ process of conceptualizing and communicating events. As Black & Chiat (2003b, p.243) state ‘when we talk about a scene or situation, we always talk about it from a particular point of view, foregrounding some aspects of it at the expense of others’, thereby including specific participant entities and determining the prominence they are given. In language, word order is one of the primary devices used to express who does what to whom (Gershkoff-Stowe & Goldin-Meadow 2002). Therefore, entities placed at a position of syntactic privilege are the ones foregrounded. In active transitive sentences, the Actor/Cause is usually placed in Subject position, thus given primary prominence and the Theme is usually given secondary prominence by taking the Object position. (Black & Chiat, 2003a)

However, this linearization can be applied to other communication systems as Tversky (1995, p.74) suggests that ‘all systems have a linear organisation, perhaps reflecting linearity of speech’. Therefore, the temporal order in which the different entities are presented in non-linguistic communication, such as drawing and gesturing, can also indicate foregrounding choices (Tversky 1995, Gershkoff-Stowe & Goldin-Meadow 2002, Sacchett, 2005). Hence, it is possible to suggest that when communicating an event the entity drawn first is foregrounded, indicating the perspective taken on the particular situation.

However, foregrounding choices can be influenced by a number of perceptual and conceptual factors that are discussed in the following section (1.2).

## **1.2 Perceptual/Conceptual influences and output constraints on foregrounding choices**

When perceptual and conceptual features converge they may increase the salience of one entity over the other, and thus guide attention towards specific entities, causing them to receive primary prominence by being foregrounded. Evidence demonstrating this is presented below, with output constraints additionally affecting foregrounding choices being mentioned when appropriate.

### 1.2.1 Visual prominence and perceptual salience

Evidence suggests that increasing the visual prominence or perceptual salience of one of the entities in a scene can influence foregrounding choices in event descriptions.

(Sacchett, 2005)

Tomlin (1997) showed how direct attentional cuing affects foregrounding choices in linguistic descriptions. His findings indicate that in active sentences, the Actor/Cause was foregrounded when the agent was cued, but when the patient was cued, their productions involved passive constructions, foregrounding the patient. Further, Flores d'Arcais (1987) demonstrated how size of the entities in a scene can affect the viewpoint adopted. In scenes where two objects were moving, his participants foregrounded the larger object in their descriptions. In a similar study by Sridhar (1988, cited in Sacchett, 2005), in which both animacy and size variables were manipulated, participants foregrounded the entity in which these perceptual features converged. The effects of animacy may be related to the effect of change, which also has been shown to increase perceptual salience. Newtonson, Engquist & Bois (1977, cited in Zacks & Tversky, 2001) showed that when individuals are asked to divide films of human activity into parts, they divide them at points where the actors' bodies changed the most, i.e. at 'points of maximal change' (Zacks & Tversky, 2001).

Therefore, a moving entity may receive more attention than a static one, resulting in its foregrounding. This is what also occurs in language where moving entities are usually foregrounded against other more static entities that act as reference entities (Sacchett, 2005).

However, apart from these internal characteristics of the entities themselves, evidence suggests that their position in a scene may also affect foregrounding choices. Flores d'Arcais's (1975) study showed that his subjects started their descriptions with the entity appearing on the left. Similarly, in Hartsuiker's & Kolk's (1998) picture description task, both non-aphasic and aphasic individuals tended to produce more active sentences when the agent appeared on the left of the picture and when the patient was inanimate. When the agent appeared on the right, more 'other' structures were produced and again the entity on the left was made the subject of the sentence, especially if the entity was animate.

These studies indicate how perceptual/conceptual factors converge to increase the salience of an entity, resulting in its foregrounding in linguistic descriptions.

However, there is evidence showing how similar perceptual and conceptual factors affect foregrounding choices when non-linguistic communication is employed. The position of entities in a scene has been found to influence the choice of the entity drawn first, with the entity on the left of the screen being more likely to be drawn first (Chatterjee, Maher & Heilman, 1995, Chatterjee, Southwood & Basilico, 1999, Sacchett, 2005). This is because replication of screen position together with the fact that most right-handed individuals start drawing on the left and then go on towards the right, result in the entity presented on the left being drawn first. Thus, the output modality constraint of 'start drawing from the left' may affect foregrounding choices. In the experimental drawing task used in this study (see Section 2.2), where video clips of events shown to participants have to be communicated through drawing, screen position of the entities is manipulated and it is predicted that the entity presented on the left of the screen is more likely to be drawn first.

Furthermore, Gershkoff-Stowe & Goldin-Meadow (2002) investigated the effects of animacy on foregrounding choices in a non-linguistic task, but found some differences to the findings of the studies involving linguistic communication. In their experiment, participants had to reconstruct scenes, involving one moving object and one stationary, for example a doll jumping into a hoop, by ordering pictures drawn on transparencies, representing the individual entities in the scene. They found that in a non-communicative context, the order in which the subjects reconstructed the scene was robust but it did not mirror the English order used in linguistic descriptions. Overall, animate/moving entities (e.g. doll) were not foregrounded and more inanimate and stable entities (e.g. hoop) were selected first. However, when their participants were told to reconstruct the scene, but that other people would see it afterwards (communicative context), they mostly selected the moving object first, resembling English language.

Geminiani, Bisiach, Berti & Rusconi (1995) conducted an experiment, where participants had to imagine visual scenes representing the meanings of simple utterances by indicating the imagined position of the two objects mentioned. They also found that the reference/stationary item was indicated first in sentences that involved both a moving and a stationary object. This occurred even when the stationary item was at sentence final position, e.g. *the car has overtaken the bike*.

These two studies may suggest that the output modality of drawing itself constraints us, making the stable/reference entity more likely to be drawn first. However, the stimuli used in these studies did not involve a Cause entity whereas in the current investigation, video clips of caused change of location events (see Section 2.2.2) are presented to the participants and there is strong evidence suggesting that causality may affect foregrounding choices, leading to the Cause entity receiving primary foregrounding. This will be explored in further detail in the next section (1.2.2).

### **1.2.2 Perceptual and conceptual factors cueing causality**

The roles of the entities themselves, may also affect foregrounding choices and may further interact with factors mentioned above.

Chatterjee et al (1995) found that agency is an important factor affecting foregrounding choices, since their participants were more likely to draw the agent first in response to both active and passive sentences. For example, even in sentences such as *the square was kicked by the circle*, participants would still draw the circle first, indicating that the Cause of the event is generally foregrounded.

This primary prominence of the Cause may be due to perceptual/conceptual factors. Verfaillie and Daems (1996) found that identification of the Cause was faster in scenes where causality could be directly perceived. They used visual events of two moving objects in which one underwent a change as a result of the other and found that in scenes where, for example, one object is pushed forward by another, causality is perceived at the moment of contact between the two objects. Applying this to real life situations e.g. a situation where an animate entity acts on an inanimate, *Andrew puts the box on the floor* or *Andrew takes the box from the floor*, perception of causality is more direct in the first example, since causality occurs at the moment Andrew initiates the event, while in the other example, causality is delayed until Andrew makes contact with the box. (Sacchett, 2005)

Chatterjee et al (1999) also found that when individuals had to decide which sentence matched a drawing of one entity acting on another, response times were faster in actions such as *push*, where the direction of the action moved away from the Actor, rather than towards, such as in *pull* scenes, especially when the agent appeared on the left. Therefore, when direction and position of the Actor line up in a scene, causality is easier to perceive (Sacchett, 2005).

In the current study the direction and position of the Actor/Cause was manipulated (see Section 2.2.2) and it was predicted that when position and direction line up, causality would be easier to perceive.

However, conceptual factors may also influence foregrounding choices. Zacks & Tversky (2001) found that the actual intention to communicate may increase the attentional salience of causal interactions, and suggest that top-down knowledge structures are activated when describing an event for communication, raising awareness of causal and goal directed relations. Griffin & Bock (2000) also showed how communicative intent raises awareness of the Cause and thus may lead to its foregrounding. They monitored eye movements of people watching scenes where one entity acts on another in two speech conditions and two non-speech conditions. The speech conditions involved communication of the event or preparation for communication, while the non-speech ones did not. They found that in the non-speech conditions initial eye movements were skewed towards the entity that was affected i.e. the patient, while in both speech conditions initial eye movements were skewed towards the initiator/Cause of the event. They concluded that perceptual factors alone are not adequate but rather it is the intention to communicate or actually communicating about an event that increases the attentional salience of the causal interactions and leads to foregrounding the Cause entity. This can explain Gershkoff-Stowe's & Goldin-Meadow's (2002) differences in foregrounding choices across the communicative and non-communicative contexts mentioned earlier.

Therefore, in the current study, it was predicted that the Cause entity would be foregrounded, since the experimental drawing task was completed within a communicative context.

Further, it has been suggested that an animate entity is seen as more agentive and thus is given primary prominence (Langacker, 1998). Therefore, the number of animate entities in a particular event can influence foregrounding choices. A scene is more likely to be viewed from the perspective of the animate entity in situations where there is only one animate entity acting on an inanimate entity, e.g. in a caused change of position event, such as *John dropped the ball in the bucket*, resulting in the foregrounding of the Cause (John). Any other viewpoint adopted would result either in excluding the cause of the event or in a passive construction. However, when there

are two animate entities in a situation, for example, in caused change of possession events, such as *a girl giving a flower to a boy*, more viewpoints are offered, since the event can be viewed as a *giving* event, but could also be viewed as a *receiving* event (*boy takes a flower from the girl*). Thus, more foregrounding choices are available and this may increase the complexity in conceptualization and communication of the event (Black & Chiat, 2000, 2003b). This type of complexity in foregrounding may also be seen in non-linguistic communication, such as drawing. Sacchett (2005) supported this view since she found that when participants were presented with video clips of caused change of location events, the Cause entity was consistently foregrounded by participants in events involving one animate entity acting on inanimate entity e.g. *girl throws the ball into the box*. On the other hand, in events involving more candidates for the Cause role e.g. *boy takes the box from the girl*, the foregrounding of the Cause was dependent on the congruence of the number of perceptual and conceptual factors.

Therefore, in situations where perceptual and conceptual cues to causality converge, foregrounding choices are somewhat straightforward. However, in situations where these cues act against each other, foregrounding choices may be affected. An example of this type of situation is Tomlin's (1997) experiment mentioned earlier, where the conceptual prominence of agency was superseded by the increase of the perceptual salience of the patient. In Hartsuiker's & Kolk's (1998) study though, conceptual prominence of agency overrode perceptual cues. When the participants were asked to describe events involving an inanimate Cause acting on animate patient, e.g. *a train running over a woman*, they mostly foregrounded the animate entity by producing 'other' sentence structures such as passive (*the woman was run over by the train*), despite the inanimate entity being the Cause. These types of structures were mostly produced when the animate entity appeared on the left of the picture, suggesting that when the Cause is less easy to identify, other perceptual cues may come into play such as cues increasing visual prominence. This was also supported by Sacchett's (2005) study, in which participants' foregrounding choices were almost entirely dependent on screen position of the Cause, in scenes where the ease of identification of the Cause was less straightforward. For example, in a scene such as *Boy takes apple from the girl*, the Cause (boy) was drawn first when it appeared on the left and the Source (girl) was drawn first when it appeared on the left.

Based on the literature reviewed above, in the present study it was predicted that the Cause entity would be foregrounded (drawn first), receiving primary prominence equal to the prominence given in Subject position in a sentence, in situations where a number of top-down conceptual and bottom-up perceptual factors converge. In situations though where more perspective options are available and some of the factors may act in conflict, participants would rely on perceptual factors to direct foregrounding decisions.

### **1.3 Implications for people with aphasia**

By examining individuals with intact language and identifying regularities in the way they approach the graphic communication of visually presented events, this will provide a basis for comparison with people with aphasia, allowing us to hypothesize about particular aspects of the 'thinking for communication' process that are intact and those that may be problematic. People with aphasia frequently face difficulties with the 'language of events' (Sacchett, 2005). These difficulties may be either with the conceptualization of the event or with the intention to communicate it or with language processing or may be with all three. Problems in conceptualizing specific aspects of events that are relevant to their communication may result in difficulties producing and understanding language that describes events. However, the language impairment itself may have an effect on the conceptualization of events for the purpose of communication. (Marshall, Chiat & Pring, 1993, 1998, Black & Chiat 2000, 2003a, Dipper et al 2005, Sacchett, 2005)

Long term, this research may aid professionals to understand the requirements for using drawing to communicate, as evidence has shown that such an approach is beneficial to people with aphasia (Lyon 1995, Sacchett, 2002). Furthermore, it will help to target more specific aspects of event processing in therapy and drawing may also be used in the assessment process as a complement to other assessments, to inform us about an individual's conceptualization and communication of events, especially when verbal output is limited. Investigations into conceptual/perceptual factors and output modality constraints affecting graphic communication of events may also reveal some thoughts of how to structure the tasks used in therapy and assessment. This will be addressed later (Chapter 4) in light of the findings of the present study.

## **2. METHODOLOGY**

The literature review conducted highlights that for event conceptualization for communication, we have to attend to specific communicative-relevant aspects of the event and that foregrounding choices may be affected by the interaction of top-down conceptual factors and bottom-up perceptual factors, which may further interact with specific output modality constraints. Therefore, in the experimental drawing task different variables were manipulated that will demonstrate how these factors affect foregrounding choices in graphic communication. The task employed here was used and devised by Sacchett (2005) and in the development of the visual stimuli, perceptual factors such as screen position of entities and direction of movement of the theme were counterbalanced with conceptual factors such as the number of animate entities and the perspective options offered.

The task investigates an individual's ability to form conceptualizations of events from visual input and to use these conceptualizations to communicate the event graphically. Therefore, no linguistic encoding is involved and performance should reflect conceptual processing and preparation for communication. (Sacchett, 2005)

This study focuses on the entity which the participants drew first in response to the visual events, aiming to identify any regularities in the entity drawn first. This involves both quantitative and qualitative analysis of the subjects' drawing productions.

### **2.1 Participants**

The participants were 12 native English-speaking adults, 6 males and 6 females, with a mean age of 24 years (range 22-29y). None of them had a history of brain damage or disease, clinical depression or mental illness. Furthermore, all participants were right-handed and did not have any formal artistic training. Detailed information for the participants is provided in Appendix A.

Both verbal and written information regarding this experiment was provided prior to the study, and written informed consent was obtained in line with the Ethics committee procedures of University College London. (Appendices B and C)



## 2.2 Stimulus Materials

### 2.2.1 Stimuli

The stimuli consist of 32 short digitized video clips (edited to 1-3 seconds of duration) presenting caused change of location events. Half of the clips (16) showed caused change of possession events and the other half (16) showed cause change of position events (see Section 2.2.2). These were further subdivided into two event-types: give/put-type events and take/pick-type events, resulting in four distinct stimulus groups, each containing 8 stimuli (see Section 2.2.2). Examples are provided below and the full list of visual stimuli employed is available in Appendix D.

	<b>Give/put-type (CS)</b>	<b>Take/pick-type (CG)</b>
<b>Change of possession</b>	<i>Boy gives vase to girl</i>	<i>Boy takes apple from girl</i>
<b>Change of position</b>	<i>Girl puts book on table</i>	<i>Boy lifts box off table</i>

Each scene is animated and completely silent. The inanimate entities have simple distinctive shapes and are easy to identify and draw. The same animate entities are used in all scenes, a boy and a girl, who can be easily distinguished by their clothing and hairstyle.

The video clips were carefully constructed by Sacchett (2005) to control for different perceptual factors: the camera was stable throughout the event; each scene included all 3 entities of the event, which were filmed against a neutral background (with the exception of the buy/sell events where the scene had to be set-table/items for sale). Also, single events were presented with a clear beginning and end, making the Cause easy to identify. The beginning was marked by the movement of the Cause, while the Source/Goal remained static or passive throughout. The end of the event was signaled by the Cause returning to stasis. Moreover, gender of the Cause entity was also balanced across the variables.

Finally, the position of the Cause entity on the screen was balanced across the variables, so that it appeared on the left in half of the clips and on the right in the other half.

### 2.2.2 Event types and manipulations

*Variable 1: Event type*

Two types of caused change of location events were presented in the video clips:

- 1) caused change of position events, e.g.
  - a) *Sam puts the cup in the box*
  - b) *Sam takes the cup out of the box*
- 2) caused change of possession events, e.g.
  - a) *Sam gives the cup to Kate*
  - b) *Sam takes the cup from Kate*

Black & Chiat (2003a) represent these types of events schematically:

ACT	PROCESS	STATE
x acts on y	y changes towards z	y is in z
<i>beginning point</i>	<i>path</i>	<i>end point</i>

This representation suggests a causal relationship in which the Actor/Cause (Sam) begins a volitional act, which in turn brings about a change in the Theme (cup), resulting in its movement to or from a Goal or Source (Kate/box), and eventually reaching its end point where it cannot undergo further change (Sacchett,2005).

Therefore, these event types were selected because although they involve the same structure, they differ in terms of the number of animate entities involved. In a change of position event which involves one animate entity, perspective taking may be more straightforward, while a change of possession event can be interpreted as a giving or receiving event, thus offering more perspective choices and increasing processing demands. (see Section 1.2.2)

Following Sacchett (2005) this manipulation will be referred from here on as the *event type* variable.

#### *Variable 2: Cause-role*

The direction of the Theme's movement in relation to the initiator/Cause of the event was also manipulated, so that in half of the events presented the Cause was co-referential with the Source (CS events) of the Theme's movement (e.g. 1a, 2a) whereas in the other half the Cause was co-referential with the Goal (CG events) (e.g. 1b, 2b).

Thus, adopting Sacchett's (2005) terminology, CS events will be referred as *give/put*-type events and CG events will be referred as *take/pick*-type events.

Performance of the participants may be affected depending on the co-referential role of the Cause. In the scenes, where the Theme starts off with the Cause and moves

away from it (CS- *give/put*-type events) causality may be perceived more easily than when the Cause's initiating movement does not immediately inflict a movement in the Theme (CG-*take/pick* type events). (See Section 1.2.2)

Using Sacchett's (2005) terms once again, this manipulation will be referred as the *cause-role* variable.

### **2.3 Procedure**

Participants had to produce a total of 32 drawings in one session, in response to the video clips presenting the caused change of location events. They were given verbal instructions supported by visual instructions (Appendix E). They were particularly instructed to draw the main thing that happens in each scene as if they want to get it across to somebody else. It was stressed that the quality of the drawings is not important, and that they should use stick figures to represent people. They were also told to draw females wearing a skirt to mark gender differences. The use of arrows and other symbols such as £ was permitted, but no written words were allowed. Finally, it was emphasized that this is a silent task and that they should try to draw the event in a single frame if possible.

The order that the stimuli were presented in was randomized and each stimulus was presented once on a 14" colour-screen of a lap top (Hewlett Packard nx9005). Further repetitions were allowed, if requested, with no limitation on the number. Each drawing was produced on a sheet of A4 paper using a blue/black pen. There was no time limit set for the completion of the task.

### **2.4 Analyses of data**

Firstly, an analysis was conducted aiming at identifying any patterns in the entity drawn on the left of the page. It was predicted that participants would draw on the left of the page the entity that appeared on the left of the screen in the video clip, thus replicating screen position.

The recording of the entity drawn on the left (Cause or Source/Goal) in response to each stimulus was conducted at the time of production of the drawings.

The main analysis aimed to identify if there was any consistency in the entity (Cause, Theme, Source/Goal) drawn first. This analysis is supported by evidence presented in Section 1.1, suggesting that the temporal order in which the entities are drawn reflect foregrounding choices, with the entity drawn first having primary prominence equal to the prominence given in the Subject position of a sentence in English.

Foregrounding choices then set the perspective from which to interpret a specific event. However, foregrounding choices may be affected by output modality factors and further perceptual and conceptual factors. Thus, the interaction between all these factors may affect foregrounding choices across both variables of *event type* and *cause-role*. The perceptual and conceptual factors controlled for are:

a) *Animacy:*

It was predicted that differences between caused change of position events and caused change of possession events will occur, since animate entities are conceptually more salient.

b) *Agency/initiator of the event:*

The initiator of an event is more likely to be foregrounded, since this entity receives more attention when the intention is to communicate.

c) *Start position of the theme:*

This factor may produce foregrounding differences between give/put-type events (CS) and take/pick-type events (CG), since causality is easier to perceive in events where the Theme starts off with the Cause and moves away from it.

d) *Screen position:*

It was predicted that the entity presented on the left of the screen is more likely to be drawn first, since foregrounding choices may interact with the output modality constraint of 'start drawing on the left'.

Evidence supporting the effects of these factors on foregrounding choices is provided in Section 1.2. Overall, it is expected that the Cause will be drawn first and thus be foregrounded when these factors converge in a visual event, hence maximally increasing the prominence of the Cause entity. However, participants' foregrounding choices may depend more on perceptual factors in the events where more perspective choices are available making the Cause less easy to determine.

For each stimulus, the entity that was drawn first was recorded at the time of production on a grid and the recordings were later analysed on SPSS and Excel.

### 3. RESULTS

The results of the analyses of data are presented in this section. The results are subjected to a group analysis with individual performances mentioned when appropriate. The aim is to identify any patterns in the participants' foregrounding choices. First an analysis of the entity drawn on the left was carried out, then analysis of the entity drawn first and finally perceptual, conceptual and output modality factors were considered.

#### 3.1 Analysis of entity drawn on left

Analysis of the entity drawn on the left of the page revealed that the Theme entity was never drawn on the left and that all participants drew the Cause or the Source/Goal entity on the left in response to all visual stimuli.

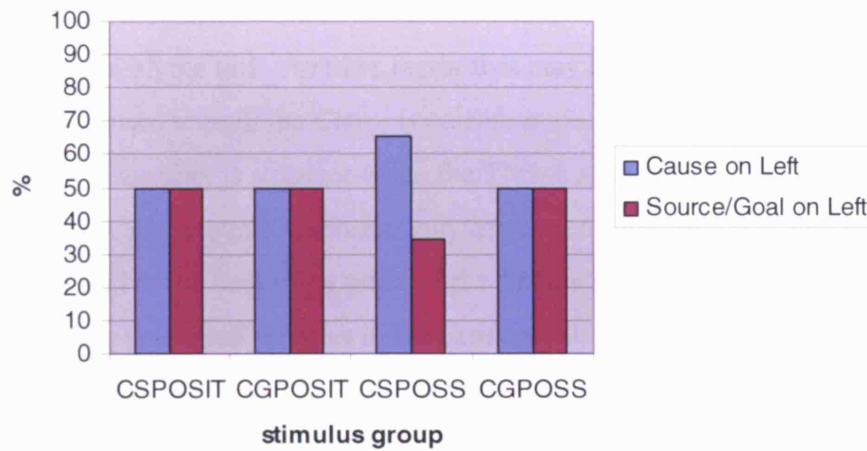
The table below shows the mean number of times the Cause and the Source/Goal was drawn on the left in each stimulus group, with standard deviations in parentheses. The proportion of the times the Cause or Source/Goal was drawn on the left of the page in each stimulus group is also presented graphically overleaf.

**Table 3.1.1:** Means and standard deviations of number of times the Cause and the Source/Goal were drawn on the left in each stimulus group across all participants.

<b>Stimulus group</b>	<b>Cause drawn on Left</b>	<b>Source/Goal drawn on Left</b>
<i>CSPOSIT</i>	4 (0.426)	4 (0.426)
<i>CGPOSIT</i>	4 (0.739)	4 (0.739)
<i>CSPOSS</i>	5.25 (0.452)	2.75 (0.452)
<i>CGPOSS</i>	4 (0.00)	4 (0.00)

**Key:** *CSPOSIT*= put-type position change events; *CGPOSIT*= pick-type position change events; *CSPOSS*= give-type possession change events; *CGPOSS*= take-type possession change events

**Figure 3.1.2:** Graph showing the proportion of times the Cause and the Source/Goal was drawn on the left in each stimulus condition across all participants.



A univariate ANOVA with items-as-subjects was carried out (SPSS GLM procedure), with three between-subjects factors: Event type (position change vs. possession change events), Cause role (CS-give/put-type vs. CG- take/pick-type) and Screen position (Cause-left vs. Source/Goal-left). The dependent variable was the number of times the Cause was drawn on the left. The results revealed a highly significant main effect of Screen position ( $F(1, 24) = 53.318, p < .0001$ ). There were no other effects and no interactions. The Cause was drawn on the left significantly more often when it was presented on the left than when on the right.

### Discussion

In most cases, the entity that was presented on the left of the screen in the video scenes was drawn on the left of the page and all participants drew the Cause and the Source/Goal on the left, an almost equal number of times in all stimulus conditions, except for one. The different means presented for the *give-type* possession change events condition are largely dependent on the responses to only two stimuli. An item-by-item analysis showed that in the visual stimulus representing the event of *Girl gives cup to boy*, where the Cause (girl) was on the right of the screen and the Goal (boy) was on the left, all participants consistently drew the Cause entity on the left of the page. Also, in the visual stimulus representing the event of *Girl sells apple to boy*, which is also a *give-type* possession change event with the Cause presented on the right, 4/12 participants drew it on the left.

This may have occurred because these two stimuli were only the third and the fourth visual events presented to the participants and in the beginning of the drawing task participants' responses were not as consistent, as they were still familiarizing themselves with the task. Another factor that may have caused these results may be that in these two stimuli the Cause is co-referential to the Source and evidence has shown that causality is stronger when the Theme starts off with the Cause (see Section 1.2.2). Thus, participants' attention may have been directed to the initiator (Cause) of the event and to the beginning point of the Theme and together with the fact that these stimuli were presented early on in the experiment, participants may have paid more attention to the Cause and not remember the scene exactly. This might also interact with the output modality constraint of 'start drawing on the left', which would make them draw the initiator, to whom they gave their attention, first and thus on the left. An interaction between all these factors may have caused participants to draw the Cause on the left when it was presented on the right in these two stimuli.

These factors could also explain the reason why 11/12 participants drew the Cause on the left when the Goal was presented on the left in the event *Girl (Cause) puts vase on table (Goal) (put-type position event)*. Furthermore, in the visual stimuli representing the event of *Girl puts book on table (put-type position event)*, where the Goal was presented on the right, all participants drew it on the left. This may be because in this type of event there is only 1 animate entity and therefore the participants may have chosen to draw the inanimate and more stable entity first as a reference object for the Theme and through interaction with the output modality constraint of 'start drawing on the left', the Goal (table) was drawn on the left (see Section 1.2.1). However, the fact that this only occurred in one stimulus of this stimulus group may be that it was only the sixth stimulus presented.

A few more irregularities occurred across the stimuli and across the participants but they appeared to be random and their impact is only reflected in the standard deviations. Examples of drawings presenting with the type of irregularities mentioned above are provided in Appendix F.

Overall, despite these deviations discussed above, participants did tend to replicate screen position, as it was predicted. Therefore, the graphic output modality, drawing, seems to make us replicate the positions of the entities in the stimulus and together with the input stimulus of 'screen position', the entity drawn on the left is determined.

This might further interact with the output modality factor of ‘start drawing on the left’ to influence the order in which the entities are drawn. (Sacchett, 2005) This will be further explored in the next section.

### 3.2 Analysis of entity drawn first

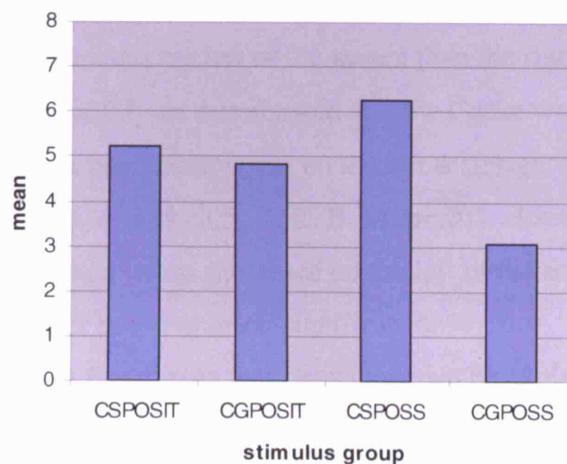
Overall, the Cause entity was drawn first, 60% of the time, across all the stimulus groups. Table 3.2.1 below presents the mean number of times the Cause entity was drawn first in each stimulus group across all participants (maximum=8), with standard deviations in parentheses and with percentages alongside. The means are also represented graphically in figure 3.2.2. (see Appendix G for breakdown across individual participants)

**Table 3.2.1:** Mean number of times participants drew the Cause first in each of the stimulus conditions, with standard deviations in parentheses and percentages alongside.

Stimulus group	Mean no. of times Cause drawn first	% of times Cause drawn first
CSPOSIT	5.25 (1.66)	66 %
CGPOSIT	4.83 (1.64)	60.4 %
CSPOSS	6.25 (0.87)	78 %
CGPOSS	3.08 (1.08)	38.5 %

Key: CSPOSIT= put-type position change events; CGPOSIT= pick-type position change events; CSPOSS= give-type possession change events; CGPOSS= take-type possession change events

**Figure 3.2.2:** Graph showing mean number of times participants drew the Cause first in each of the stimulus conditions.





A parametric method of analysis can be employed for this data set, since the dependent variable, the number of times the Cause was drawn first, is a ratio scale variable.

A univariate ANOVA with items-as-subjects was carried out (SPSS GLM procedure) with three between-subjects factors: Event type (Position change vs. possession change events), Cause role (CS-give/put-type vs. CG- take/pick-type) and Screen position (Cause-left (CL) vs. Source/Goal left (S/GL)). The dependent variable was the number of times the Cause entity was drawn first.

The results of the analyses showed a significant main effect of Cause-role ( $F(1,24) = 13.562, p = .001$ ) and a statistically significant main effect of Screen position ( $F(1,24) = 14.853, p = .001$ ). There was no effect of Event type, but there was an interaction between Event type and Cause role ( $F(1,24) = 7.988, p = .009$ ), and between Cause role and Screen position ( $F(1,24) = 4.584, p < .05$ ). No further interactions were significant, although the interaction between Event type and Screen position neared significance ( $F(1,24) = 3.880, p = .061$ ).

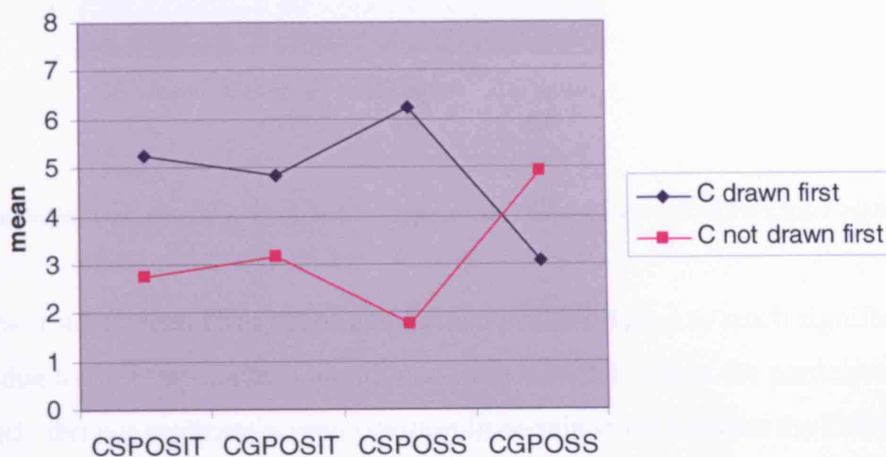
The main effect of Cause role shows that the Cause was drawn first significantly more in *CS-give/put-type* events than *CG-take/pick-type* events. This significant main effect was further supported by individual analyses, which indicated that the difference in the number of times the Cause was drawn first between *CS* and *CG* events was significant for 4/12 participants (Fishers exact Test: P. C, B. M, J. D, J. S,  $p < .05$ ). However, overall the Cause entity was drawn first more in *CS* events than in *CG* events for another 6 participants, although it failed to reach significance. For the remaining 2 participants the Cause entity was drawn first equally across *CS* and *CG* events.

The main effect of Screen position shows that the Cause was more likely to be drawn first when it was presented on the left of the screen than the right. This was also supported by individual analyses that showed that the Cause was drawn first significantly more when presentation was on the left than right for 4/12 participants (Fishers Exact Test: S. J, A. P,  $p < .05$ ; D. C, B. M,  $p < .01$ ). However, overall the Cause was drawn first more when it was presented on the left of the screen for the remaining 8 participants although it failed to reach significance.

The interaction between Event type and Cause role can be explained by the fact that the effect of Cause role was significant only for possession change events (one-way ANOVA, SPSS GLM procedure), ( $F(1,14) = 8.790, p = .01$ ) and not for position

change events ( $F < 1$ ). In position events, the Cause was more likely to be drawn first regardless of the Cause role, but in possession events the Cause was more likely to be drawn first when the Cause role was co-referential with the Source (*CS-give*-type possession events). When the Cause was co-referential with the Goal, it was less likely to be drawn first. This interaction is also presented graphically in figure 3.2.3:

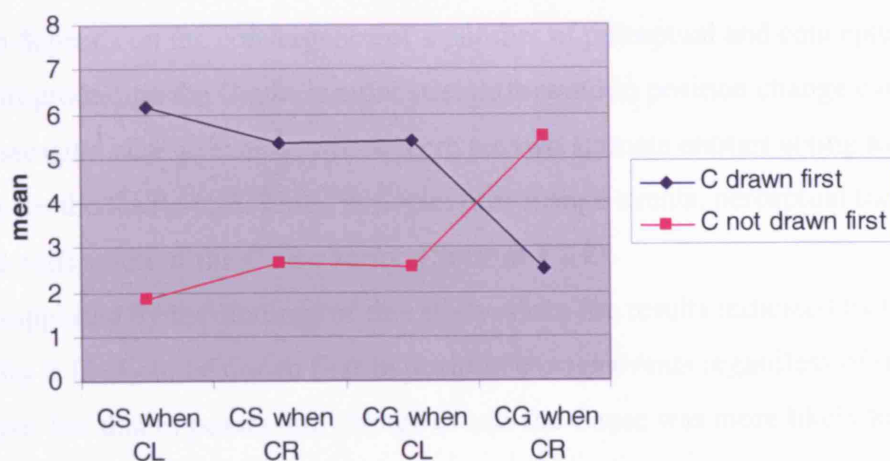
Figure 3.2.3: Graph showing interaction between the variables of Event type and the Cause role.



Key: CSPOSIT= put-type position change events; CGPOSIT= pick-type position change events; CSPOSS= give-type possession change events; CGPOSS= take-type possession change events

Likewise, the interaction between Cause role and Screen position can be explained by the fact that there was a significant effect of Screen position only for *CG-take/pick*-type events (one-way ANOVA, SPSS GLM procedure), ( $F(1,14) = 13.012, p = .003$ ) and not for *CS-give/put*-type events ( $p > .05$ ). In *CS* events, the Cause was more likely to be drawn first even when it appeared on right of screen, but for *CG* events the Cause was more likely to be drawn first only when it appeared on the left of the screen. When it appeared on the right, it was less likely to be drawn first. This interaction is also shown graphically in figure 3.2.4 overleaf:

Figure 3.2.4: Graph showing interaction between the variables of Screen position and the Cause role.



Key: CS= give/put-type events; CG= take/pick-type events; CL= Cause-left; CR= Cause-right.

The interaction between Event type and Screen position failed to reach significance, possibly due to the irregularities mentioned in section 3.1, where the participants consistently did not replicate screen position in certain stimuli across the Event type variable. However, post hoc analysis of the interaction showed a significant effect of Screen position for possession change events (one-way ANOVA, SPSS GLM procedure), ( $F(1,14) = 6.253, p = .025$ ) and not for position change events ( $p > .05$ ). In position events, the cause was more likely to be drawn first even when it appeared on the right of the screen, but for possession events the Cause was more likely to be drawn first only when it appeared on the left of the screen.

### Discussion

This analysis was based on the hypothesis that the entity drawn first reflects foregrounding choices in the graphic communication of events, equal to that given to sentence subject position in English. Overall, the results suggest that the entity most likely to be drawn first is the Cause (60% of all stimuli), which mirrors linguistic foregrounding. However, 40% of the time, participants foregrounded the Source/Goal, suggesting that in the graphic communication of events, there is considerable variation in terms of foregrounding choices.

The results showed variation in foregrounding choices between the different stimulus groups. Examples of drawings in response to different stimuli are presented in

Appendix H. Particularly, the findings indicated that primary foregrounding of the Cause depended on the ease of identification of the entity that played the role and that this in turn depends on the convergence of a number of perceptual and conceptual factors. Foregrounding the Cause is more straightforward in position change events than in possession change events, where there are two animate entities acting as candidates for the Cause role. Thus, in possession change events, perceptual factors may aid identification of the Cause entity. (Section 1.2.2)

This was supported by the findings of this study, since the results indicated that the Cause entity is likely to be drawn first in position change events regardless of the role of the Cause, but that in possession change events the Cause was more likely to be drawn first when it was co-referential with the Source, *CS-give*-type possession events. Therefore, when more perspective options are available, participants tend to rely on the Cause role to determine foregrounding choices. In addition, the results showed that in *CG-take/pick*-type events, the Cause was more likely to be drawn first when it appeared on the left of the screen, thus interacting with the output modality constraint of 'start drawing on the left'. This finding may be explained by earlier evidence that causality is easier to perceive when Theme starts with the Cause (see Section 1.2.2). When this is not the case (i.e. when Theme does not start with Cause = *CG* events), the perceptual factor of Screen position becomes the most important. However, the results indicated that Screen position was significant for possession change events and thus overall Screen position played an important role for *CG-take/pick*-type possession events, where there is the least convergence of perceptual factors.

The effects of these perceptual factors will be addressed in more detail in the next section (3.3).

### 3.3 Perceptual and conceptual influences on foregrounding

The perceptual and conceptual factors that may affect foregrounding choices are:

- i) the number of animate entities
- ii) the initiator of the event
- iii) the start position of the theme
- iv) the left screen position

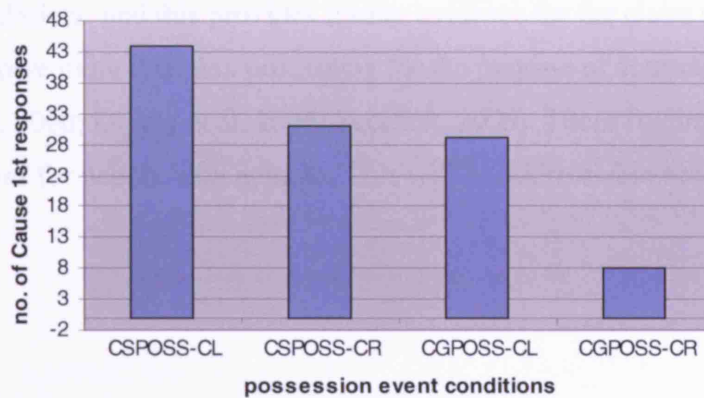
(see Section 1.2, 2.4)

In position change of events, where there is only 1 animate entity, factor (i) acts as a strong conceptual cue for the identification of the Cause and it combines with factor (ii) to maximize the prominence of the Cause entity, thus leading to its foregrounding. However, in possession change events, there is more than one possible Cause in the event, since 2 animate entities are present. In these types of events foregrounding choices depend on the remaining 3 perceptual factors.

Factor (ii) directs attention to the Cause entity, factor (iii) directs attention to the beginning point of the Theme and factor (iv) directs attention to the entity on the left of the screen.

Careful analysis of the possession events showed that when these 3 factors converge, the Cause is drawn first significantly more often. The Cause was drawn first 44/48 times in *CS- give*-type possession events with Cause on left of screen (condition (a)). When this condition was compared to the remaining 3 conditions: (b) *CS- give*-type possession events with Cause on right of screen, (c) *CG- take*-type possession events with Cause on left of screen and (d) *CG- take*-type possession events with Cause on right of screen, the difference in the number of times the Cause was drawn first was significant. Specifically, when comparing condition (a) and (d), the two exact opposites, the difference was highly significant (chi-square= 54.378, df = 1,  $p > .0001$ ). Significance was also found between conditions (a) vs. (b) which differ only in terms of Cause screen position- (chi-square= 12.865, df = 1,  $p > .0001$ ) and between (a) vs. (c) which differ only in terms of Cause role- (chi-square= 10.301, df= 1,  $p > .001$ ). The differences in the number of Cause first responses across the four possession change event conditions can also be seen graphically overleaf:

3.3.1: Number of times the Cause entity was drawn first in each possession change event condition.



Key: CSPOSS-CL= CS- give-type possession events with Cause on left of screen (a); CSPOSS-CR= CS- give-type possession events with Cause on right of screen (b); CGPOSS-CL= CG- take-type possession events with Cause on left of screen (c); CGPOSS-CR= CG- take-type possession events with Cause on right of screen(d)

Furthermore, when two factors converge, the entity that they both direct attention to is more likely to be drawn first. Therefore, when factor (ii) initiator and (iii) start position of Theme converge, as in CS- give-type possession events with Cause on right of screen (condition (b)), they act together to increase attentional salience of the Cause resulting in a high incidence of Cause first responses 31/48. Also, in CG-take-type possession events, with Cause on left of screen (condition (c)) where again two factors (ii) initiator and (iv) screen position converge, the incidence of Cause first responses is high 29/48.

Additional to significant differences between (a) and (b), a significant difference between conditions (c) and (d) which differ only in terms of Cause screen position, was highly significant (chi-square= 19.393, df= 1,  $p < .0001$ ), suggesting that foregrounding choices in less straightforward situations are dependent on the factor of Screen position (iv). This is an example of how input and output modality factors may interact. As mentioned in section 3.1 the graphic output modality constraints of 'replicate screen position' and 'start on drawing on the left' interact with the input factor of Screen position to influence foregrounding choices, i.e. entity on left is more likely to be drawn first in situations where there are two possible candidates for the role of Cause. (Sacchett, 2005)



These analyses indicate that in possession change events, which involve more candidates for the Cause, participants do rely on perceptual factors to determine their foregrounding choices, and this provides further evidence for the claim that these events may involve more complex processing for the purpose of communication (Black & Chiat, 2000; Dipper et al, 2005; Sacchett, 2005). These findings may also have implications for people with aphasia. This will be addressed in section 4.

## **4. DISCUSSION**

In the first section (4.1) of this final chapter the theoretical implications of the study are discussed with a specific focus on the claims raised in the introduction (Chapter 1). Section 4.2 discusses the limitations in the development of the study and how they can be avoided. Section 4.3 explains how the findings affect therapy and assessment for aphasic individuals and finally Section 4.4 outlines areas identified for future research.

### **4.1 Reviewing foregrounding choices**

The results of the analyses carried out revealed a number of regularities, providing information about how individuals with intact language tackle the task of communicating visually presented caused change of location events through drawing. On the whole, foregrounding choices mirrored linguistic communication, with the Cause entity drawn first most of the time, indicating that participants appreciated the causal structure of the events and were able to identify the roles of the entities by guiding their attention to the ACT component of the event. This supports Sacchett's (2005) findings on participants without language impairment, where the importance of the initiator of the event was reflected in the temporal order the entities were drawn, with the Cause entity mostly drawn first.

However, variations found between the different stimulus groups indicated that foregrounding choices are dependent on the ease of identification of the Cause entity, which in turn depends on perceptual and conceptual factors, acting together to increase the salience of the Cause entity or acting against each other to make the identification of the Cause entity less straightforward (Hartsuiker & Kolk 1998, Sacchett, 2005).

The number of perspective options offered in each stimulus was found to affect the likelihood of the Cause entity being drawn first, suggesting that scenes offering more perspective options may make the Cause harder to identify.

In position change events involving one animate entity acting as the only candidate for the role of the cause, the Cause entity was primarily drawn first. This finding is in line with Sacchett's (2005) results, who also found that in position change events,



participants with intact language almost consistently foregrounded the Cause entity. Therefore, these findings provide further support for the claim that when communicating about an event our attention is directed towards potential causes, resulting in presenting the event from the perspective of the Cause entity (Griffin & Bock 2000, Zacks & Tversky 2001, Sacchett, 2005). These findings also show how animacy acts as a strong conceptual cue to agentivity (Langacker, 1998). On the other hand, in possession change events involving two possible candidates for the role of the Cause depending on the perspective adopted, foregrounding of the Cause entity occurred when bottom-up perceptual factors combined. Notably, the findings of this study showed similar patterns to those found by Sacchett (2005). More specifically both of these studies demonstrated that when all perceptual cues converged in possession change stimuli, the Cause was drawn first more often, and even when two cues converged, there was a higher incidence of Cause-first responses. This demonstrates that perceptual cues such as the Cause role and Screen position are important in aiding foregrounding of the Cause in situations where its identification is less easy, thus supporting previous research (Verfaillie & Daems, 1996, Chatterjee et al, 1995, Chatterjee et al, 1999). Therefore, drawing from these findings, further support is given to the claim that scenes offering more than one perspective option, add a further layer of complexity and show increased 'paring-down' to visual event conceptualization (Black & Chiat, 2000, Dipper et al, 2005).

Finally, in situations where perceptual factors may have acted against each other (e.g. in *take*-type possession events), participants relied on screen position of the entities to determine what will be drawn first. The entity presented on the left of the screen was overall drawn first as a result of the interaction between the input modality which brings about replication of screen position and the output modality constraint of 'start drawing on the left'. This is similar to Sacchett's (2005) findings and to findings of other research in this area (Chatterjee et al, 1995, Chatterjee et al, 1999), thus providing support to their findings that interactions between input-output modalities, affect foregrounding choices.

Furthermore, Sacchett (2005) found that participants consistently drew on the left the entity presented on the left of the screen, whereas the results of the current study showed some deviations. These deviations were largely due to responses to a few specific stimuli that were presented early on in the experimental drawing task, which

possibly skewed the results. Ways to overcome possible skewing of results are discussed in the next section (4.2).

#### **4.2 Limitations of the experimental drawing task**

The experimental drawing task was successful in identifying participants' foregrounding choices under different conditions, although some aspects of the procedure employed and the visual stimuli used could have been altered to avoid any unnecessary skewing of the results.

The results indicate that in response to certain stimuli presented in the beginning of the task, participants' performance deviated from the patterns that characterized the rest of their performance (see Section 3.1). This may have occurred because the participants had not yet developed a consistent way of dealing with the task as it was a new and unknown task for them. The introduction of a few practice items would aid familiarization with the task allowing more objective patterns to occur and preventing possible skewing of the results.

In addition, more careful randomization of the visual stimuli would avoid visual stimuli from the same stimulus group being presented sequentially and possibly affecting participants' performance. The drawing produced may be similar to the previous one simply because the stimuli are presented in sequence. Thus, it would not be possible to observe if the participants would have responded in the same manner regardless.

Finally, it was observed that when participants had to produce drawings in response to visual stimuli representing events of *buying* and *selling*, e.g. *girl sells the apple to boy*, they experienced difficulties in remembering exactly the transaction that took place and this may have added complexity in the processing of these events. The background was not neutral in these scenes because the scene had to be set accordingly e.g. table, fruits and this might have interfered with the focus of participants' attention and thus further interfere with foregrounding choices. It was revealed that some of the deviations and random responses mentioned earlier occurred in this type of events. Alternatively, other *give-type* and *take-type* possession events could be used or simply use more *give/throw* and *take/grab* events.

### **4.3 Implications for therapy and assessment in aphasia**

Evidence has shown that many people with aphasia experience problems with the 'language of events' with regards to verb and sentence processing, both in production and comprehension (Byng, 1988, Caramazza & Hillis, 1991, Nickels, Black & Byng, 1991, Byng, Nickels & Black, 1994, Berndt, Mitchum, Haendiges & Sandson, 1997, Marshall, Chiat & Pring, 1997).

The findings of this study suggest that people without language impairment rely on perceptual factors to guide their foregrounding choices, when conceptual cues to causality are less clear-cut. Therefore, the interaction between perceptual/conceptual and output constraints considered in this study may be highly relevant to aphasia. If foregrounding decisions of people with no language impairment are influenced by these factors, individuals with aphasia are likely to encounter more problems and thus these factors should be taken into account in the development of stimuli for clinical therapy and assessment, especially since picture-based tasks are very commonly used. Sacchett (2005) found that some individuals with aphasia failed to present the events from the perspective of the Cause entity, even when there were strong conceptual cues to agentivity, as in the position change events. She interpreted this finding as a failure to identify the role of the Cause entity as the initiator of the event and to appreciate the causal structure of the events, suggesting that these participants were not focusing on the same aspects of the visual scenes as the controls.

It follows, that visual stimuli in initial stages of therapy, should be carefully constructed to make the identification of the Cause entity as straightforward as possible. Therefore, in the beginning, events that have limited perspective options could be employed, e.g. position change events involving one animate entity acting on an inanimate entity, since the Cause entity can be more easily identified in these types of events and thus guide foregrounding choices (Hartsuiker & Kolk, 1998, Black & Chiat 2000, Sacchett 2005). Further, perceptual and conceptual factors should act in congruence, for example, by placing the Cause entity on the left of the screen, thus making it perceptually more salient (Flores d'Arcais's, 1975, Sridhar, 1988, Chatterjee et al, 1995) or by ensuring that direction and position line up in a scene, making causality easier to perceive (Verfaillie and Daems, 1996, Chatterjee et al 1999). As therapy progresses, stimuli can become gradually more complex. For example by using stimuli in which the convergence of perceptual and conceptual cues

is reduced, e.g. by varying the position of the animate entity or by introducing a second animate entity, more perspective options are provided and thus processing complexity increases (Black & Chiat, 2000).

Careful stimuli construction is important for the development of assessment materials as well. When using current picture based language assessment, one needs to consider the perceptual/conceptual factors of existing stimuli to see whether they might affect performance. When developing new assessments of language and non-linguistic communication, stimuli should include both converging and diverging conceptual and perceptual cues, in order to get a complete picture of a client's abilities. For example, on a sentence-picture matching task, if a client performs well on all stimuli where perceptual cues to causality converge but performs poorly when they do not converge, this could be evidence for event perception problems, rather than language problems, particularly if the semantic and syntactic structure of the sentences used are the same.

Therefore, the drawing task may be a useful clinical tool in investigations of event conceptualization in aphasia, since it shows specific aspects of 'thinking for communication' that may be impaired and allows more specific hypotheses to formulate about intact and impaired processing, especially in individuals with limited linguistic output. Researchers suggest that the difficulties underlying the verb and sentence processing problems commonly seen in some aphasic individuals may in fact be due to difficulties in communicating about events, linguistically and non-linguistically at the level of event conceptualization, thus in the 'thinking for communication' process (Marshall et al, 1993, Byng et al, 1994, Black & Chiat 2000, Dipper et al 2005, Sacchett 2005). Therefore, they suggest a problem in the schematization of events for the purpose of communication, i.e. at the conceptual level of processing, which the drawing task could target.

Limited or unreliable linguistic output has always been a barrier in assessing the processes involved in 'thinking for communication'. Clinicians have relied on assessments that only focus on input, such as sentence to picture matching tasks (Marshall et al, 1993). Others have used other types of non-verbal communication modalities, such as graphic symbol systems or computerized graphics to reveal underlying causes of the language impairments of people with aphasia (Funnel & Allport, 1989, Crerar, Ellis & Dean, 1996, McCall, Shelton, Weinrich & Cox, 2000).

The drawing task, thus provides a solution for difficulties in assessing the processes of 'thinking for communication' and also allows more freedom for individuals to depict an event as they wish, providing a better indication of the focus adopted, rather than simply choosing from a set of alternatives.

Therefore, it could be used alongside other assessment materials to allow specific hypotheses to emerge regarding the nature of the difficulties an individual with aphasia may experience. This in turn would also allow more target specific therapy, such as therapy targeting to increase appreciation of causal interactions and the roles of participants in an event (Sacchett, 2005). Research has shown that event conceptualization may be an appropriate target for therapy for some people with aphasia (Marshall et al, 1993), by focusing, for example, on increasing awareness of how events are structured which eventually would increase effectiveness of their communication (Sacchett, 2005).

Drawing, in general, has been proven to be an appropriate target for therapy, especially for individuals whose language skills are unlikely to improve (Lyon, 1995, Sacchett, 2002). Drawing therapy studies have shown that for some aphasic individuals, effective communication through drawing is better than through language. These studies also report improvements in the ability to communicate about events (Lyon & Helm-Estabrooks 1987, Lyon, 1995, Sacchett, Byng, Marshall & Pound, 1999). By providing additional control data, some of the requirements for using drawing as a means of communication emerge (i.e. drawing the Cause first) and thus, this research may ultimately help individuals with limited linguistic output in graphically communicating about events, which is a crucial part of everyday interactions.

#### 4.4 Further recommendations

The main contribution of the present study has been to provide additional evidence to existing research about the process of 'thinking for communication', with a particular focus on foregrounding choices and factors that may affect them.

In terms of future research, the following areas could be of use:

- Increase the data available for normal participants so that clear patterns can emerge and be used as a point of comparison with aphasic people. Specifically, by replicating Sacchett's (2005) study, involving graphic communication of events in response to visual stimuli and verbal stimuli, by both individuals with aphasia and controls, will provide more data for patterns to emerge and comparisons to be made. Any deviation from control performance in both the visual and verbal condition would reveal problems with specific aspects of event processing and sentence comprehension. Deviations from control data in the verbal condition only would imply problems specific to language, whereas deviations in both conditions, would argue for an underlying problem with the conceptualization of events for communication.
- A cross linguistic study, would be highly relevant since the forms and structures available to different languages vary, directing attention to specific aspects of events. If speakers of different languages produce similar patterns in the graphic communication of events, this may suggest that there is an 'intrinsic graphic system of organization' (Gershkoff-Stowe & Goldin-Meadow 2002). However, if different patterns emerge demonstrating language differences, this would provide evidence of sharing conceptual processing for both graphic and linguistic communication. (Sacchett, 2005)
- A study comparing graphic event communication across different types of events, involving both individuals with aphasia and control participants. For example, events varying in the number and nature of participants involved and the roles and relations between these participants, can be employed. Differences would reveal that the action and nature of participants affect the ease of communication of these events. (Sacchett, 2005)

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## **APPENDICES**

## **APPENDIX A**

### DETAILED INFORMATION FOR EACH PARTICIPANT

	<b>Name</b>	<b>Age</b>	<b>Sex</b>	<b>Hand use</b>
<b>1</b>	S. J	22	F	R
<b>2</b>	B. M	22	F	R
<b>3</b>	J. S	22	F	R
<b>4</b>	A. M	23	F	R
<b>5</b>	A. P	24	F	R
<b>6</b>	T. L	24	F	R
<b>7</b>	N. S	24	M	R
<b>8</b>	J. D	24	M	R
<b>9</b>	T. C	25	M	R
<b>10</b>	D. C	26	M	R
<b>11</b>	G. A	27	M	R
<b>12</b>	P. C	29	M	R

## **APPENDIX B**

### INFORMATION SHEET FOR PROSPECTIVE PARTICIPANTS

#### **CONFIDENTIAL**

#### **Using non-linguistic communication to investigate event processing: evidence from drawing production in adults.**

Maria Fotinopoulou, Student Speech & Language Therapist  
Tel: 020 7336 0059

Supervisor: Carol Sacchett, Research Speech & Language Therapist  
Department of Human Communication Science, University College London  
Chandler House, 2 Wakefield Street, London WC1N 1PF  
Tel: 020 7679 4252

Volunteers are needed to help with a research project investigating the use of drawing to communicate. This study aims to work out what is required in order to get certain kinds of messages across using drawing. I will be studying the drawings produced by a small number of people to identify any regularities and patterns in the way they approach the task.

This research will ultimately help people with aphasia (people who lose the ability to speak or write following a stroke), since they are often encouraged to use other means of communication, such as gestures or drawing, to get their message across. Therefore, the results from this study can form a basis for comparisons to be made between normal and aphasic adults. This will eventually enable Speech & Language Therapists working with aphasics to understand what the requirements are for being able to use drawing as a means of communication. This will help them plan appropriate therapy.

#### **What would it involve?**

You would have to draw a number of things that happen ("events") in short video clips.

The whole thing should take no more than 1 hour. I can come to your home if that is more convenient, or you can suggest somewhere else.

You do not have to take part in this study if you do not want to. If you decide to take part, you may withdraw at any time without having to give a reason. If you would like to participate please contact me on the above. Please keep this leaflet.

All proposals for research using human subjects are reviewed by an ethics committee before they can proceed. This proposal was reviewed by the Joint UCL/UCLH Committees on the Ethics of Human research.

## **APPENDIX C**

### CONSENT FORM FOR PARTICIPANTS

#### CONFIDENTIAL

#### **Using non-linguistic communication to investigate event processing: evidence from drawing production in adults.**

Maria Fotinopoulou, Student Speech & Language Therapist  
Tel: 020 7336 0059  
Supervisor: Carol Sacchett, Research Speech & Language Therapist  
Department of Human Communication Science, University College London  
Chandler House, 2 Wakefield Street, London WC1n 1PF  
Tel: 020 7679 4252

#### CONSENT FORM

I have read the information sheet about this study.	YES	NO
I have had an opportunity to ask questions and discuss the study.	YES	NO
I have received satisfactory answers to my questions.	YES	NO
I have received enough information about this study.	YES	NO
I understand that I can withdraw from this study: *at any time *without giving a reason.	YES	NO
I agree to take part in this study.	YES	NO

Signed .....Date .....

Print name here .....

Signature of investigator .....Date.....

Signature of supervisor.....Date.....

## APPENDIX D

### FULL LIST OF STIMULI FOR THE EXPERIMENTAL DRAWING TASK

Event type	Screen position	Cause-role	
<i>Position change</i>	Cause on left	<b><i>Put-type</i></b> <b><i>(Cause=Source)</i></b>	<b><i>Pick-type</i></b> <b><i>(Cause=Goal)</i></b>
		Girl puts book on table Girl throws ball into box Boy puts box on chair Boy throws ball into bucket	Boy lifts box off table Girl takes ball out of box Boy takes cushion off chair Girl picks apple from bowl
	Source/ Goal on left	Girl puts vase on table Boy drops ball into box Boy puts cup on table Girl drops flower into bucket	Girl lifts vase off table Boy takes book out of box Boy takes case from chair Girl picks flower from vase
		<b><i>Give-type</i></b> <b><i>(Cause=Source)</i></b>	<b><i>Take-type</i></b> <b><i>(Cause=Goal)</i></b>
<i>Possession change</i>	Cause on left	Boy gives vase to girl Girl gives flower to boy Girl throws ball to boy Boy sells book to girl	Boy takes apple from girl Girl takes book from boy Boy grabs cushion from girl Girl buys apple from boy
		Girl gives cup to boy Boy gives cup to girl Boy throws ball to girl Girl sells apple to boy	Girl takes flower from boy Boy takes box from girl Girl grabs case from boy Boy buys book from girl

## APPENDIX E

### EVENT DRAWING TASK INSTRUCTIONS FOR PARTICIPANTS

## What do I have to do?

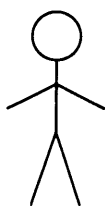
You will see a short video scene involving one or two people and something happening.

### You have to:

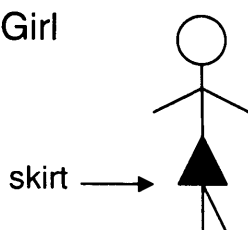
- Watch the scene and try to remember what happens. You may ask for repetitions if you can't remember it the first time.
- Draw the **main thing** that happens in the scene, *as if you were trying to get it across to somebody else*.
- **YOU DON'T HAVE TO DO A "GOOD" DRAWING.** The quality of the drawing is not the important thing.
- Try to include only the main things that are relevant to getting the message across. You don't need to put in unnecessary detail.

**For people, draw stick figures, e.g.**

Boy



Girl



**You can use arrows and other symbols, e.g. £, but NO written words.**



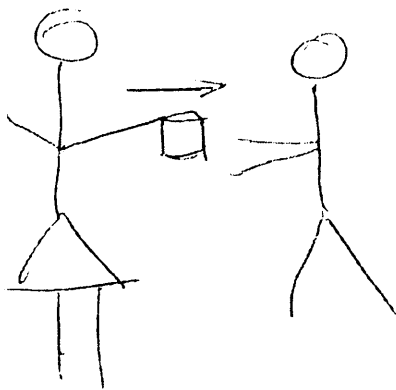
**APPENDIX F**

**EXAMPLES OF PARTICIPANTS' DRAWINGS DEMONSTRATING DEVIATIONS  
IN THE ENTITY DRAWN ON THE LEFT**

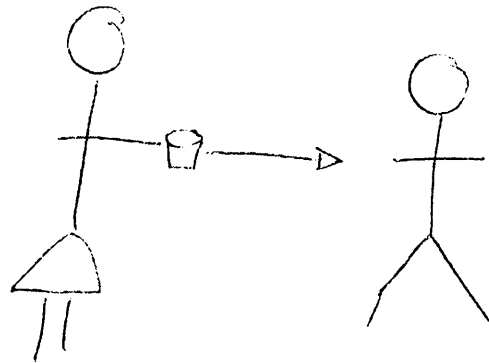
(Drawings have been reduced in size)

**EXAMPLE 1** Give-type possession change event, with Goal on the left  
Stimulus event 4: Girl gives the cup to the boy (Goal)

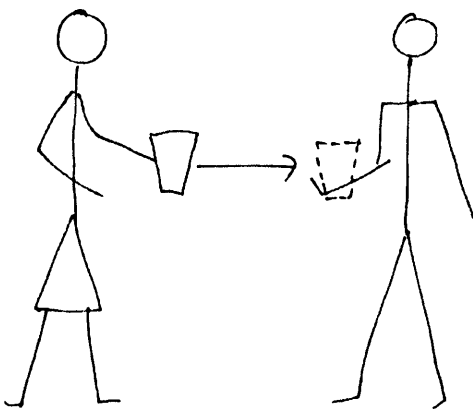
P. C



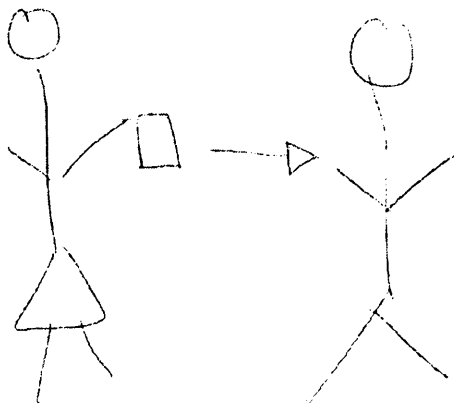
B. M



T. C



S. J

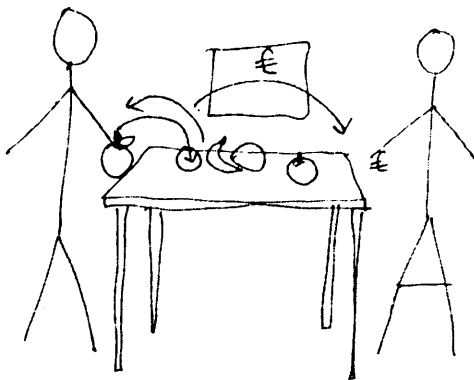


**EXAMPLE 2** Give-type possession change event, with Goal on the left  
Stimulus event 3: Girl sells the apple to the boy (Goal)

2 drawings with Goal on left:

T. C

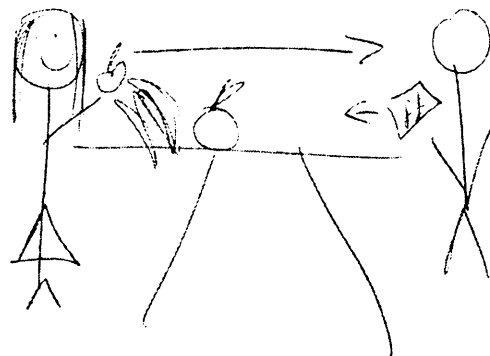
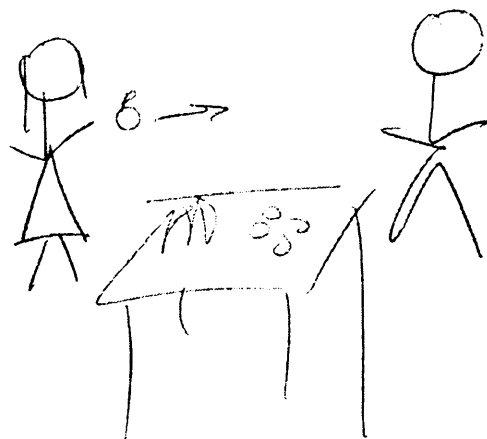
S. J



2 drawings with Goal on right (deviation):

D. C

A. M

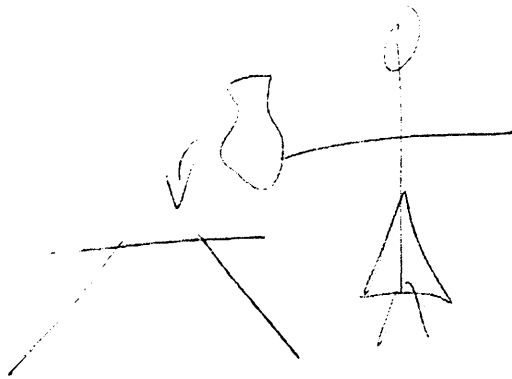
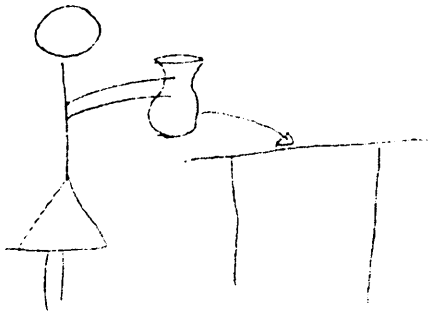


**EXAMPLE 3** Put-type position change event, with Goal on the left  
Stimulus event 15: Girl puts the vase on the table (Goal)

1 drawing with Goal on right (deviation) and one with Goal on left

B. M

G. A

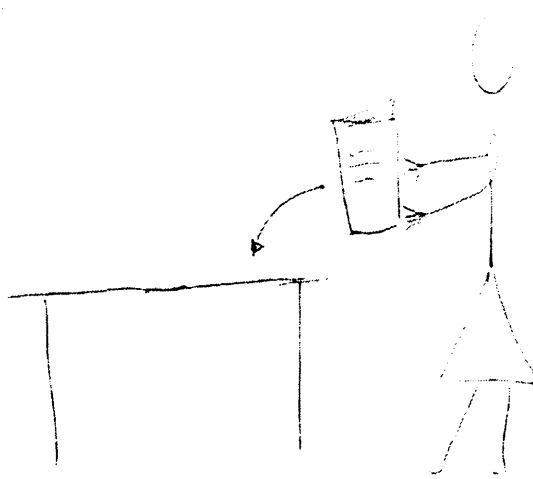
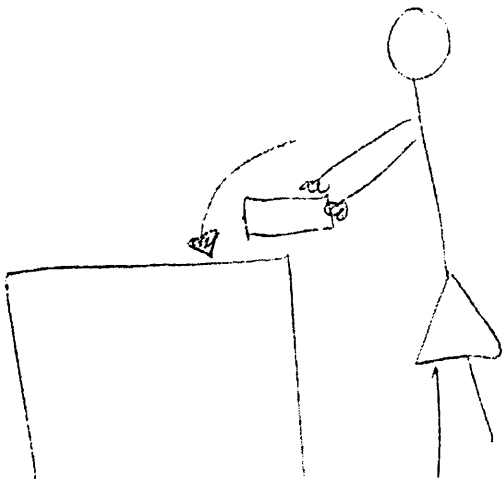


**EXAMPLE 4** Put-type position change event, with Cause on the left  
Stimulus event 6: Girl puts the book on the table

2 drawings with Cause on the right (deviation)

S. J

A. M



## **APPENDIX G**

TOTAL NUMBER OF TIMES CAUSE DRAWN FIRST IN EACH STIMULUS  
CONDITION PRODUCED BY EACH PARTICIPANT

<i>Participants</i>	<b>CSPOSIT</b>	<b>CGPOSIT</b>	<b>CSPOSS</b>	<b>CGPOSS</b>	<b>Total</b>
1) P. C	7	7	7	1	<b>22</b>
2) S. J	3	5	5	3	<b>16</b>
3) T. C	3	2	6	2	<b>13</b>
4) D. C	5	6	7	4	<b>22</b>
5) A. M	7	7	7	3	<b>24</b>
6) B. M	6	3	6	3	<b>18</b>
7) A. P	3	4	6	4	<b>17</b>
8) G. A	4	6	6	4	<b>20</b>
9) J. D	7	4	8	5	<b>24</b>
10) T. L	7	6	5	3	<b>21</b>
11) J. S	5	3	6	2	<b>16</b>
12) N. S	6	5	6	3	<b>20</b>
<b>Total</b>	<b>63</b>	<b>58</b>	<b>75</b>	<b>37</b>	<b>233</b>

(Maximum per cell=8)

*Key: CSPOSIT= put-type position change events; CGPOSIT= pick-type position change events; CSPOSS= give-type possession change events; CGPOSS= take-type possession change events*

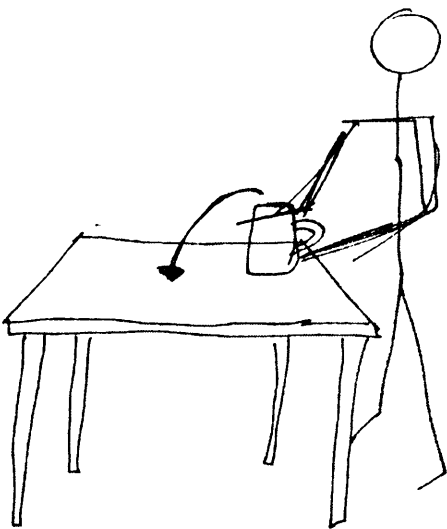
**APPENDIX H**

**EXAMPLES OF PARTICIPANTS' DRAWINGS FOR EACH STIMULUS GROUP**

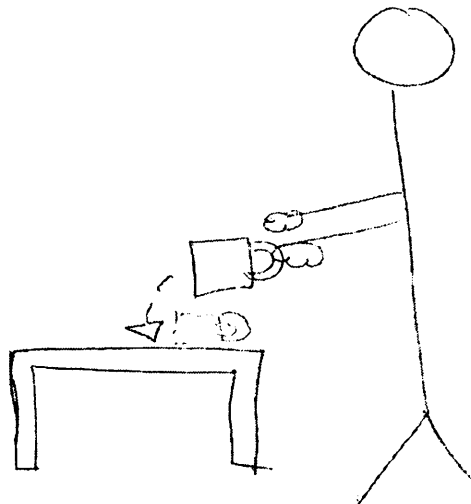
(Drawings have been reduced in size)

**EXAMPLE 1** Put-type position change event, with Goal on the left  
Stimulus event: Boy puts the cup on the table

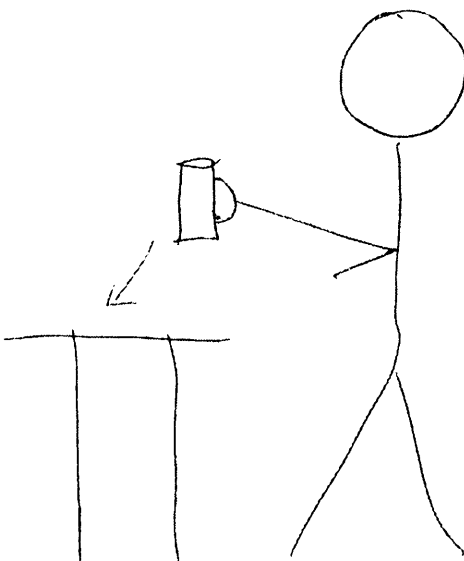
T. C



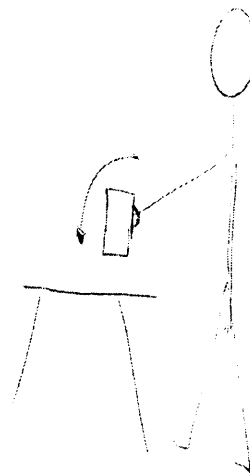
S. J



P. C

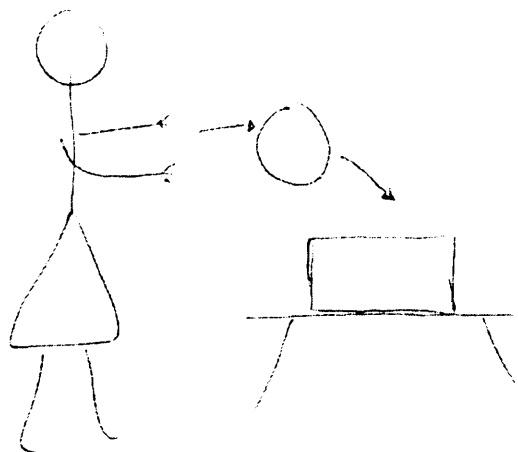


A. M

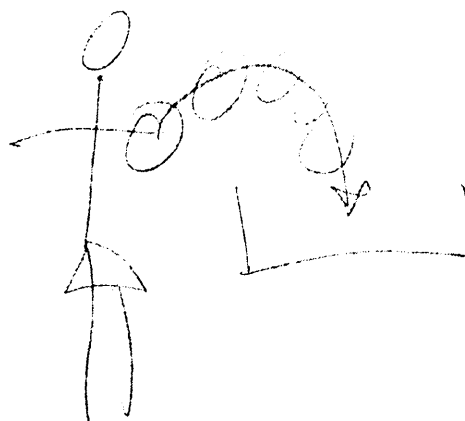


**EXAMPLE 2** Put-type position change event, with Cause on the left  
Stimulus event: Girl throws the ball into the box

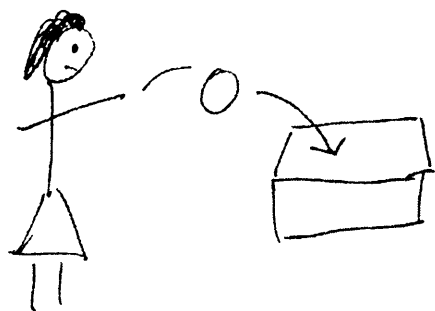
J. S



G. A



J. D

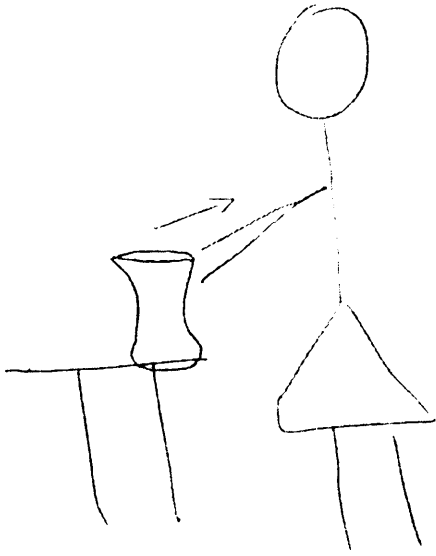


T. L

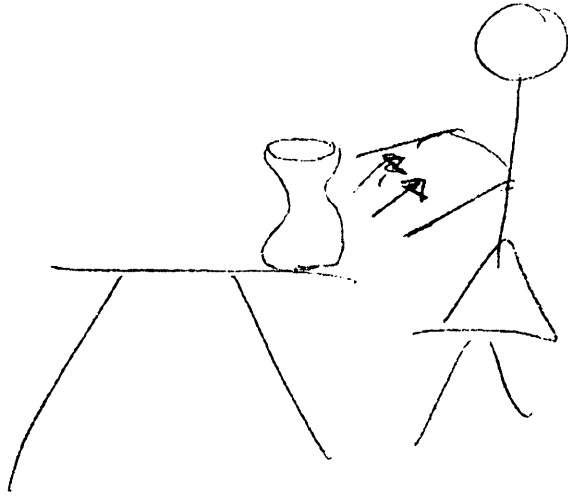


**EXAMPLE 3** Pick-type position change event, with Source on the left.  
Stimulus event: Girl lifts the vase off the table

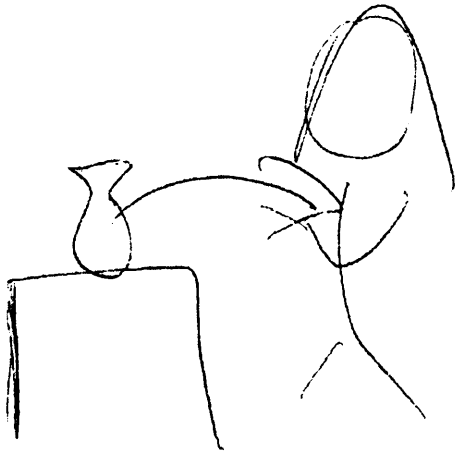
P. C



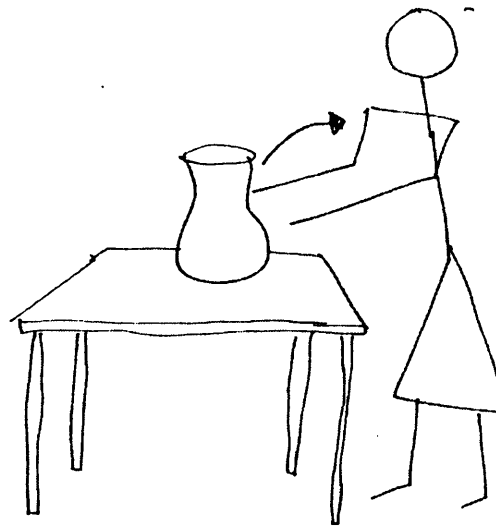
A. P



T. L

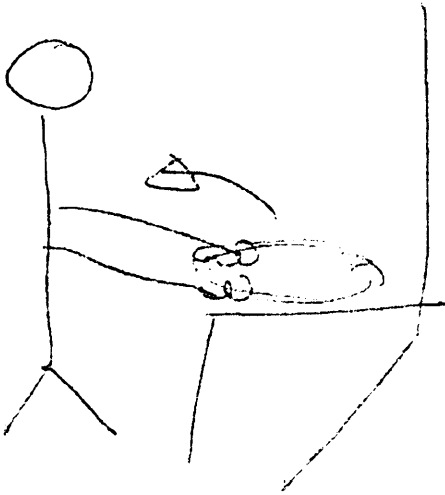


T. C

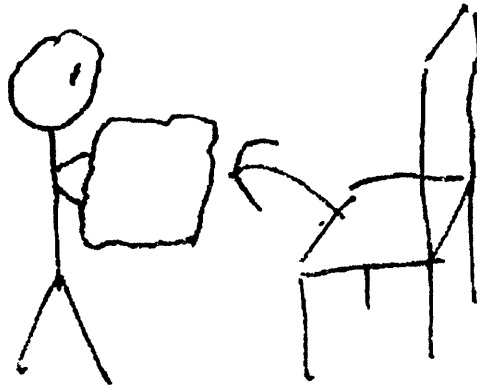


**EXAMPLE 4** Pick-type position change event, with Cause on the left  
Stimulus event: Boy takes the cushion off the chair

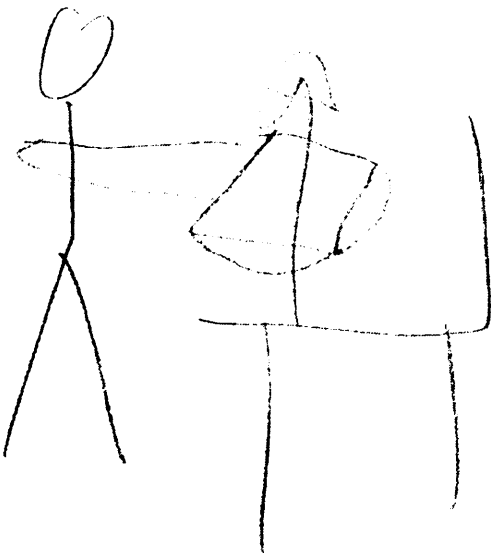
S. J



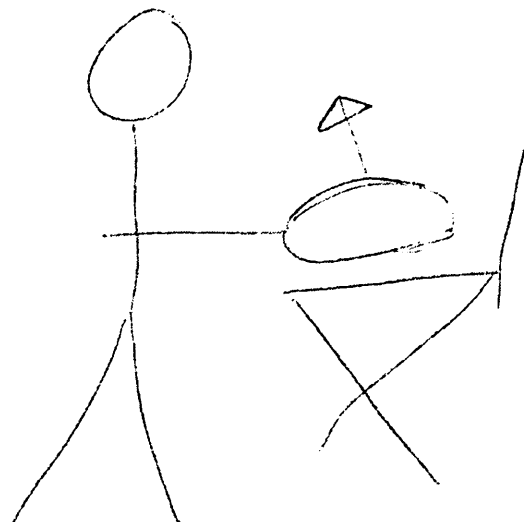
J. D



G. A



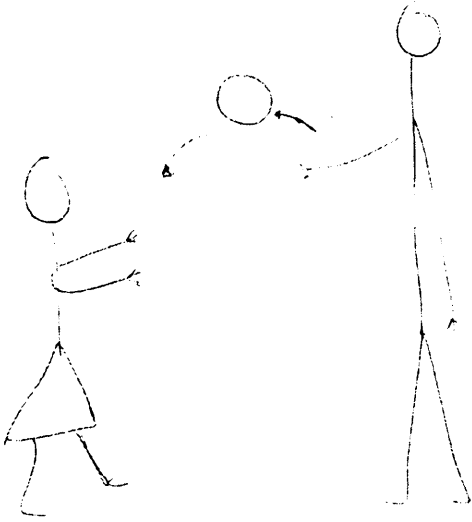
B. M



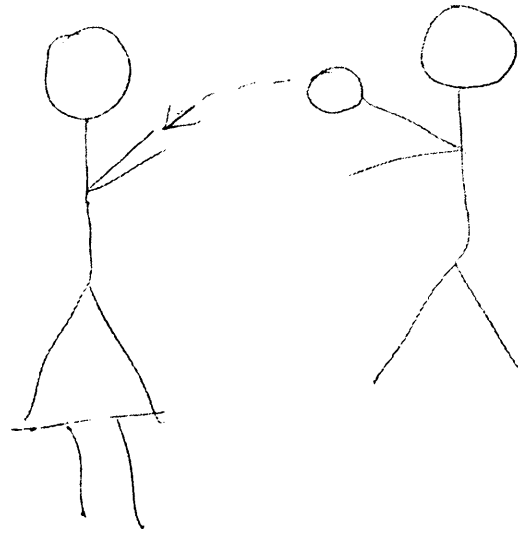


**EXAMPLE 5** Give-type possession change event, with Goal on the left.  
Stimulus event: Boy throws the ball to the girl

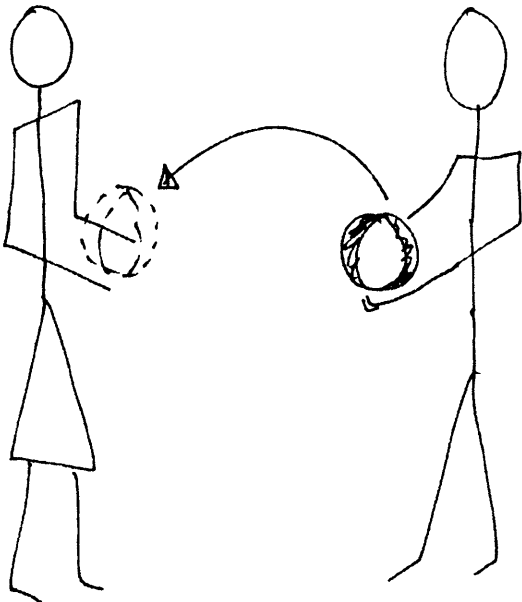
A. M



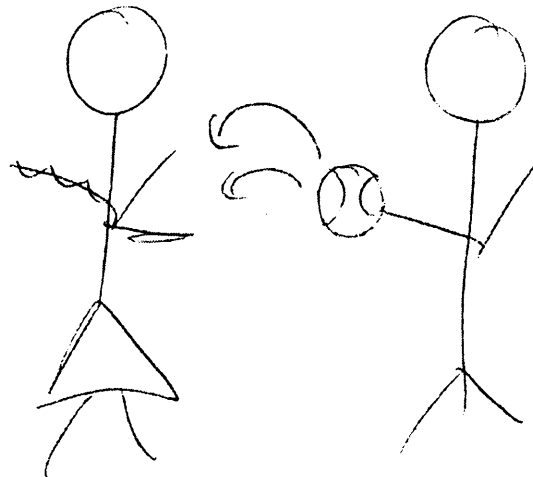
P. C



T. C

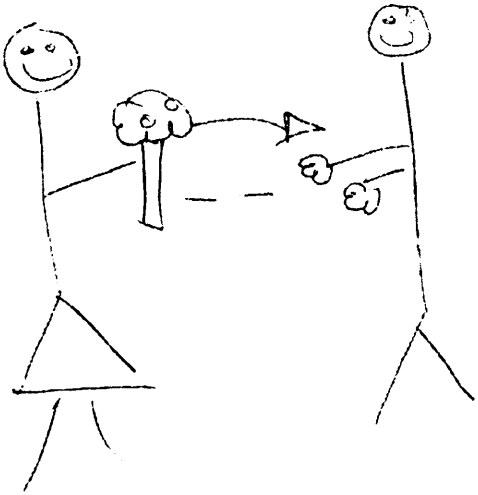


A. P

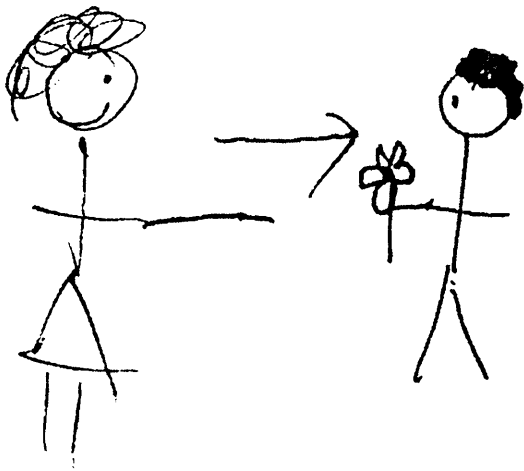


**EXAMPLE 6** Give-type possession change event, with Cause on the left  
Stimulus event: Girl gives the flower to the boy

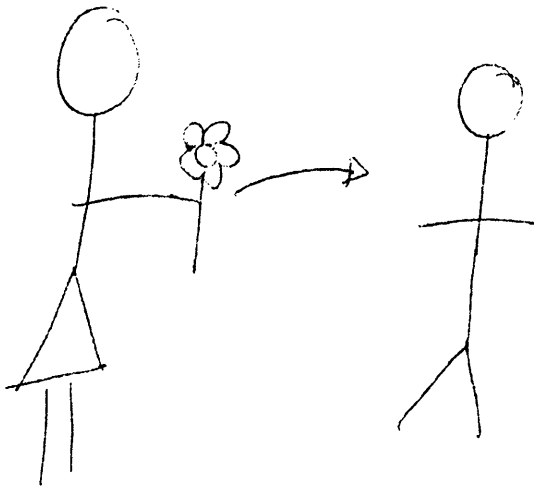
S. J



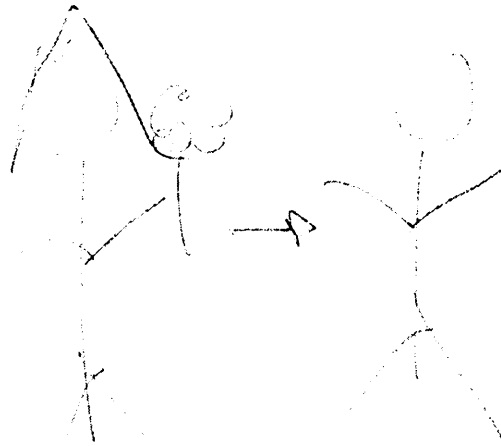
J. D



B. M

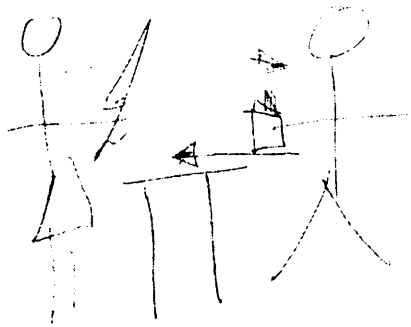


J. S

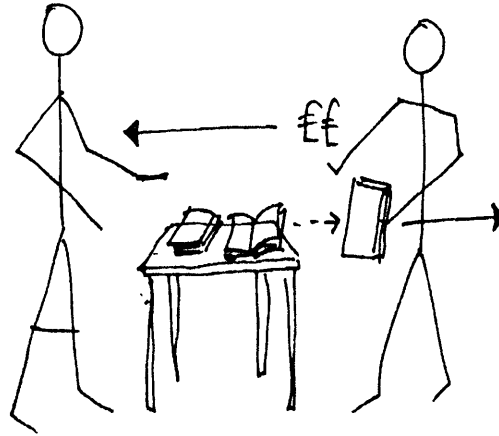


**EXAMPLE 7** Take-type possession change event, with Source on the left  
Stimulus event: Boy buys the book from the girl

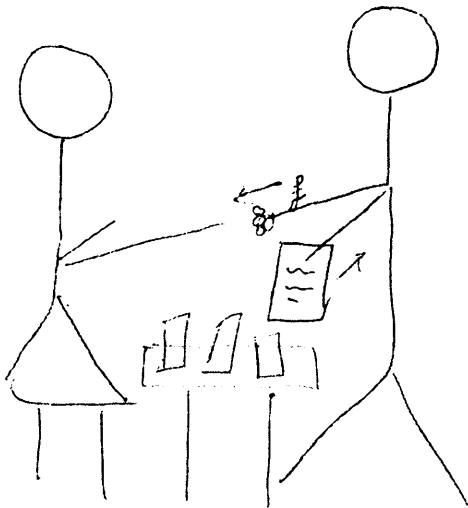
G. A



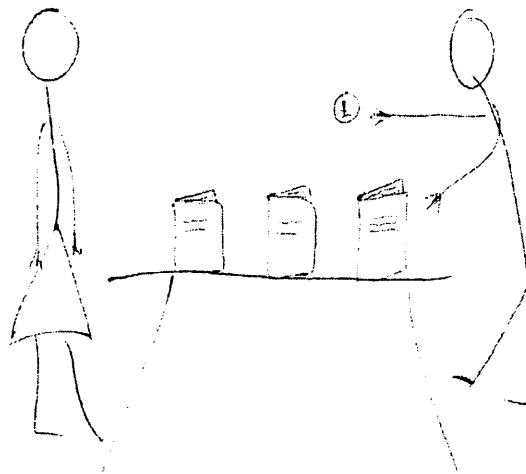
T. C



P. C

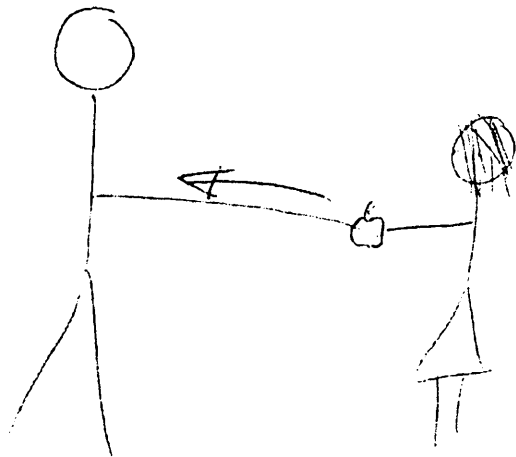


A. M

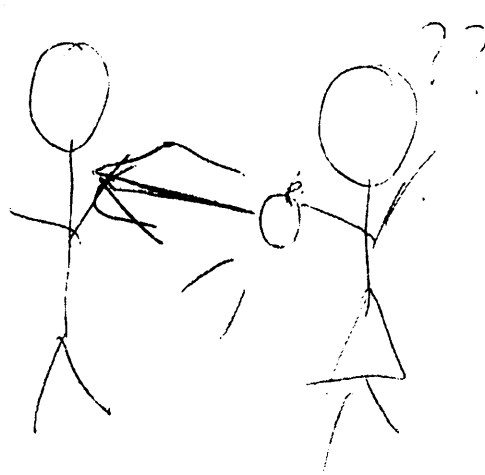


**EXAMPLE 8** Take-type Possession change event, with Cause on the left  
Stimulus event: Boy takes the apple from the girl

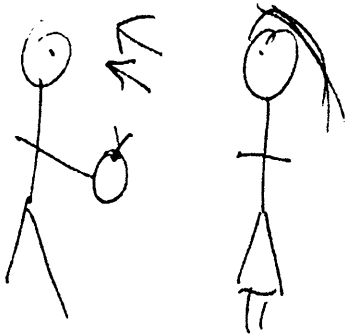
B. M



A. P



J. D



T. L

